A Comprehensive Guide to Mastering Autism, Autoimmune, and Other Neurological Disorders

(Formerly, "To Infuse or Not to Infuse" and "A Comprehensive Guide to Managing Autism")

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A Comprehensive Guide to Mastering Autism

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Warning: Do not scan and read this paper piecemeal. It must be studied to avoid mis-steps.
Use FIND, COPY, and PASTE to extract papagraphs of interest into a new, shorter document for better correlation.

Autism can be mastered! There are several very basic things discussed in this paper that can be done at home with little or no expensive testing. Foremost is the home testing for thyroid function discussed toward the end of this paper, and support of thyroid function. The "unloading of the donkey" is vital to possibly 80% of these troubled children for they are poisoned, drowning in their own toxic wastes. Elimination of bowel disorders is very first on the list of vital action. It is often as simple as supplying a digestive enzyme supplement, or removing milk. A few autistic children can be helped dramatically by medical procedures such as an infusion of the intestinal hormone Secretin, but by and large, we are dealing with a toxic condition requiring biochemical/dietary, not drug-based, intervention.

The need and the beneficial response to Secretin treatment, I think, are dependent upon the amount of damage to the duodenum and small intestine, and on the stomach's ability to produce adequate hydrochloric acid (HCl) for proper digestion. Additionally, **the WGA lectin of wheat (gluten/gliadin) was shown to reduce Secretin production by 57%; however, administration of 500 mg of N-acetylglucosamine twice a day (preferably at beginning of the meal) completely suppressed this effect!** Since these factors largely determine proper digestion and assimilation, it is vital that all systems be functioning optimally. Healing of the intestines, including rebalancing of flora, is vital to health and well-being and mental function. Release of Secretin is dependent on adequate HCl in the chyme and upon the binding (neutralization) of Lectins found in grains and legumes, in particular. Secretin is reduced in hypothyroid rats (Robberecht et al, 1981); so, support the thyroid and bind (or remove) the lectins (more later). Without adequate HCl, Secretin infusion can, at best, be only partially effective in restoring digestion and proper physical and mental function. HCl production and thyroid function are also very dependent on adequate zinc levels, usually lacking in these children. This lack of zinc may lead to skin conditions, loss of taste, neuropsychiatric symptoms, sleep problems, and even the suppression of growth. An advanced zinc deficiency is indicated by white specks or spots on fingernails. With support for the thyroid, neutralizing of lectins (N-acetylglucosamine neutralizes the WGA of wheat, and also the potato lectin), adequate zinc and vitamin B_6 intake, supplemental betaine hydrochloride (HCl – where needed), DMAE, and/or Bethanechol, Secretin infusion may be totally unnecessary.

The path of autism is different for each child. Some are prone to seizures, some are not; some behave aggressively, others are overly passive. However, children with autism and with ADHD share several factors. "In one study, 66% of patients diagnosed with ADHD were found to be hypothyroid (at least as many with autism are hypothyroid). Supporting their thyroid levels was largely curative. Visual and auditory hallucinations may result from altered perception and have been misdiagnosed as schizophrenia or psychosis (or autism). Other behavioral symptoms have included fear - ranging from mild anxiety to frank paranoia, mood swings, and aggression. Thyroid hormone disorders may induce almost any psychiatric symptom or syndrome, including rage"—Aronson and Dodman, 1997.

Moods and behavior are largely influenced by the ratio of five central nervous system chemicals known as amines. These include: norepinephrine (noradrenaline), epinephrine (adrenaline), serotonin (5-HT), dopamine, and phenylethylamine (PEA). The first three excite the CNS (central nervous system) while the last two inhibit or modulate that excitement. The ratio of these amines controls our levels of irritability. Kirov has observed an association between severity of anxiety or depression and low plasma Magnesium (Mg). Pliszka and Rogeness measured serum Mg in 165 boys admitted to a psychiatric

hospital and found low Mg levels to be associated with dysphoric mood and sleep disorders. For a detailed study ask for "Managing Vital Neurotransmitters".

Additionally, there is a deep disturbance in their fatty acid metabolism that impairs their utilization of amino acids, and often there is an imbalance in their electrolytes. These can be symptoms of hypothyroidism! Hsu studied the effects of only one nutrient deficiency, zinc, on the levels of free amino acids in urine, plasma, and skin. When there was a zinc deficiency, there was an inability for the body to metabolize all of the available amino acids that were digested--thus they were excreted into the urine as waste! Mercury in the system (from sources such as dental amalgam "silver" fillings, vaccines, and Chlorox) excretes excessive amounts of zinc, creating a hard to restore deficiency. While I would suggest avoiding picolinate in other mineral chelates, it may be the answer to this difficulty as it enhances zinc uptake by a factor of three. However, an incidental and unexpected result of zinc picolinate supplementation was an increase in plasma copper level from 155 µg./deciliter during ZnSO 4 treatment to 251 µg./deciliter after 10 weeks of treatment with the picolinate. This is probably explainable on the basis that additional free intestinal picolinic acid was available to complex with the copper and thereby enhance its absorption. It is vital not to imbalance the zinc:copper ratio. Zinc controls both the thyroid function and the production of HCl for digestion.

Electrolytes control what's called membrane traffic—what goes in and out of cells. The delicate balance of electrolytes also controls the electrical activity within the brain and heart. Additionally, it doesn't make any difference what gets to that cell if it can't get into the cell. We know that one of the major ways that you can affect cellular circulation is by modulating the kinds of fatty acids that you eat. You increase receptor sensitivity by increasing the fluidity of the cell membrane, which means increasing the omega-3 content of the diet, because most people are very deficient. The cell membranes are going to be a reflection of your dietary fat, and that will determine their fluidity. Thus, providing other nutritional supplements is relatively ineffective until the electrolyte (sodium-potassium-magnesium-calcium) and fatty-acid imbalances are corrected. You can actually make the membranes too fluid. If you eat and incorporate too many omega-3 oils, then the membranes will become highly oxidizable (so you must eat vitamin E and monounsaturates as well). Practitioners suggest the extent of the nutritional problem in these observations:

1. Zinc deficiency exists in 90% of autistic children predisposing to hypothyroidism, poor digestion, and low immune function
2. Copper excess exists in 85%, suppressing the thyroid. Avoid zinc picolinate in this case as it will increase copper levels.
3. Manganese deficiency exists in 20%. Finding these three together indicates a sick child with physical and behavioral problems.
4. Calcium and magnesium deficiencies are common, with 75% of Americans lacking Mg
5. Omega 3 fatty acid imbalance exists in nearly 100%
6. Fiber deficiency exists in nearly 100%
7. Antioxidant deficiency exists in nearly 100% of Down's and autistics. "Clear evidence of higher oxidative stress and damage in treatment-naïve autistics than in controls" – Dr. Wm. Walsh, Email 7/24/06. This oxidative stress, particularly from burn injuries, may release excessive histamine. This increases the production of the enzyme xanthine oxidase, which generates hydrogen peroxide and superoxide, two potent free radicals that cause additional tissue damage. The seriousness of this is seen in the report that this lowers nitric oxide in the blood, reducing oxygen to the brain by 62%! This can only be offset by a very high intake of carefully selected antioxidants as recommended herein.

8. "Massive deficiency of DHEA in the autistics (factor of three)" – ditto.
9. Shaw recently reported 17-19% have low cholesterol (GPL- Cholesterol, RMC 12/07/07.

A recent study (Arnold GL, Hyman SL, Mooney RA, Kirby RS. Journal of Autism and Developmental Disorders. August 2003; 33(4): 449-454), found that 58% of children with autism who consumed a regular diet, had at least one essential amino acid deficiency, and this group was most likely to be deficient in valine, leucine, phenylalanine (that produces tyrosine, dopamine, and adrenal hormones), or lysine. Sixty percent of children with autism on a restricted diet had at least one amino acid deficiency, and this group was most likely to be deficient in valine, isoleucine, leucine, phenylalanine, or lysine. These were slightly more likely to be deficient in tryptophan, the amino acid that is a necessary element in the production of serotonin and in prevention of subclinical Pellagra. Isoleucine, leucine, and tyrosine (that produces dopamine and adrenal hormones) were reported as being the most frequently observed deficiencies. Only 1 of 24 children in the control group had an essential amino acid deficiency. In another study, researchers measured plasma, amino-acid levels of 36 ASD children and found that all had multiple deficiencies. This should come as no surprise, but what is troubling is that 10 of the 36 children were on a gluten-free/casein-free (Gf/Cf) diet, and those ten were found to have the most severe deficiencies. This is not surprising, as commercial interests, habit, and self-selection have made Gf/Cf into a high-carbohydrate diet. In time, increasing allergies and self-selection narrow the diet still further. Initial gains are sometimes lost, and the child is literally starving. A child cannot thrive on such a diet! Either the SCD diet or Donna Gates' Body Ecology diet is likely a better approach.

Protein plays a critical role in every aspect of health. Our skin, hair, and nails are protein. Our immune system functions largely by releasing proteins called immunoglobulins; so, without enough protein, the immune system comes to a halt, systemic inflammation develops, and the body lives (exists) by eating its muscles, which are protein! Brain chemistry itself is dependent on protein and fatty acids, which are used to make neurotransmitters. Without enough protein, the brain can't make these neurotransmitters and depression, hyperactivity, or behavioral disorders can result. The thousands of enzymes needed for life processes are proteins. There are many physical signs of protein deficiency in children. A very common one is the characteristic protruding abdomen that so many children with autism have. Other signs include low muscle tone, reduced weight gain or growth, and weak or slow-growing nails. You must not allow the diet to be largely carbohydrate. Every meal and major snack must have a balanced amount of protein in ratio to carbohydrates! Seeds and nuts are good sources supplying about ¼ to 1/3 their content as good quality protein. Sunflower seed has 52% protein, and sesame seed provides good quality protein; but nothing can replace animal sources. A vegetarian diet typically lacks protein, zinc, and vitamin B_{12}. A largely carbohydrate diet has too little protein. The liver depends heavily upon adequate amounts of protein, or it can become cirrotic. When animals were protein starved for only two weeks, their livers shrank 40%! A growing child must have at least 100 grams of protein daily. This may be too little for the older, active child. A grown man of 175 pounds needs 125 grams (24% of a 2000 calorie dietary). The Government says you need only half that!

Eggs have from 6 to 12 grams of protein depending upon their size. A serving of about 4 oz of meat, poultry, or fish contain about 16-20 grams of best quality protein, (beef is 15-25% fat, pork is 25-37% fat, chicken is 12% fat, and turkey is 20% fat), a serving of potato provides only 2 grams of protein (and should be eaten only with butter or cream). One cannot go by this table of content, however, for even though a healthy person can digest meats and eggs at 97% efficiency, cereals and fruits supply only 85% of their protein; vegetables, 83%, legumes, 78%, and nuts only 70%. Those who lack hydrochloric acid will not digest protein that well by any means. More frightening, without adequate zinc, the amino acids that are digested are largely excreted in the

urine as waste and vitamin A cannot be released into the blood! A lack of zinc contributes to the chronic diarrhea often seen in autistics. A supplement of zinc showed a 15% reduction of diarrhea.

Recent research has shown that the cascade of signals in the proinflammatory immune response tend to cause the amino acid tryptophan to break down into damaging kynurenic acid rather than serotonin, a brain chemical that influences mood. "That's extremely interesting," says Fallon, "because serotonin depletion seems to be involved in depression. So, you can see a very clear mechanism whereby people with chronic immune activation can become depressed." Supplementing vitamin B_6, niacin, and various anti-inflammatories may offset this, allowing tryptophan to metabolize to serotonin. Ensure adequate zinc and protein intake.

The brain is the most cholesterol-rich organ of the body. Myelin is largely cholesterol. Pregnant women with low cholesterol readings are twice as likely to have premature births, or to have babies with small heads (brains). Great Plains Laboratory reports dangerously low cholesterol in 17.5% of autistics studied. NIH concluded earlier that people with total serum cholesterol below 160 mg/dl had a death rate 10-20% higher than those with 160-190 mg/dl. Specifically, they died of cancer (lung and bladder cancer, primarily), respiratory and digestive disease, suicide and trauma, and hemorrhagic stroke. They suffered depression, anxiety, bipolar and Parkinson's disease, and tuberculosis, and men with **LDL** levels below 160 mg/dl had significantly lower numbers of white blood cells of all types. Thus, LDL protects against infections, and also against deadly toxins such as that produced by staphylococcus. Shaw studying autism and Tierney studying the rare genetic conditon SLOS found that particularly those with total serum cholesterol below 100 mg/dl additionally displayed autistic symptoms such as sleep disturbances (lethargy and excess sleeping), inability to talk or walk, antisocial tendencies, increased rates of infection, skin rashes, self-hurtful behavior, low-muscle tone, tactile defensiveness, poor growth rate, and various behavioral problems. Low cholesterol values are associated with manganese deficiencies, celiac disease, hyperthyroidism, liver disease, malabsorption, and malnutrition. These conditions all significantly improved, even some adults spoke for the first time, all within days of taking a cholesterol supplement! The lack of adequate cholesterol was found to be from a lack of production in the liver. So much for the drive to have everyone use a statin drug to reduce production by 40%! Ensure that your child's total serum cholesterol is above 160 mg/dl, and that LDL is 150-160 mg/dl, that is, his total serum reading should be around 200! This is best done with foods (eggs and red meat) where possible, but a supplement may be necessary (New Beginnings Nutritionals *Sonic Cholesterol*). A child with IgE allergy to eggs should eat them only on advice of his doctor. These foods help to ensure that both protein and cholesterol are adequate.

After feeding a mixture of amino acids to brain-damaged mice, the right balance of brain chemicals was restored in the animals and their learning ability returned to normal! The amino acids given were leucine, isoleucine, and valine, known as branched chain amino acids (BCAAs). BCAAs make up nearly one-fifth of all muscle proteins and enhance the biogenesis of mitochondria in the cells ensuring greater energy production. One study of elderly diabetics showed that a BCAA-rich amino acid mixture improved numerous parameters of blood sugar metabolism, including hemoglobin A1c. Animal studies show promise that oral BCAAs can improve the devastating consequences of traumatic brain injury by improving cognitive performance. BCAAs have improved the survival and the qualiy of life of those with liver cirrhosis (free from hepatic failure, rupture of esophageal or gastric varices, or liver cancer.) These essential amino acids are vital for the creation of two, brain chemicals that play a key role in the functioning of nerves. The two neurotransmitters, glutamate and gamma-aminobutyric acid (GABA), work together to keep brain activity in balance. Glutamate excites neurons, stimulating them to fire, while GABA inhibits them. If neurons are too excited or not excited enough, the brain does not function properly – Online journal, *Proceedings of the National Academy of Sciences*. In fact, too much GABA causes lethargy and will cause a distinct learning disability as there is no retention of things studied!

Additionally, there is heavy-metals poisoning: Jill James, found that many autistic children are genetically deficient in their capacity to produce glutathione, an antioxidant generated in the brain that

helps remove mercury from the body. A recent study found 85 percent exhibited severely elevated Copper/Zinc (Cu/Zn) ratios in blood, suggesting a disorder of metallothionein (MT), a short, linear protein responsible for homeostasis of copper and zinc and many other metals. "The severity of the Cu/Zn imbalance was far greater than that of any other population we have studied over the past 25 years," said William Walsh, Ph.D., Physician, biochemist, and chief scientist of the Pfeiffer Treatment Center, Naperville, Illinois. His database suggests that copper overload and zinc depletion are the most common metal-metabolism abnormalities in behavioral conditions such as, ADHD, autism, depression, bipolar disorders, and schizophrenia. In another report, of 23 autistic children who had serum ferritin measured, 12 were iron deficient. Iron deficiency is a frequent factor in restless leg syndrome. A study of iron-deficient, non-anemic rats concluded, **"The results of this study show that L-thyroxine administration and/or iron supplementation increases Glutathione (GSH), Glutathione Peroxidase (GSH-Px), and Super Oxide Dismutase (SOD) levels of erythrocytes (red blood cells)"—Chung Hua Yu Fang I Hsueh Tsa Chih 1996 Nov; 30(6):351-3.** Note, however, the contradiction when using serum iron measurements (serum iron tests are not as efficient is detecting iron deficiency): "I checked iron levels in our population of 3,000 autism patients. We found that autistic children exhibited higher serum iron levels than controls (non-autistic, healthy children). However, all of the differences occurred in about 1/3 of the autism population with the other 2/3 resembling the controls. The high-iron kids were extremely high, the rest of the autistics were quite normal. It appears that a segment of the autism population has very abnormal iron metabolism (and abnormal ceruloplasmin)"—Bill Walsh. So, are "our" kids high or low iron? Do not rely on serum iron.

So, serum iron is not the best measure of iron sufficiency. Blood tests for hemoglobin and serum ferritin levels that are checked for transferrin saturation percentages are more useful, but the results of these tests are confounded in states of prolonged inflammation or disease such as autism, for autism is a state of chronic brain inflammation (Dr. Marcel Just, John Hopkins). Transferrin is a glycoprotein that binds iron very tightly but reversibly. The affinity for Fe(III) is extremely high, but the affinity decreases progressively with decreasing pH below neutrality. A skilled hematologist is often the best professional from whom to obtain personal information concerning blood iron levels. Ferritin metabolism is influenced by thyroid hormone as well as by iron. Thus, the raised serum ferritin in hyperthyroid patients may be partially attributed to increased ferritin synthesis in the liver and its possible leakage into circulation. <u>When copper is deficient, the body can't use iron, so it accumulates and causes damage, increasing the risk of Type II diabetes by 3 times.</u> There may be a copper-deficiency anemia. The disease is called siderosis, which is characterized by a gray pallor to the skin from iron accumulation in the tissues. "In addition, these sufferers (of excess serum iron) are unusually sensitive to lead, cadmium, mercury, and other toxic metals so that they tend to accumulate rather than eliminate them. This is probably because Phase I was overactive compared to Phase II in 86%. Phase I was functional, but Phase II was impaired in 14%, thus 100% of children with autism had abnormal liver detoxification— S. Edelson and D. Cantor, Toxicology and Industrial Health (2000) 16 1-9. Children are more susceptible than adults. They have more exposure (crawling, playing in dirt, licking hands), and they excrete less (adults retain only 1%, children retain 33%). Iron interferes with the absorption of the essential minerals zinc, manganese, and molybdenum, and it destroys vitamin E. Its own absorption is blocked by calcium and magnesium. Additionally, when a mineral is lacking, its heavy metal equivalent tends to be held and used, for example: cadmium sits just beneath zinc in the periodic table of the elements, so their structures are similar. Cadmium can replace zinc in the tissues and in enzyme binding sites. An important cause of cadmium toxicity, other than exposure, is a zinc deficiency. If zinc is deficient due to poor diet or stress, the body will absorb cadmium from food, water, or the air, and use it in place of zinc. Our greatest exposure to cadmium is white flour!

Nevertheless, if a mouse cannot make MT, then it should not get copper deficient when fed a high-zinc diet. We fed some of these mice and some control mice (ones that can make MT) diets that contained normal amounts of zinc and some that contained much more zinc. The results showed that the mouse without MT got copper deficient when fed the same high-zinc diet as the mouse that had MT. This study strongly suggests that the old theory is not true and that stimulation of MT is not necessary for high-zinc to bring about a copper deficiency. We suggest instead that the high zinc is inhibiting a copper transport protein in the intestinal membrane, and copper cannot be absorbed"—Reeves PG, Copper Metabolism in Metallothionein-null Mice Fed a High-zinc Diet. J Nutr Biochem 9:598-601, 1998. Copper is preferentially bound to transferrin, the protein transport molecule in the mucosa, competing with iron. Normally, this transport mechanism is not completely saturated, so there are adequate binding sites for both the iron and the copper. Nevertheless, when copper is administered in excess, iron absorption is inhibited because of the preferential binding of copper to the transferrin. Supplement copper and zinc, and copper and iron, at different times of day. When serum iron is high, supplement transferrin (lactoferrin) to bind the iron and transport it safely. Colostrum is a good source of lactoferrin.

Transferrin is a blood protein that carries iron through the blood to the bone marrow, spleen, and liver for either the storage of iron as ferritin or the manufacture of new red blood cells. It is a protein with a relatively short half-life that can be a marker for recent protein status, and it is used for this purpose. Low blood transferrin may be an indicator of protein or calorie malnutrition, resulting in inadequate synthesis of transferrin by the liver or it can result from excess protein loss through the kidneys (proteinuria). A systemic infection or cancer can also lower the blood transferrin level. A high blood transferrin is a marker of iron deficiency. If an individual has a low blood transferrin level, the production of hemoglobin can be impaired and can lead to anemia, even if there is ample iron in the body.

Ceruloplasmin is a copper-containing protein involved in handing over iron from transferrin to hemoglobin in the formation of new red blood cells, or in removing iron from old red blood cells for inclusion in new ones. A copper deficiency results in low ceruloplasmin and can result in anemia that presents much like iron-deficiency (microcytic, hypochromic) anemia, possibly leading to a misdiagnosis. A ceruloplasmin deficiency is associated with iron accumulation in the pancreas, liver, and brain, resulting in neurological disorders. Laboratory testing for iron overload/hemochromatosis begins with two specific blood tests, Serum Iron and TIBC (total iron binding capacity), from which the Serum Transferrin Saturation is calculated. Serum Ferritin is frequently measured as well, if possible while fasting, to evaluate the body's iron stores and estimate the degree of iron overload.

Blood and urine analyses yielded evidence of a metallothionein dysfunction in 499 of 503 patients (99%) diagnosed with autism spectrum disorders, according to Walsh, suggesting that autism may be caused by either a genetic MT defect or a biochemical abnormality, which disables MT protein. Mechanisms with the potential for disrupting MT functioning include severe Zn depletion, possibly from a pyrrole disorder, impaired synthesis of GSH, toxic metal overload, and a sulfur amino acid abnormality. "An MT disorder may affect the development of brain neurons and may cause impairments in the immune system and gastrointestinal tract, along with hypersensitivity to toxic metals," he said. The excess copper in these kids is probably from two causes. Mercury depresses zinc, and there is a high incidence of zinc malabsorption. To reduce copper, you must use significant amounts of vitamin C and zinc. Nevertheless, the slower the metabolism of an individual, the more likely he is to develop copper overload, regardless of his copper intake, according to David L. Watts, D.C., Ph.D., director of research at Trace Elements, Inc., in Dallas, Texas, and author of Trace Elements and Other Essential Nutrients (Trace Elements, 1995).

Treatment for this imbalance between zinc and copper centers on stimulation of MT protein with divalent metals (such as zinc and manganese) that are in depletion, and by providing N-acetylcysteine,

serine, selenium, and other constituents of MT. Of secondary benefit are vitamins B_6, A, C, D, E, glutathione, and glucocorticoids (anti-inflammatory drugs). This treatment should be gradual during the first 4 weeks of treatment to avoid rapid release of copper from tissues, which could cause a sudden worsening of symptoms. MT-Promotion must be done very carefully to avoid zinc depletion that can result in temporary worsening of behavior, stimming, enuresis, etc. "Severe zinc deficiency has effects on the distribution of nine elements (potassium, phosphorus, sodium, magnesium, calcium, iron, zinc, copper, and manganese) in regions of the rat brain" J Nutr 113(10):1895-905 (1983)].

Speaking of Fibromyalgia, Dr. Brice E. Vickery, DC stated, "At the end of the seventies I found that nine out of ten subjects examined were not able to digest/transport, utilize, or incorporate the daily dietary protein that was usually adequate (except for some vegetarians) in intake. The discoveries of Rheinholdt Voll, M.D. enabled me to put two and two together and establish that the malfunction of the pancreatic points that he identified as protein digestion function, carbohydrate digestion function, and fat digestion function on the Pancreas Meridian were almost always caused by lack of suitable amino acids (which can be from a lack of zinc to form a digestive enzyme, or an imbalance in sodium and potassium -WSL). We developed the Vickery-Voll test that was the beginning of an entirely new view of the body.

"The way it is believed to work is simple. The (supplementation of) amino acids in the correct proportions and in adequate amounts reverse this deficiency by supplying the pancreas and intestinal glands with the ingredients necessary to synthesize adequate digestive enzymes to digest the dietary intake. Having the necessary enzymes, the daily food intake is more completely utilized and the transport or carrier proteins are manufactured in suitable amounts and the entire 'Enzyme Cascade' of the body is re-established. This begins within twelve hours! Signs of a lack of enzymes are: fatigue, headaches, sinus problems, allergies, colon problems, arthritis and joint pain, acne, and ADD/ADHD"—Dr. Susan Lark. If taking the labeled amount of the enzyme supplement with each meal and major snack doesn't solve the digestive problem, increase the amount.

Every case of fibromyalgia is found to have this deficiency of enzymes, and a vitamin D lack, as does many other problems. Oxidative stress plays a role in Pancreatitis (inflammation of the pancreas). In fact, those with Pancreatitis have low levels of vitamins D and E and other antioxidants. This may be due to lack of absorption of fat-soluble vitamins (such as vitamin E) because the enzymes from the pancreas required to absorb fat are not functioning properly, or, this may be due to poor intake. Surely, these children lack needed proteins for enzymes and carriers, and use of a digestive enzyme supplement and additional protein input (including pure amino acids—proline and lysine being particularly important in building collagen) will greatly benefit these children in most cases.

Mercury adversely affects detoxification systems such as metallothionein (MT), cytochrome p450 (Phase I) liver enzymes, and bile. Mercury ties up this material so it cannot bind and clear other metals such as lead, cadmium, and aluminum. Mercury inhibits sulfur ligands in MT and, in the case of intestinal cell membranes, inactivates MT that normally binds cuprous ions, thus allowing buildup of copper to toxic levels and malfunction of the zinc and copper containing antioxidant, Super Oxide Dismutase (SOD). Mercury induced reactive oxygen species and lipid peroxidation (forming free radicals) has been found to be a major factor in mercury's neurotoxicity, along with its leading to decreased levels of the vital enzymes glutathione peroxidase and superoxide dismutase (SOD).

Attempts to lower this mercury/heay metal load can be problematic when you chelate heavy metals too aggressively with DMPS or DMSA. They can damage the pancreas as testified to by those who have been there. There are safer, perhaps slower, ways that will preserve your pancreas.

Subject: Chronic Pancreatitis and Depletion of Glutathione Disease ...

Xenobiotic metabolism, oxidant stress, and chronic pancreatitis. Focus on glutathione.
Wallig MA - Digestion - 1998; 59 Suppl 4: 13-24

Chronic pancreatitis, although relatively rare in the Western World, is common in certain tropical zones where staple crops such as cassava are rich in cyanogenic glycosides. This paper reviews the evidence for a cyanide connection, with reference to experimental studies using another plant nitrile, crambene; and then examines the hypothesis that **chronic pancreatitis represents a manifestation of uncoordinated detoxification reactions between Phase I, pancreatic cytochrome P450 mono-oxygenases, and phase II conjugating enzymes, resulting in the irreversible consumption of glutathione in the acinar cell of the pancreas.** The conclusion is that the central role of disrupted pancreatic glutathione status, as a result of 'xenobiotic stress', in the evolution of chronic pancreatitis cannot be overestimated. This position contrasts with that in acute pancreatitis, in which glutathione depletion has a pivotal role too, but occurs as a result of 'stress' from reactive oxygen species. End.

Dr. Jill St. James found that 80% of autistic children lack up to 80% of normal levels of glutathione and its precursors, leaving none to spare for aggressive detoxification. There seems to be a direct correlation between levels Hepatitis A, B, and C viral infections and mercury toxicity and levels of glutathione, whereby increased viral activity precedes decreased glutathione levels. For a successful recovery from mercury poisoning, among other disorders, the importance of additional glutathione and supplementation of essential fatty acids (fish oil etc.) and anti-oxidants should be emphasized. This lack of adequate antioxidants allows further toxicity and free-radical damage; however, use of Sodium Ascorbate in high amounts will prevent much of this damage. Nevertheless, the use of this phenolic (as ascorbid acid) can make barbiturates more toxic, and is pharmaceutically incompatible with sodium salicylate, sodium nitrate theobromine, and methenamine. Twenty percent of the people tested were reactive to **ascorbic acid**. Sodium Ascorbate is better tolerated. Some of this reactivity may be from allergy to source material (usually corn).

As with other cell types, the proliferation, growth, and differentiation of immune cells is dependent on glutathione (GSH). The B-lymphocytes require adequate levels of intracellular GSH to differentiate, and healthy humans with relatively low lymphocyte GSH were found to have significantly lower CD4 counts. Intracellular GSH is also required for the T-cell proliferative response to mitogenic stimulation, for the activation of cytotoxic T “killer” cells, and for many specific T-cell functions, including DNA synthesis for cell replication, as well as for the metabolism of interleukin-2, which is important for the mitogenic response. Experimental depletion of GSH inhibits immune cell functions, sometimes markedly, and in a number of different experimental systems the intracellular GSH of lymphocytes was shown to determine the magnitude of immunological capacity. These and other findings indicate that intracellular GSH status plays a central role in the functioning of immune cells. Interestingly, in those animals that could not make their own ascorbate (newborn rats, guinea pigs), GSH depletion was lethal. Supplementation of the diet with ascorbate protected these animals against GSH depletion and saved their lives. Since children with autism are very low on GSH, ensure that they are getting significant amounts of vitamin C, preferably as Sodium Ascorbate.

Vitamin C possesses abilities that are characterized by its capacity to antagonize (neutralize) many of the pharmacological effects of histamine (undermethylation). It should be employed with (in place of) the antihistamine drugs in all allergic states. It is because of this factor that it serves so well in the treatment of acute rheumatic fever. Additionally, sufficient quantities of vitamin C will relieve the

intraocular pressure in glaucomatous eyes, relieve prickly heat, and is a positive reversal for pemphigus. Aside from this and the virus diseases (in proper amounts, it kills all viruses), it is of tremendous value in all diseases in which an exotoxin is produced (Candida, Clostridia, etc.). It also has specificity for SNAKE BITE, except for the cobra and the coral. It neutralizes all exotoxins. It is directly concerned with antibody formation, and this in turn leads to an increase in gamma globulin of the blood serum. It joins with the virus to form a new compound that is destroyed by oxidation. It makes all body cells more permeable which allows entrance of immune factors otherwise denied. It prevents or lessens tissue damage. It serves as a hydrogen transport in cellular respiration. It functions as a dehydrator and diuretic. It is the KEY to good health. Watch for the signs that reveal pre-existing chronic vitamin C deficiencies. Shaw (1945 5) states that food deposits on our teeth and dental tartar represents this condition. (I might add any signs of pyrrohea and/or nosebleed should be a red flag.) People who find that they are counted in this group should supplement their diet with at least two grams of vitamin C (as Sodium Ascorbate) each day - Dr Fred R. Klenner, MD.

Glutathione consumption from foods ranges from 25-125 milligrams per day. With the provision of sufficient amounts of sulfur, the liver will produce far more glutathione (up to 14,000 milligrams per day) than what the diet provides. Sulfur-rich foods (garlic, eggs, asparagus, onions) may be lacking in various diets and the provision of sulfur in food supplements (sulfur-bearing amino acids like N-acetylcysteine, taurine, MSM, and lipoic acid), or glutathione itself may be advantageous.

"Glyconutrients have proven to enhance glutathione, glutathione peroxidase, and superoxide dismutase"—*Sugars that Heal*, by Emil I. Mondoa, MD, Page 191. The Mannose found in Ambrotose® significantly inhibits superoxide anion formation, thus reducing hydrogen peroxide formation — Kim HS, et al, 8/99. Ambrotose AO™ by Mannatech™ combines vital glyconutrients with needed antioxidants and precursors that form glutathione nicely addressing this lack. Additionally, vitamin D reduces inflammatory cytokines and increases concentrations of glutathione - the brain's master antioxidant. N-acetylcysteine (NAC) can raise abnormally low GSH levels also. Van Zandwijk found that a daily dose of 600 mg NAC was beneficial and innocuous while 1200 mg and 1800 mg per day caused significant adverse effects, possibly by contributing to cysteine toxicity and to its chelating heavy metals (moving mercury). Cysteine catabolism produces two sets of products: pyruvate + sulfate + ammonia and taurine + CO2. One of cysteine's "breakdown" enzymes, cysteine dioxygenase (CDO), needed to form these metabolites has been demonstrated to be low in children with autism. This tends to an excess of cysteine that can reach toxic levels, and possibly to a lack of CO2. Excess free cysteine has been implicated in several degenerative diseases including Rheumatoid Arthritis, Alzheimer's Disease, Autism (neurodevelopmental), Parkinson's Disease, Peripheral Neuron Degeneration, and others. This requires some caution in using NAC and GSH (transdermally). Note that cysteine dioxygenase is a **non-heme iron enzyme** that catalyzes the conversion of L-cysteine to cysteine sulfinic acid (cysteine sulfinate) by incorporation of dioxygen. Supplement serine and vitamin B_6, magnesium, zinc, selenium, molybdenum, and iron (if needed) to support this pathway. The amino acid glycine readily converts to serine and supports glutathione production.

Metallothioneins across species are rich in cysteine (~30%) and have higher affinities for mercury (Hg) and cadmium (Cd) than for zinc. Therefore, as Hg and Cd bind to metallothionein, and are restricted from entering the mitochondria, zinc is released. The free, ionized zinc, which would be toxic if permitted to accumulate, binds to a metal regulatory element on the promoter region of the metallothionein gene and "turns on" the synthesis of metallothionein. Increases of as much as 3-times are reported. Such induction of metallothionein provides increased binding capacity for both toxic metals (protective) and zinc (functional). The displacement of zinc in the presence of toxic metal burden may explain in part why increased levels of zinc are so commonly seen in the scalp hair of patients exhibiting significant levels of toxic metals Hg, Cd, Pb (Quig, unpublished observations). Most of the zinc is cellular with only a small amount in the blood plasma. For this reason, blood tests are a poor indicator

of systemic zinc status.

Retrospective analysis of the full-blood count and, as far as was available, serum-ferritin measurements of 96 children (52 with autism and 44 with Asperger's syndrome) was undertaken. Six of the autistic group (11.54%) was shown to have iron deficiency anemia and, of the 23 autistic children who had serum ferritin measured, 12 (52.17%) were iron deficient. Only two of the Asperger's group (4.55%) had iron deficiency anemia and, of the 23 children who had their serum ferritin measured, only three (13.64%) showed iron deficiency anemia. Iron deficiency, with or without anemia, can impair cognition, and is associated with poor muscle strength, and with developmental slowing in infants, and mood changes and poor concentration in children.

Furthermore, autistics' minerals, fatty acids, and amino acids are deficient and/or imbalanced. Their production of red and white blood cells is irregular. They have a dysfunctional immune system (often attacking "self"). They frequent show a high, white-blood-cell count indicating inflammation (now seen as a stroke predictor—chronic, low-level inflammation increases risk of heart disease by 5 and risk of stroke by 4 in postmenopausal women) that will quickly normalize when adequate anti-inflammatory enzymes are provided. (I recommend Vitalzym™ or Wobenzym N™ from your health food store. At the very least, give bromelain in significant amounts. Nevertheless, remember that some who take bromelain get diarrhea and some are allergic to it. Dr. Carlos Pardo-Villamizar, an assistant professor of neurology and pathology at Johns Hopkins, studied the brain tissue of 11 people with autism who died at ages 5 to 44. He found a pattern of inflammation in the same regions that appear to have excess white matter. The brain has an innate immune system separate from the body. Tart cherries have been shown to reduce inflammation, pain, and swelling more effectively than aspirin! Tart cherry juice is 10-times more effective than aspirin according to a Michigan State University study. Cherrie juice may be contraindicated for those with dysbiosis or blood sugar problems.

Dr. Robert Ader, University of Rochester, discovered that the immune system, like the brain, can learn! He gave rats a drug, which suppresses the production of white cells by the bone marrow, along with saccharin-laced water. Afterward, when only given saccharin water, the T-cell count was reduced the same as with the drug! Shades of Pavlof's dogs! What does that say about our drug usage for our kids? Drugs have sweeteners and other substances in them that could mark the immune system; we discontinue the drug, but continue to take the secondary substances the drug contained and the drug response continues to our detriment! Could we make this work for us? We take a helpful drug for a time, taking it with some saccharin or juice. We then discontinue the drug while continuing to take the juice at the same time of day. Will we not continue to get the benefits without the side effects?

Additionally, Ader's colleague noted that emotions have a powerful effect on the autonomic nervous system, which regulates everything from how much insulin is secreted to blood pressure levels. They then detected a meeting point where the Autonomic Nervous System (ANS) directly talks to lymphocytes and macrophages, cells of the immune system. They found synapse-like contacts where the nerve terminals of the autonomic system have endings that directly abut those of the immune cells. This physical contact point allows the nerve cells to release neurotransmitters to regulate immune cells, indeed they signal back and forth. Additionally, the nervous system and the immune system communicate with each other through hormones and other substances. This pathway connects the emotions to the immune system via the hormones released when under emotional or other stressors. So, the nervous system not only connects to the immune system; but it is essential to its proper function. Stress suppresses immune function when these stress hormones are elevated, becoming chronic and long-lasting when stress is constant as it is for these affected children. People who experienced chronic anxiety, long periods of sadness, pessimism, unremitting tension, incessant hostility, relentless cynicism, or suspiciousness were found to have double the risk of disease – including asthma, arthritis, headache, peptic ulcers, and heart disease. Parents, as well as their autistic children, are likely to suffer from several of these risk factors; so, Mom, Dad, take care of yourself first!

Eighty percent suffer mitochondrial disorders (lack of energy production) according to Dr. Colemen, of George Washington University Hospital. According to Dr. Raphael Kellman, MD, NYC, who

specializes in thyroid treatment, ninety percent of his patients suffer some degree of hypothyroidism despite "normal" TSH readings ("normal" TSH, T4 readings aren't enough; to create the enzymes needed to convert fats to energy, thyroid hormone T4 must be converted to T3; so, adequate, free T3 values are vital). Eighty-three percent suffer dysfunctional Phase I and II, liver-enzyme activity (causing a build up of toxins and heavy metals), and 85% of autistics meet criteria for malabsorption leading to a multitude of nutrient deficiencies (Wm. Walsh). Both the autistic and the ADHD children often suffer lymphoid modular hyperplasia (measles infection in the gut-Wakefield). Thus, children with autism do not absorb food properly, leading to nutrient deficiencies.

The most common deficiencies of poor diet and malabsorption are fatty acids, the minerals iodine, zinc, selenium, magnesium, and calcium, and the vitamins A, B_6, C, D, K, and E. There are various reasons, for example, acid foods make selenium insoluble, so babies regularly fed fruit juices are liable to malabsorption of selenium. **Do not give selenium with acid juices!** Further, a study of children in Zaire, found that in hypothyroidism induced by iodine deficiency, supplementing as little as 50 mcg/day selenium caused increased hypothyroid conditions, lowering T4, raising TSH (probably due to increased conversion of T4 to T3 – a good thing). Do not supplement selenium when iodine is deficient, or better, do supplement iodine significantly when supplementing selenium. Additionally, you must supplement iodine and antioxidants vitamins C and E and selenium when supplementing the fatty acids or you will deplete these vital nutrients and suffer free-radical damage.

Results obtained following iodine supplementation revealed that **in some subjects, the urine levels of mercury, lead, and cadmium increased by several fold after just one day of supplementation!** For aluminum, this increased excretion was not observed usually until after one month or more on the iodine supplement. Additionally, iodine supplementation resulted in marked increase in bromide excretion, and to a lesser extent in fluoride also. Iodine may cause gastritis and reflux by disengaging the bromine found in commercial bread, in particular, in the gut, and it is relieved by chlorophyll. Lack of iodine and zinc contribute to lack of stomach acid production. These findings have since been replicated in a large number of tests. Female patients with breast cancer seem to retain more iodine on the loading test then normal subjects and excreted more bromide than normal subjects.

The form of B_6 supplemented may be important, as it was found that the amount of activated B_6 (pyridoxal-5-phosphate) was low in 42% of autistics. These deficiencies compromise immune function, and provide inadequate, antioxidant protection to offset the high, oxidative stress these children suffer, thus causing significant damage to cells throughout the body and brain.

The mechanism of stress upon the body was just reported in the May 2008 issue of Brain, Behavior, and Immunity. Telomeres are caps at the ends of chromosomes that contribute to their stability. Each time a cell divides, telomeres lose length; and thus, a cell's life is determined. Abnormally shortened telomeres in white blood cells, known as lymphocytes, have been associated with HIV, osteoporosis, heart disease, and aging. Telomeres also lose length in response to chronic stress. Activity of an enzyme within the cell known as telomerase helps prevent telomere shortening and maintains the cells' ability to continue dividing. Rita Effros, et al, UCLA David Geffen School of Medicine studied lymphocytes from healthy donors between the ages of 25 and 55. After three days, cultures treated with high cortisol levels found in the chronically stressed had fewer cells than the control cultures. Telomerase activity was reduced by up to 50 percent compared with activity measured in control cultures treated with the amount of cortisol found in nominally stressed humans (that had no effect upon the telomerase activity). The discovery explains how stress by reducing telomerase activity accelerates cellular aging (and destroys brain cells by the billions), via increased cortisol production. Reducing stress and or its effects is vital to your health and length of life and to your autistic child's responses.

Dr. Bill Walsh confirmed this: "I returned from last week's DAN! Think Tank convinced that the preponderance of evidence now points directly to oxidative stress and oxidative damage as the prime culprit in autism. My definition of autism is the following: A genetic weakness in ability to cope with environmental insults, resulting in severe, oxidative stress, incompetent intestinal and blood-brain barriers, and incomplete maturation of the brain during early development. I may be wrong, but I doubt it"-Email to Kathy Blanco, 2/21/04. Dr. Walsh went on to state, iron free radicals (ions) represent the primary oxidative stress in the brain of most humans. ASD involves oxidative stress during early brain development. In theory, elevated iron in the brain could result in ASD. A genetic inability to regulate iron might be causative in 1/3 of autism cases."

Underlying all these biochemical imbalances, according to the report, *Still No Free Lunch*, food scientists have compared the nutritional levels of modern crops with historic, and generally lower-yielding, ones. Today's food production methods provide 10 to 25 percent less iron, zinc, protein, calcium, vitamin C, and other nutrients in our foods. Researchers from Washington State University analyzed 63 spring wheat cultivars grown between 1842 and 2003 and found an 11 percent decline in iron content, a 16 percent decline in copper, a 25 percent decline in zinc, and a 50 percent decline in selenium! This fact makes use of a good multivitamin/mineral supplement vital to health, well-being, and length of life, especially in today's stressed out world. One study confirmed this. Over a ten year period, only half as many, who took a multivitamin/mineral supplement, died!

Mothers are under as much or more stress than their children and need to deal with it as outlined herein. Studies show that vitamin C at 1500-3000 mg day reduced all markers of stress in both marathoners and work-stressed subjects, including lower cortisol levels. Still other studies showed that both omega-3 fish oil and Phosphatidylserine significantly blunted the rise in cortisol levels and lowered other markers of stress, resulting in reduction of anger, aggression, and depression. Chromium (200 mg day) reduces cortisol levels by 47%, as does a 45-minute massage (backrub?). Take a hot, Epsom salts bath. Rhodiola Rosea, an adaptogenic herb, prevents adrenal burnout that often occurs from long-continued, chronic stress. Finally, moderate, daily exercise lowers stress-induced hormone levels, enhances immune function, boosts circulation to the brain, improves quality of sleep, and aids in weight-control. A recent study showed that the telomeres, that determine when a cell can no longer reproduce itself and must die, were shortened by oxidative stress, decreasing by at least 10 years one's life expectancy! Another study showed that those who were optimistic had a 55% lower risk of death from all causes, and a 23% lower risk of cardiovascular death! Another study found that those under constant pressure were up to 2-1/2 times more likely to suffer a heart attack than those with relatively stress-free lives. Mom, use these supplements, keep a hopeful, expectant outlook. Socialize, laugh a lot, take a walk, and take care of yourself first! Your family needs you for the full course.

Another study is reported: Abou Donia of Duke University in a decade of neurologic research has revealed widespread damage to the brain, nervous system, liver, and testes of rats exposed to 60 days of low-dose chemicals -- the insect repellant DEET, the insecticide permethrin, and the anti-nerve gas agent pyridostigmine bromide. These are the drugs given soldiers during the Persian Gulf War, and the rats were exposed to the same levels -- in weight-adjusted doses -- as the soldiers were reportedly given. DEET alone caused a decrease in BBB permeability in the brainstem. A combination of DEET and permethrin significantly decreased the BBB permeability in the cortex. All treatments caused a significant decline in sensorimotor performance in a dose- and time-dependent manner. These results show that daily dermal exposure to DEET, alone or in combination with permethrin, decreased BBB permeability in certain brain regions, and impaired sensorimotor performance. Do not use DEET on children.

Now, Abou Donia has demonstrated that the combination of stress and short-term exposure to chemicals (28 days) can promote cellular death in specific brain regions and serious injury to the liver. Brain regions that sustained

significant damage in this study were the cerebral cortex (motor and sensory function), the hippocampus (learning and memory), and the cerebellum (gait and coordination of movements). His earlier studies demonstrated severe damage to the cingulate cortex, dentate gyrus, thalamus, and hypothalamus.

Stress alone caused little or no brain injury in the rats, nor did the three chemicals given together in low doses for 28 days. "But when we put the animals under moderate stress by simply restricting their movement in a plastic holder for five minutes at a time every day, the animals experienced enough stress that it intensified the effects of the chemicals dramatically." The study showed that stress plus chemicals increased the amount of destructive molecules in the brain called reactive oxygen species -- also known as oxygen free radicals. This astonishing study shows again the absolute necessity of maintaining high levels of a variety of antioxidants by all who value their health and well being in today's toxic, stress-filled world!

An explanation of the why of some of these things is suggested in tests on mice. Since the immune system develops during gestation, maternal zinc deprivation has been studied in mice. The results showed that the offspring born to zinc-deficient dams had a greatly reduced immunocompetence, the lymphoid organs being particularly affected. Another study by the same authors found that this diminished immunocompetence can persist for as long as three generations of normally fed offspring! The problem is inherited, but not genetic! Further studies showed that if the offspring were only moderately deprived of zinc during the latter two-thirds of pregnancy, even this can lead to long-lasting, aberrant patterns of serum Immunoglobulins-G (IgG) and Immunoglobulin-A (IgA) levels, despite a complete, nutritional rehabilitation beginning at birth. This seems discouraging of recovery, but the possibility of recovery is in therapeutic amounts of vitamin B_6 and zinc. Additionally, the powerful antioxidant formula, Ambrotose AO™, will greatly enhance that possibility. Since much of the problem is from "toxins" from Candida or other gut pathogens and environmental poisons, it is helpful to know that vitamin B_{12}, greatly lacking in the American diet, is powerful in decomposing all toxins. Sublingual Methylcobalamin (Source Naturals) or B_{12} injections are very beneficial. Many DAN! doctors are using B_{12} injections with good results.

Having read the above, one may get the impression that all is well with Mom and Dad. Not so! Though a recent study reports that autistic patients are in fact characterized by presenting in their blood high levels of non-inherited antibodies against the body's own brain tissue, and confirmed that these antibodies were not present in their parents, these are still inherited characteristics. Studies show tremendous lack in the American public. Men and women show these deficiencies in astonishingly high numbers:

Vitamins	Men	Women
A	8%	9%
B_1	38%	63% Yes!
B_2	01%	21%
B_6	57%	86% Yes! The Pill is largely responsible.
C	29%	24%
D	98%	98% Wow!
E	40%	60%
Pyrophosphate	46%	46%

Is it any wonder that Dr. Chandra found that even healthy oldsters were greatly benefited in Immune Function by taking a slightly higher than RDA multivitamin/mineral supplement? A recent study states, "These results are the first experimental evidence that deficiency alone results in early developmental defects in the brain. The decreased maturation of the radial glial cells of the CA1 region of the hippocampus is related to the deficiency of thyroid hormones in the fetal brain, mainly caused by the maternal hypothyroxinemia, and not to a deficiency of the trace-

element itself." These deficiencies are passed to the children with the above-mentioned results. Is it any wonder our children are less and less healthy and plagued with infections and mental problems? Nevertheless, our and our children's diets still lack iodine, even when taking a multi!

Pottenger's Cat Experiments illustrate the genetic tendency principles:
In the 1940's Francis M. Pottenger, M.D., began a ten-year study using 900 cats to determine what effects processed foods have on the body, and to examine the genetic propensity of passing degenerative disease traits from generation to generation. The cats were divided into five groups with two of the groups fed raw whole foods and while the other three groups ate cooked, enzyme-less foods. At the time, it was thought that this single difference accounted for the observed problems, but we now know that the cats cannot metabolize taurine (people can) and must obtain it from raw (animal) foods. This does not change the below observations. The fact that people do eat some raw, enzyme-bearing food, and do metabolize taurine, probably accounts for the fact that we haven't yet failed totally in our being able to reproduce. The cats were observed over a four-generation period, and the following results were documented:

POTTENGER CAT EXPERIMENT SUMMARY

GROUP	A	B	C	D	E
FOOD FED	Raw meat	Raw milk	Pasteurized milk	Evaporated milk	Condensed milk
1st Generation	Remained healthy	Remained healthy	Developed diseases and illnesses near end of life		
2nd Generation	Remained healthy	Remained healthy	Developed diseases and illnesses in middle of life		
3rd Generation	Remained healthy	Remained healthy	Developed diseases and illnesses in beginning of life; many died before six months of age;		
4th Generation	Remained healthy	Remained healthy	No fourth generation was produced: either third generation parents were sterile, or fourth generation cats were aborted before birth		
Source: Pottenger's Cats, a Study in Nutrition					

Similarly, the nutritional importance of using only fresh, stone-ground grains was revealed in studies done in Germany (Bernasek, 1970). Rats were fed diets consisting of either 50% flour or bread and 50% rat chow. Group 1 consumed fresh stone-ground flour. Group 2 ate bread made with this flour. Group 3 consumed the same flour as group 1, but after 15 days of storage. Group 4 ate bread made with the stale flour fed to group 3. A fifth group consumed white flour. After four generations, only the rats fed fresh, stone-ground flour or bread made with it maintained their fertility! The rats in groups 3 to 5 became infertile! - Mark Sircus Ac., OMD.

This and the Pottenger's cats study give insight into why children today are getting degenerative diseases that used to only show up in humans at an age of 50 years or older.

These genetic weaknesses **will get worse with each succeeding generation if they continue an enzyme-less, nutrient-poor diet.** The study proved that epigenetic weakness becomes more evident with each generation, but more importantly, that there comes a point when it becomes totally out of control. This is evident in the fourth generation. **It took another three generations for third-generation cats placed on a raw-food diet at birth to return to base-line health of the first generation!** Confirming this, a study of very old humans showed that their lifestyle had more to do with their advanced age than did the age attained by their parents. Nevertheless, parents must take care of their health needs before conceiving a child! Those concerned may request my paper "Preparation for a Healthy, Happy Child".

One study found that problem foods in the diet accounted for 24% of the symptoms in children **who were already gluten-free and casein-free;** however, problem foods in the diet accounted for 34% of the symptoms in children who were not previously gluten-free and casein-free. Although there is great variation among children, in most children, we found approximately one-third of the symptoms were food related and two thirds of the symptoms were related to the environmental factors: volatile organics, plastics, resins, and molds. In terms of the types of symptoms, there was great variation; however, most children responded as follows: Physical symptoms such as congestion, eczema, and asthma were equally caused by food and environmental factors. Symptoms associated with the digestive system were associated with foods two-thirds of the time, and associated with environmental factors one-third of the time. **Neurological symptoms were associated with environmental factors 84% of the time,** and associated with foods 16% of the time. Included in this group of symptoms were head banging, seizures, cognitive abilities, withdrawal, depression, temperament, moodiness, OCD, violence, aggression, sensory sensitivity, self-stimulation, and social interaction - social awareness and abilities. Nevertheless, a study of 45 children following an SCD dietary and environmental avoidance protocol found the children's symptoms largely disappeared.

It is interesting to note that uric acid plays a key, antioxidant role in the plasma: uric acid (along with glutathione and lipoic acid) scavenges peroxynitrite (a dangerous, free radical that contributes to inflammatory processes and hardening of the arteries—Chen 2002); and thus inhibits CNS inflammation, blood-CNS barrier permeability changes, and tissue damage in a mouse model of multiple sclerosis—FASEB J 2000 Apr; 14(5):691-8. Many of these children have low urea/uric acid, possibly reflecting high, oxidative stress. Stress also causes the body to use zinc and magnesium, and the resulting lack of magnesium can cause depression, anxiety, sensitivities to light, sounds, temperature, and touch, and to heart problems, particularly a rapid beat and arrhythmias. This may not be from lack of intake but due to excessive gastrointestinal losses from malabsorption (take magnesium taurate to greatly enhance absorption and to reduce the laxative effect of unabsorbed magnesium), diarrhea, bowel resection, or renal losses due to hypercalcemia, alcohol excess, or use of diuretics, chemotherapy, or antibiotics. It occurs also as a metabolic derangement of both thyroid and parathyroid disorders. The lower levels of magnesium within the cell not only doubles the generation of free radicals, but greatly lowers glutathione (as does a lack of vitamin D), resulting in 40 to 50% more damage! The nutrient deficiencies can occasionally cause extreme behaviors; some children with autism have been reported to have actually gouged out their eyes due to a calcium deficit. If your child is pushing at his eyes, supplement calcium, magnesium, and vitamin D_3, and get him in the sun. Nevertheless, researchers took skin biopsies of 12 children with burn injuries and tracked their vitamin D levels for seven years. They found that the children's skin (even unburned skin) became so inefficient at generating vitamin D that exposure to sunlight alone does not produce enough of the vitamin!

Hyperacusis, which is defined as abnormal acuteness of hearing due to increased irritability of the sensory neural mechanism; is characterized by intolerance for ordinary sound levels. Unlike hypersensitivity to low-pitched hums, this is hypersensitivity to all sounds making day-to-day life a misery. One report links 40% of autism cases with Hyperacusis!

Children with autism have a lot of metabolic abnormalities as indicated, but that is a result of the problems with their immune system. Heavy metals such as mercury (Hg) induce a dramatic activation of the immune system and autoantibody production in the genetically susceptible. This autoimmune syndrome is dependent on T-Cells, which are important for B-Cell activation and cytokine secretion. Studies have found mercury impairs the body's ability to kill Candida albicans by impairment of the lytic activity of neutrophils. Plant workers with average mercury excretion of 20-ug/g creatinine were found to have long-lasting impairment of neutrophil function. "Candidiasis/dysbiosis associated with Hg burden can compromise the absorption of aromatic amino acids such as phenylalanine/tyrosine and tryptophan, which are precursors to dopamine, epinephrine, and norepinephrine, and serotonin, respectively" "The pro-oxidative effects of the metals are compounded by the fact that the metals also inhibit antioxidative enzymes and deplete intracellular glutathione." (Quig, unpublished). This can lead to many if not all their health and behavior problems, and is a major reason to ensure a high intake of protective antioxidants such as Ambrotose AO™ (Mannatech, Inc.), selenium, alpha lipoic acid, and vitamins C and E.

A likely cause of this hoarding of heavy metals by the autistic child is set forth and two effective ways to overcome autoimmunity are suggested:

> Vitamin D treatment effect lies in activated vitamin D's powerful anti-inflammatory properties. Its administration decreases production of inflammatory cytokines in the brain, which have consistently been associated with brain impairment. Activated vitamin D stimulates neurotrophin release (neurotrophin induces the survival of nerve cells), reduces toxic calcium levels in the brain, and inhibits the production of nitrous oxide (excess nitrous oxide destroys brain cells). **Besides reducing inflammatory cytokines, vitamin D does one more vital thing: it increases concentrations of glutathione—the brain's master antioxidant.**

> Vitamin D's role in increasing glutathione levels may explain the link between mercury and other heavy metals, oxidative stress, and autism. For example, activated vitamin D lessens heavy metal induced oxidative injuries in rat brain. The primary route for brain toxicity of most heavy metals is through depletion of glutathione. Besides its function as a master antioxidant, glutathione acts as a chelating (binding) agent to remove heavy metals, like mercury. Autistic individuals have difficulty excreting heavy metals. If brain levels of activated vitamin D are too low to employ glutathione properly, and thus unable to remove heavy metals, they may be damaged by heavy metal loads normal children easily excrete. [Take note that the usual vitamin D supplement (ergocalciferol) has potency of about one-quarter that of sun-generated vitamin D_3 (cholecalciferol).]
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> Seizures are very common in autism and activated vitamin D reduces the seizure threshold by making brain tissue less likely to seize. A controlled study found vitamin D reduced the incidence of seizures in patients with intractable seizures (as does magnesium sulfate - Epsom salts - as a bath or medically infused/injected).
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> Professors Hollis and Wagner of the Medical University of South Carolina discovered that breast milk is a source of vitamin D that is rich enough to maintain healthy levels in infants—**provided the mothers took at least 4,000 units/day. Moms must get in the sun with their infants! -** Excerpted from: The May 2007 Vitamin D Newsletter: Autism and Vitamin D. by John Cannell, MD, Atascadero, CA.

Safe upper limit may not accommodate the need for folic acid by fertile Caucasian females living in equatorial climates (solar ultraviolet radiation significantly reduces folic acid levels among light-skinned individuals).

Several months ago, Dr. Almeras, Professor Feron, and their group at the University of the Mediterranean in Marseilles found developmental vitamin D deficiency disrupts 36 proteins involved in mammalian brain development. Severe maternal vitamin D deficiency leads to rat pups with increased brain size and enlarged ventricles (chambers in the brain), abnormalities very similar to those found in autistic children. Prospective Mothers must get the sun, or supplement with vitamin D_3. Take your vitamin A and D, other than CLO and multivitamins, separately for best results.

Additionally, "I don't know how many seizure patients I've gotten off their medicines by just getting them off MSG and giving them magnesium (preferably magnesium taurate with vitamins B_6 and D_3 to ensure utilization). They quit having seizures. They were on maximum dosages of medications and still having seizures. Most neurologists and neurosurgeons that treat seizures are not aware of this." - Dr. Russell Blaylock, MD.

"MSG toxicity - taurine deficiency link theory is my own. I developed the theory over ten years ago. At first in my research of glutamate toxicity and its effect on cardiovascular health, most of the neuro scientific data at the time linked glutamate toxicity to its effect on the amino acid cysteine. (Glutamate and cysteine compete for uptake in the body.) I then was given an article about the amino acid taurine by a colleague. That was the link. Taurine deficiency symptoms are the exact same symptoms of MSG reaction, particularly, a racing heart. (Taurine is the amino acid that regulates heartbeat.) When I realized that the body manufactures taurine from cysteine, the pieces fell into place. I then tested my theory. The next MSG reaction I had, I took taurine in pill form. The headache went away, the racing heart calmed down, the blood pressure went down, and I was able to sleep. Since that time, I have used

it quite often and always keep some handy as an "antidote". It is interesting to note, that now taurine is being used in Japan to treat high blood pressure. It is also being studied to treat diabetes and epilepsy now. These are also two diseases impacted by glutamate. Glutamate triggers the pancreas to produce insulin, but too much insulin can result in insulin resistance, Type II diabetes, and obesity. Also, MSG is well known as an epilepsy trigger. All these facts point to the conclusion that ingested MSG somehow interferes with taurine formation in the body, perhaps by interfering with the uptake of the cysteine needed to make taurine. It is by no means an "official" theory, but we have had many reports of MSG sensitive persons who report relief of some MSG reaction symptoms by ingesting taurine. It is also interesting to note that the body uses Vitamin B_6 to make taurine, and that Vitamin B_6 deficiency makes MSG reactions worse." - Carol A. Hoernlein, P.E., Founder MSGTruth.org. This belief has major scientific support. Aspartate, glutamate, and glutamine, among other amino acids, are excitatory in excess, or in absence of sufficient fuel in the brain. They are antagonistic to the functions of taurine, alanine, GABA, and glycine according to a contemporary review of taurine by Richard Smayda, D.O. Consequently, taurine does detoxify glutamates. Taurine (and magnesium) prevents glutamate excitotoxicity through regulation of calcium and mitochondrial energy metabolism according to scientists writing in the November 1999 issue of Journal of Neuroscience. They clearly and unambiguously point out that the control of intracellular calcium concentrations is a fundamental process in neuronal survival and function. This, prevention of glutamate excitotoxicity, is exactly what we need. Avoid hypoglycemia to avoid excitotoxic reactions caused by a lack of brain fuel.

Furthermore, viruses are causative: "There are over 20 viruses that have been shown to cause seizures in people, including many that are ubiquitous and known to have latent states, with Epstein Barr, other Herpes viruses, influenza, Coxsackie, measles, and mumps being among them. I am personally of the opinion that chronic latent viruses which have an affinity for glial cells are the main underlying cause of idiopathic epilepsy." - John B. Symes, D.V.M.

There is evidence to suggest a possible causal relationship between increased levels of proinflammatory cytokines and symptoms of aggression and agitation in autism. In agreement with the above, a new, novel treatment for Autism is reported by Stewart Johnson, father of a severely autistic son, age 16: "After 14 years of observing my autistic son and researching the topic, I formed the hypothesis that the most difficult symptoms of autism (including self-abusive behavior, compulsivity, anxiety, behavioral inflexibility, etc.) are the result of an aberrant immune response. I researched ways to down-regulate the immune system and came to TSO, a living organism being used successfully to treat other autoimmune disorders (Crohn's disease). After preparing a research paper showing this hypothesis was supported by the medical literature, I presented it to my son's doctor and we began treating my son with TSO (eggs of helminth). After 10 weeks he completely lost all symptoms of agitation, aggression, self-abusive behavior (including head smashing/banging and hand biting), perseveration, behavioral inflexibility, compulsivity, impulsivity, repeated questioning, "stimming", and hypersensitivity to external stimuli. He continues to take TSO every two weeks, and the symptoms have been gone now for 15 months." Details at www.autismtso.com. Hey, whatever works, but I would give vitamin D and Ambrotose^R a try first. Note other ways to control inflammatory cytokines discussed herein.

Another parent's report on head banging (often thought to be due to chronic pain) is of interest: "I told a friend about annatto 160b as her two-year-old daughter had been splitting her head open head banging. My friend has kept her daughter off the annatto for a week now and her daughter has stopped head banging. She still gets in the position when she is throwing a tantrum but doesn't bang her head. This is the only additive she has removed!" – by email.

Another study found that this impairment of neutrophils by heavy metals and lack of glutathione decreases the

body's ability to combat viruses, some of which cause inflammatory damage to heart and brain. Samplings of immune data reveal that most of these autism-spectrum disorder (ASD) children have atypical elevations of antibodies against otherwise common pathogens such as Epstein-Barr virus, Cytomegalovirus, and/or Human Herpes Virus 6 (EBV, CMV, HHV-6), and in some 30%, elevated anti-measles antibodies indicative of chronic infection from measles vaccine—Kawashima H, Mori T, Kashiwagi Y, Takekuma K, Hoshika A, Wakefield A; Department of Paediatrics, Tokyo Medical University, Japan. "Of the 160 autistic children we looked at, only five did not have bowel disease"—Wakefield.

HHV-6 induces synthesis of a broad range of host cell proteins, including interferon alpha, CD4, interleukin-1 beta, and tumor necrosis factor-alpha [TNF(a)]. Additionally, HHV-6 kills Natural Killer Cells. Human herpesvirus-6, the etiologic (causative) agent of roseola, is ubiquitous, establishes latency in the host, and can infect a variety of immunocompetent cells, with CD4+ T-lymphocytes being the targets in which it replicates most efficiently, and HHV-6 has an "Immunosuppressive effect...on T-cell functions" such as "suppression of interleukin-2 synthesis and cell proliferation."

Carlos A. Pardo-Villamizar, M.D., at the Johns Hopkins University School of Medicine in Baltimore, Maryland said that, "Compared with normal control brains, the brains of the people with autism featured immune system activation and inflammation in the brain. This ongoing inflammatory process was present in different areas of the brain and produced by (immune system) cells known as microglia and astroglia". HHV-6 and measles are known inhabitants of brains. Hopkins researchers showed that the measles virus blocks the release of an important chemical from monocytes, a type of white blood cell. The molecule, called Interleukin-12 (IL-12), is critical for the activation of a part of the immune system called cell-mediated immunity (CMI). CMI is an important defense mechanism against a variety of viruses and bacteria, as well as protozoa, one type of which causes malaria. In the absence of IL-12 production by monocytes, CMI is greatly weakened. Various neurologic manifestations, including convulsions and encephalitis, can occur during primary HHV-6 infection, or in immunocompromised patients. HHV6 has been reported within oligodendrocytes and microglia, and focal HHV6—encephalitis has been documented. It is considered causative in Chronic Fatigue syndrome (CFS) and is suspected of causing multiple sclerosis.

Professor Marc Feldmann of the Imperial College, London predicted that drugs he helped develop to treat rheumatoid arthritis may prove to be effective for many more medical conditions, including atherosclerosis. The drugs, which block a cytokine known as tumor necrosis factor-alpha (TNF-alpha), include infliximab, etanercept, and adalimumab, which have shown a dramatic protective effect in patients afflicted with rheumatoid arthritis. These agents have also shown to be of benefit for other autoimmune and inflammatory conditions, including Crohn's disease, psoriasis, psoriatic arthritis, ankylosing Spondylitis, and ulcerative colitis. Additionally, they have shown promise in the treatment of acute alcoholic hepatitis, a potentially fatal condition.

Cytokines such as TNF(a) are molecules released by immune cells to alert the immune system that the body is under attack and to initiate a response against the infection. Recent evidence suggests that TNF-alpha regulates synaptic function in the brain also. "In autoimmune diseases, such as arthritis, we discovered that cytokines are over-produced causing the immune system to fight itself, resulting in inflammation and tissue destruction," Dr Feldmann explained. **"We further found that by blocking just one cytokine – tumor necrosis factor alpha – we were able to block all the cytokines involved in the inflammation, with remarkable clinical results."** Prescription drugs, like Enbrel, directly bind to TNF(a) and block its interaction with TNF cell-surface receptors. Though these drugs do work, many studies have demonstrated significant clinical improvement in rheumatoid arthritis patients with high-dose, fish-oil supplements (Kremer 2000) and other nutrients mentioned herein that also inhibit TNF(a), without the side effects of the drugs.

Dr Feldmann believes that similar drugs may have the potential to treat many other conditions, and is currently researching their effect on atherosclerosis. Atherosclerosis, he explained, "is caused by a chronic inflammatory response in the walls of the arteries, in large part, caused by an excessive immune response to cholesterol", or HHV6 and/or H. pylori, both of which have been identified in the plaque?

Aging (sic) results in an increase of inflammatory cytokines (destructive, cell-signaling chemicals) that contribute to the progression of many degenerative diseases (Van der Meide et al. 1996; Licinio et al. 1999). Rheumatoid arthritis is a classic autoimmune disorder in which excess levels of cytokines such as TNF(a), interleukin-6 (IL-6), interleukin 1b [IL-1(b)], and/or interleukin-8 (IL-8) are known to cause or contribute to the inflammatory syndrome (Deon et al. 2001). It is also true that the IgG molecule lacks a galactose molecule at its end, allowing other lectins to bind to this site. The more such misshaped molecules, the more severe the inflammation!

Chronic inflammation is also involved in diseases as diverse as atherosclerosis, cancer, heart valve dysfunction, overweight, diabetes, congestive heart failure, digestive system diseases, and Alzheimer's disease (Brouqui et al. 1994; Devaux et al. 1997; De Keyser et al. 1998). In aged people with multiple degenerative diseases, the inflammatory marker, C-reactive protein, is often sharply elevated, indicating the presence of an underlying inflammatory disorder (Invitti 2002; Lee et al. 2002; Santoro et al. 2002; Sitzer et al. 2002). When a cytokine blood profile is conducted on people in a weakened condition, an excess level of one or more of the inflammatory cytokines, e.g., TNF(a), IL-6, IL-1(b), or IL-8, is usually found (Santoro et al. 2002).

Observe the likely scenario; heavy metals cause HHV-6 to be chronic, latent in the body and brain inducing the body to set up an inflammatory response. One can seek only to control the inflammatory symptoms with the suggested drugs, or he can eradicate the cause. However, inhibiting TNF(a) stops the damage while you eliminate the heavy metals and the viruses. How much better it is to inhibit the cause of overactive inflammation and enhance both mind and body function by replacing missing nutrients as suggested in this paper (rather than resorting to drugs that only inhibit TNF(a).

John O'Leary, Ph.D., a world-class researcher and molecular biologist from Ireland, using state of the art sequencing technology, showed how he had found measles virus in the gut of 96% of autistic children, compared to 6.6% of normal children. This virus did not come from the natural disease; it came from the measles vaccine. In addition, Dr. O'Leary found measles virus present in 75% of children with Crohn's Disease. Crohn's has traditionally been an intestinal disease of adults, following years of dietary abuse. Its appearance in children is a new event, and Dr. O'Leary's work points to measles virus from vaccines as the likely cause. Additionally, Candida, according to antibody studies done at the Atkins Center, is involved in more than 80 percent of all cases of Crohn's and Colitis. The Great Plains Laboratory reports Candida metabolites are elevated in about 75% of people with autism, and additionally, about 40% have metabolites to Clostridia bacteria, in fact, gastrointestinal disorders have been associated with a high level of clostridia in ASD children.

The Measles pathogenic (disease producing) power is derived from the fact that they can set up persistent infections within various lymph tissues (that of the gut, for example, as shown by Wakefield) as well as within circulating cells of the immune system. Wakefield found that controls had prevalence in the gut of HHV-6 DNA similar to that of those with ulcerative colitis—86%! Virus infected monocytes (White Cells) travel freely throughout the body, and have been shown to enter the brain, take up residence there, and secrete cytokines (chemical messengers) toxic to brain tissue. They also serve as foci of infection. Interferon production is stimulated by infection with a virus to protect the body from super infection by some other microorganism. In this study, vaccination of one-year-old infants with measles vaccine caused a precipitous drop in the level of alpha-interferon produced by lymphocytes. This decline persisted for one year following vaccination, at which time the

experiment was terminated—Journal of Infectious Diseases. Thus, this study showed that measles vaccine produced a significant long-term immune suppression. Similarly, the report in the British medical journal *Lancet* confirmed that a significantly higher percentage of these children had received a DTP shot within 30 days of the onset of polio compared to a control group of children without polio: 43 percent of polio victims compared to 28 percent of controls. The DTP vaccine suppresses the body's ability to fight off the poliovirus. Thus, we have evidence of long-term damage to the immune system from vaccines. Starting at about 4 months, this leads to the infections, antibiotics, more infections, and more vaccines that often precede autism.

We now know that, in far too many cases, these live vaccine viruses escape the immune system and take up residence in the body--for a lifetime. A recent autopsy study of elderly individuals found that 20% of the brains contained live measles viruses and 45% of the other organs contained live measles viruses. Similar findings have been described in autistic children and the measles virus is identical genetically to the one used in the vaccine.

Measles infection usually resolves itself over 1-2 weeks given good sanitation, water quality, and hygiene. Treatment with vitamin A, as found in cod liver oil, has been known to be effective since its success was published in the British Medical Journal in 1932. The measles virus can invade, infect, and inflame specific areas of the brain's central nervous system causing persistent viral infection and damage. There are three types of measles-related brain inflammation (encephalitis). First, there is an acute post-infectious type that occurs during or shortly after the initial infection and is characterized by inflammation around blood vessels and loss of myelin (the protective covering around neural cells). This type is thought to be due to autoimmune processes. A second form of brain inflammation follows the acute infection and is called subacute sclerosing panencephalitis (SSPE). This type presents itself 1-10 years later as a persistent measles infection with many mutations inside the cells of the cerebellum and spinal cord in people with competent, mature, immune systems. SSPE can be fatal because it causes general destruction of brain tissue, leading to progressive dementia, seizures, and chronic neurological disorders affecting coordination.

The final type of measles-related complication in brain inflammation is a progressive, infectious one in people without competent immune systems, such as immunocompromised people or children with immune systems that are still developing. This form manifests itself 1-6 months following measles infection. Common symptoms include seizures, motor and sensory system deficits, and lethargy (fatigue) with the acute or sub-acute progression of this third type of encephalitis. The symptoms are a result of brain tissue death caused by unrestricted viral replication, which happens when immune function is decreased due to absence or immaturity. These symptoms of measles virus infection in the brains of people without competent immune systems are too similar to autism to ignore. Measles infects specific brain areas such as the frontal cortex, thalamus, hypothalamus, substantia nigra, locus ceruleus, raphe nuclei, hippocampus, amygdala, rhinal cortex, and cingulate gyrus where neurons have specific CD46 or growth factor receptors. These are commonly damaged areas of the brain in autism.

Measles normally mutates only one third as fast as HIV, but shifts from magnesium to manganese cations in the body can significantly enhance viral mutation rates by 6-10 fold. Vaccines that contain mercury theoretically drive the mutation process higher, rendering immune systems less effective. Viral mutations can escape vaccine protection and or drive measles-mutant strains in the body toward continued successful mutation (selenium deficiencies, common in autistic children, also mutate viruses). Also, if there is too much iron, low zinc, and high copper, this also mutates viruses. Such chronic measles infection can be treated with very high intakes of vitamins A and C and glutathione, oral or injection, and antivirals discussed elsewhere herein.

Dr. Anju Usman, MD, was puzzled as to why antibiotics often failed to clear an intestinal/bladder infection. Her studies revealed a colony of "coated" bacteria that had formed into a "biofilm" and uncoated themselves, making themselves resistant to immune attack and to antibiotics at levels 100-1000 times the normal minimal-lethal dose.

Further research showed that this mucus film was maintained by a high content of calcium, magnesium, and iron. When these minerals were removed by sodium EDTA chelation, or when she withheld all supplementation of these nutrients for two months during her medical treatment, the bacterial infection was readily overcome. Fibrinogen induces biofilm formation by Streptococcus suis and enhances its antibiotic resistance - Grignon L, Grenier D. Use of Nattokinase and Lumbrokinase has proven effective in exposing these colonies. Lactoferrin supplementation also binds iron and disbands biofilm - forcing expression of outer membrane proteins on the bacteria so that the immune system can identify and attack the singular bacteria. In bladder infections, at least, the biofilm is destroyed by D-mannose and by cranberry concentrate that contains D-mannose. Would not the use of lactoferrin, Nattokinase/Lumbrokinase, and D-mannose be preferable to denying needed supplements of calcium and magnesium? Use of probiotics with prebiotics assist in this mission and aid in keeping pathogens under control.

Dr. Peta Cohen, MS, RD offers this thought: At an Autism One Conference in Chicago, one researcher presented his proton analysis of brain tissue, attempting to verify the presence of mercury in the brains of autistic children, and he couldn't find it. He found evidence of activation of the microglia (a type of glial cell that acts as the first and main form of active-immune defense in the central nervous system) as a consequence of toxic metals. So, where are these metals? I'm suggesting they are in the biofilm, along with the bugs, in the gut. If the biofilm wasn't using toxic metals, along with common minerals, to build the biofilm, then why all of a sudden do I get these huge dumps of metals on stool tests?

Ebola virus kills 4 out of 10 of its victims. However, in the presence of selenium supplementation the fatality rate drops by over 80 percent! That is a persuasive demonstration of the anti-viral power of this essential mineral. A similar phenomenon has been recognized and reported in AIDS. It is reasonable to say that selenium increases our resistance to viral disease. What with the Nile virus, and others, supplement selenium. Another proven protocol:

> Effecting a cure when a virus is the offending agent, and many times bringing about this change in the short space of 24 hours, is a rewarding moment in medicine. Vitamin C treatment must be intensive to be successful. Use veins when practical; otherwise, give vitamin C intramuscularly. Never give less than 350 mg/kg body weight. This must be repeated every hour for 6 to 12 times, depending upon clinical improvement, then every two to four hours until the patient has recovered. Ice cubes held to the gluteal muscle before and after injection will reduce or eliminate pain and induration. When treatment continues for several days, the child can be placed on an ice cap between injections. When employing vitamin C intravenously, it is best to use sodium ascorbate and the solution free of all additives except sodium bisulfite. The dose of vitamin C using a syringe should range between 350 mg and 400 mg/kg body weight. In older patients, or when very high doses are required, the vitamin can be added to 5 percent dextrose in water, in saline solution or in Ringer's solution. The concentration should be approximately 1 gm to 18 cc fluid. Bottle injections will need 1 gm calcium gluconate one to two times each day to replace calcium ions removed by the high intravenous schedule. One quart of milk daily will suffice when using the vitamin intramuscularly. In place of milk, one can substitute calcium gluconate tablets. Supplemental vitamin C is always given by mouth. As a guide in determining the amount and frequency of injections we recommend our Silver Nitrate-Urine test. This is done by placing ten drops of 5 percent silver nitrate in a Wasserman tube and adding ten drops of urine. A color pattern will develop showing white, beige, smoke gray, or one that looks like fine grain charcoal. Charcoal is the color needed, and the test is performed at least every four hours. The test itself is read in one minute. These large doses of ascorbic acid will also bring all body tissue back to saturation, which means that the white blood cells will now be capable of destroying other pathogens that might be clouding the picture. Unless the white blood cells are saturated with ascorbic acid, they are like soldiers without bullets. Research on this is now under way at the Bowman Gray School of Medicine by McCall and Cooper. White cells ingest bacteria

and in the process produce hydrogen peroxide. Hydrogen peroxide will combine with ascorbic acid to produce a substance that is lethal to bacteria. I have seen diphtheria, hemolytic streptococcus, and staphylococcus infections clear within hours following injections of ascorbic acid in a dose range of from 500 mg to 700 mg/kg body weight given intravenously and run in through a 20G needle as fast as the patients cardiovascular system will allow.

In the earliest stages of infection, innate response (Th1) predominates, but later the lymphocytes (a version of white cells) start to generate adaptive immune (Th2) responses. They then 'remember' the pathogen, and mount more effective and rapid responses should the individual become reinfected with the same pathogen at a later date. With this in mind, besides early innoculations with vaccines (prior to maturation of the adaptive immune system), the routine use of innate immune suppressing drugs - called anti-inflammatories, anti-pyretic, or anti-histamines for early infections is the major culprit in the epidemic of chronic illness - Dr. Greg Blaney, MD.

Lymphocytes play an important role in survival from infection. We found in several cases of trichinosis that the behavior of the lymphocytes was the real story of the changing blood picture and actually determined the course of the disease. Wintrobe observed that the function of the lymphocytes was stimulation of antibody formation, and that the lymphocytic response runs parallel with the recovery of the patient. This build-up of antibodies appears directly proportional to the concentration of ascorbic acid in all body tissue, and yet we give vaccines but pay no attention to the degree of tissue saturation of ascorbic acid (or of vitamin A needed to fight the infection). Dr. Nossal of the Institute of Medical Research, Melbourne, Australia, wonders about the mechanism by which lymphocytes, on meeting antigens, decide to be turned on or off. He asks, "What physiological mechanism underlies the discrimination between immunization and the induction of immunological tolerance?" We would suggest that it is controlled by vitamin C, which in turn affects the negative charge that then influences the response of the lymphocyte. Ginter of the Research Institute of Human Nutrition, Bratislava, offers some evidence to this effect in his statement: "all reactions which are connected with vitamin C have oxidation-reduction features. It is therefore probable that the biological function of vitamin C can be located in the metabolic reactions which are connected with electron transfer."

Vitamin A, also, is crucial to a very sophisticated bi-directional mechanism that takes place in the digestive system and leads to immune tolerance across the entire gut lining. Immune tolerance is the essence of good health. An intolerant immune system will lead to a wide range of illnesses, and the gut is where many people first lose immune tolerance. Vitamin A (retinoic acid) is key to our ability to consume a wide range of antigens (food) and yet not react adversely.

The killing power of ascorbic acid is not limited to just herpes simplex and the adenovirus. When proper amounts are used it will destroy all virus organisms. We found measles to be a medical curiosity. Specifically, we observe that vitamin C prophylactically, by mouth, was not protective (against the measles virus) unless 1 gram was given every two hours around the clock. One gram given every four hours intramuscularly was also protective. One gram every four hours would modify the attack of measles, but not kill it. With our own children we kept the measles syndrome going off and on for 30 days by giving 1gm every two hours for two days, then off for two days. The disease was then stopped by continuing 1 gm every two hours, by mouth, for four days. By 1950, we learned that we could kill the measles virus in 24 hours by giving intramuscular injections in a dose range of 350 mg/kg body weight every 2 hours. We also found that we could dry up chicken pox in the same time, but more dramatic results were obtained by giving 400 mg/kg body weight intravenously. Two to three injections in 24 hours were all that was required. We published these results in 1951. Recently, we cured a man weighing

85 kg in four days taking 30 gm each day by mouth. In conclusion, the killing power of ascorbic acid (as sodium ascorbate) on virus bodies has been demonstrated by me in hundreds of cases, many of which were treated in our hospital with nothing but vitamin C. We have published some 28 papers on this matter. - Dr. Frederick Robert Klenner, MD. Vitamin A is also vital in fighting measles.

Infants and children often run a fever and show other signs of acute inflammation after receiving multiple vaccinations. Fever is generally considered harmful by physicians, and is treated with antipyretics as it may lead to febrile seizures, stupor, dehydration, increased breathing, discomfort, and tachycardia. Home use of antipyretics upon the first signs of a fever is also common. This approach has lead to the ubiquitous use of aspirin, acetaminophen (Tylenol™), nimesulide, and ibuprofen, which control temperature by inhibiting prostaglandin synthesis in the hypothalamus.

Fever is metabolically expensive: every degree C rise in temperature increases the metabolic rate approximately 10%. It stands to reason that a defense mechanism that is so costly in terms of energy must be important. Numerous studies have shown that fever enhances the immune response by increasing mobility and activity of white cells (doubles production and activity of leukocytes), stimulating the production of interferon, causing the activation of T-lymphocytes, and indirectly reducing plasma iron concentrations. Antiviral and antibacterial properties of interferon are also increased at febrile temperatures. A decreased morbidity and mortality rate has been associated with fever in a variety of infections. Newborn animals infected with a variety of viruses have a higher survival rate when febrile. The use of antipyretics to suppress fever results in an increased mortality rate in bacterially infected rabbits, and an increase in influenza virus production in ferrets. There is anecdotal evidence that children with autism show behavioral improvement when febrile (D. Odell, personal communications, 2003). This is likely because the fever suppresses a chronic viral infection. There is a reason for 98.6 F. body temperature. Laboratories know that Candida and Strep thrive at lower body temperatures! If your well child consistently registers less than 98.6 F (37.0 C) support the thyroid. Never use drugs to lower fever unless all else fails, and then only if the fever is causing the child a serious problem like above 103 F (no harm will occur normally until the fever is above 105.2 F). Rather, use a dip in luke-warm water, a spray of water on a covering towel, a serving of strawberries, or a pad soaked in alcohol placed over the tummy. Don't chill the child. Force water. Vitamin E seems to reduce prostaglandin E_2, which results in an enhancement of T-helper 1 cytokines. If he is lethargic, showing dehydration, then obtain help.

In a study in Afghanistan, 200 children with measles were divided into two groups. The study revealed that children receiving the antipyretics (aspirin) had prolonged illness with more diarrhea, ear infections, and respiratory ailments, such as pneumonia, bronchitis, and laryngitis, and significantly greater mortality rates! This is what you are asking for when you break a fever.

These chronic viral infections apparently cause the body to sequester mercury and other heavy metals according to clinical experience of Dr. Amy Yasko of Maine. She finds that by reducing the viral load and then chelating, even after chelation with DMSA and DMPS showed no remaining mercury, mercury comes pouring out again, and dramatic improvement is noted in the children!

Initial Autism Research Findings at Harvard-Massachusetts General show that patients undergoing endoscopic procedure all had GI symptoms of pain or diarrhea:

Endoscopy Findings:

- Esophagitis in 23 out of 111 (20%)
- Gastritis in 14 out of 111 (12%); 4 had Helicobacter pylori

- Duodenitis in 11 out of 111 (10%); 2 had Celiac Sprue (According to Dr. Buie, all children with ASD should get a blood test for Celiac Sprue before going on a GF diet. Once they're on the diet, those antibodies are gone.)
- Eosinophilic Inflammation in five out of 111 (5%)

Pancreatic Function Testing: Duodenal collection of pancreatic enzymes:

- 10 out of 90 (11%) had low enzyme activity (This is a very high finding compared to the general population.)
- Two out of these 10 (20%) had total pancreatic insufficiency, five with multiple enzyme defects

Carbohydrate Digestion:

- Lactase deficiency was found in 55% of ASD children tested, especially in black children
- Combined deficiency of disaccharides enzymes was found in 15%
- Enzyme assays correlate well with hydrogen breath tests

Another study showed that 58% of the examined children had disaccharidase/glucoamylase enzyme activities below the normal range. Carbohydrate malabsorption may result in gaseousness with crampy abdominal pain and may be the cause of chronic loose stools. The most frequent finding was a low lactase activity in 14 of the 21 children with pathologic disaccharidase results. All of the 21 children with low enzyme activities had loose stools and/or gaseousness. Do supplement digestive enzymes!

Colonoscopy Findings:

- Colitis was found in 11 of 89 patients (12%), none with features of Ulcerative Colitis or Crohn's
- Histologic (biopsy reviewed) lymphoid nodular hyperplasia was found in 15 of 89 patients (16%)
- Eosinophilic inflammation was found in 13 of 89 patients (14%); cause or significance is unclear

Dr. Tim Buie, lead researcher, states that more than half of these children had treatable gastrointestinal problems that ranged from moderate to severe including esophagitis, gastritis, and enterocolitis along with the lymphoid nodular hyperplasia (measles in the gut).

Dr. Sudhir Gupta reports: "Complete Immunoglobulin E (IgE) deficiency was seen in 10% of the patients. Almost 20% of the patients had low IgA, and 8% of them had a complete lack of it, which is quite high compared to the general population (1 in 700-1,000). About 25% of the subjects had IgG subclass deficiency. (Positive IgG antibodies to gluten were found in 100% of IgA-deficient persons with biopsy proven celiac disease but who were negative by the endomysial antibody test. These IgG antibodies are thought to increase intestinal permeability-WSL). About 25% of the patients had a deficiency of various subsets of lymphocytes (e.g., CD3, CD4, and CD8 Killer T-Cells). In fact, almost 40% of these autistic children had a deficiency in Natural Killer Cells (Th1 suppressed). In general, the cytokines IL-2 and alpha-interferon are increased, while IL-1 is normal." IgG anti-brain autoantibodies were present in 27% with ASD, and with 2% from healthy children. IgM autoantibodies to the myelin were present in 36% with ASD compared with 0% of controls. The presence of these antibodies raises the possibility that autoimmunity plays a role in the pathogenesis of language and social developmental abnormalities in a subset of children with these disorders - Serum autoantibodies to brain in Landau-Kleffner variant, autism, and other neurologic disorders. J Pediatr 1999 May; 134(5): 607-13.

A Cornell researcher, Rodney Dietert, professor of immunotoxicology at Cornell's College of Veterinary Medicine, and Janice Dietert, of Performance Plus Consulting in Lansing, N.Y., have conducted the first comprehensive review of later-life diseases that develop in people who were exposed

to environmental toxins or drugs either in the womb or as infants. They have found that most of the diseases have two things in common: They involve an imbalanced immune system and exaggerated inflammatory reactions (at the cellular level).

In a peer-reviewed article on developmental immunotoxicity (DIT), published in a recent issue of Current Medicinal Chemistry, the Dieterts found that almost all the chronic diseases that are associated with DIT share the same type of immunological damage.

The diseases linked to DIT include asthma, allergy, suppressed responses to vaccines, increased susceptibility to infections, childhood neurobehavioral conditions, autoimmunity, cancer, cerebral palsy, atherosclerosis, hypertension, and male sterility.

Toxins that are known to cause developmental immune problems in fetuses and neonates, according to the Dieterts, include herbicides, pesticides, alcohol, heavy metals, maternal smoking, antibiotics, diesel exhaust, drugs of abuse, and PCBs. Antidotes to DIT, the researchers note, could come from a variety of sources, including herbal and fungal chemicals -- from mushrooms to clover -- which appear to have promise.

Two immune processes -- T-helper (Th) cell balances and dendritic cell maturation -- are both compromised in ways that disrupt the regulation of inflammatory cell function, which leads to exaggerated inflammatory responses. “Most therapeutic approaches have looked at specific disease outcomes from DIT, rather than focusing on the underlying immune dysfunction that creates the increased disease risk,” said Robert Dietert. “Instead, we looked at the common immune dysfunction that is related to a host of diseases.”

Knowing the most common immune dysfunction patterns from DIT allows researchers to consider more seriously those **“medicinals with the capacity to restore inflammatory cell regulation, promote dendritic cell maturation, and restore desirable Th balance that would be the most likely candidates to combat the problems resulting from DIT.”**

Autism may involve autoimmunity to brain matter. Autistic children, but not normal children, had antibodies to caudate nucleus (49% positive sera), cerebral cortex (18% positive sera), and cerebellum (9% positive sera). Brain stem and hippocampus were negative--Neuroscience Letters Volume 355, Issues 1-2, 23 January 2004, Pages 53-56, Vijendra Singh, et al.

It is vital to note that the production of interleukin-4 in the spleen of zinc-deficient mice is depressed, leading to depressed levels of IgE, IgG1, and eosinophils; and that the function of T-cells and antigen-presenting cells is impaired by zinc deficiency as well as by energy restriction. Children with clinical or subclinical vitamin A deficiency also have depressed IgG responses to tetanus toxoid compared with children supplemented with vitamin A. The results of more than three decades of work indicate that zinc deficiency rapidly diminishes antibody and cell-mediated responses. The moderate deficiencies in zinc noted in sickle cell anemia, renal disease, chronic gastrointestinal disorders and Acrodermatitis Enteropathica; subjects with human immunodeficiency virus; children with diarrhea; and the malabsorption of autistic and elderly persons can greatly alter host defense systems leading to increases in opportunistic infections and mortality rates. **This is likely because adequate zinc is needed to release vitamin A from the liver.** Corticosteriods (hyrocortisone, prednisone, dexamethasone, etc.) will increase the rate of vitamin A transport from the liver; however, they will result in elevated serum levels and depletion of vitamin A reserves. Both vitamin A and zinc deficiency are widespread among our children and parents. These deficiencies have very negative aspects on the immune function.

Dr. Singh further states: “I firmly believe that up to eighty percent (and possibly all) cases of autism are caused by an abnormal immune reaction, commonly known as autoimmunity. The autoimmune process in autism results from a complex interaction between the immune system and the nervous system.

“Antibodies to measles (rubeola) (MV) and human herpes virus-6 (HHV-6) are elevated, which is a sign of a present infection, past infection, or a reaction to the measles-mumps-rubella (MMR) vaccine. The HHV-6 and measles viruses are etiologically linked to autism because they are related to brain autoantibodies and demyelinating diseases.

“Recently, I conducted a study of measles virus (MV) and HHV-6 in autism.... This study showed two things in particular: first, that the virus antibody levels in the blood of autistic children were much higher when compared to normal children; and secondly, the elevated virus antibody levels were associated with the brain autoantibody titer. Interestingly, the viral antibody and brain autoantibody association was particularly true of MV antibody and Myelin-Basic Protein (MBP) autoantibody (i.e., 90 percent of autistic children showed this association). This observation led me to hypothesize that a measles virus-induced autoimmune (sic) response is a causal factor in autism, whereas HHV-6, via co-infection, may contribute to the pathophysiology of the disorder. Although as yet unproven, I think it is an excellent working hypothesis to explain autism, and it may also help us understand why some children show autistic regression after the measles-mumps-rubella (MMR) immunization.”

At DAN! 2002 Dr. Singh stated, “We measured antibodies to the measles, mumps, rubella, CMV, and human herpesvirus-6 viruses and to our surprise, we found that the antibody level of only the measles virus, but not the other viruses tested was significantly higher in autistic children than in the normal children. In addition we found an interesting correlation between measles antibody and brain autoimmunity, which was marked by Myelin Basic Protein Autoantibodies. The two immune markers correlated in greater than 90% of autistic children, suggesting a causal link of measles virus with autoimmunity (sic) in autism”. The higher than normal antibody level to the measles virus could be the sign of a present infection, past infection, or an immune reaction to the MMR Vaccine. He added that further study showed a greater than 90% correlation between MMR antibody and MBP autoantibody.

“There is enormous potential for restoring brain function in autistic children and adults through immunology.... The goal of therapy should be to normalize or reconstitute the immune response instead of inducing immune suppression or stimulation. This will maintain a balance within the normal immune response, avoiding major fluctuations of overt immune activity which could be detrimental to the patient.” - Excerpts from Autism, Autoimmunity, and Immunotherapy: a Commentary by Vijendra K. Singh, Ph.D. Department of Biology & Biotechnology Center, Utah State University, Logan Scientific Board Member, Autism Autoimmunity Project.

Dr. Singh indicated that two cytokines or immune activation markers, Interleukin-12 (IL-12) and Interferon Gamma (IFN-g), play a very important role in causation of autoimmune disease, that is, they initiate an autoimmune reaction via induction (activation) of Th-1 white blood cells. We have found that these two cytokines are selectively elevated in autistic children, suggesting the induction of autoimmunity via Th-1 cells in autism. Therefore, they should be measured as a sign of altered cellular autoimmunity in patients with autism. **It is interesting to note that autoantibodies (antibodies against self) can be induced in older animals by giving them a vaccine!** Younger animal will usually react to a vaccination by producing beneficial antibodies, but do we not see the autoantibody reaction in this subset of children called autistic?

It has been observed that immune suppression was most profound in infants with the highest antibody responses and was associated with increased numbers of circulating CD8 T-cells, and with increased plasma levels of soluble surface molecules and cellular products associated with immune activations. This delayed immune response allows unwanted microbes to gain a solid foothold before the body mounts its defenses to destroy them. Frighteningly, another study found in animals that this lack of response of Killer Cells allowed usually harmless viruses to become more virulent creating serious illness. Canadian doctors found this delayed response in individuals with nutritional deficiencies. When provided proper dietary ratios of protein, carbohydrates, and fats for eight weeks, they tested higher on helper T-cells and showed a better overall response to antigens (Chandra 1989). Chandra also showed immune systems of "healthy" oldsters significantly responded to a multivitamin/mineral supplement. Another study showed that both colostrum and human milk enhanced B-cell response, but formula did not (Juto 1985).

Of interest is yet another study: They looked for T-cells that recognized these peptides in blood samples from 12 patients and from 12 people who did not have multiple sclerosis. They found that the T-cell that recognized one of the peptides -- corresponding to amino acids 95 to 117 of myelin proteolipid protein (PLP) -- was at least four times more common in the patients' blood. "There also were enough of these T-cells to cause disease," Trotter says. In contrast, the immune cells of multiple sclerosis patients do not recognize myelin basic protein more frequently than those of people without MS.

A new view of multiple sclerosis may arise from the first extensive study of brain tissue from the earliest hours during a bout of the disease. The results, published February 23, 2004, in the advance on-line edition of the Annals of Neurology, suggest that the earliest event is not, as previously believed, a misguided immune system attack on a brain substance called myelin. Instead, the first event appears to be the death of the brain cells that produce myelin (Oligodendrocytes), triggering a subsequent immune system mop-up operation to clean up the cells and the myelin, said author John W. Prineas, MBBS, of the University of Sydney in Australia.

It is well established that the symptoms of MS are caused by a breakdown of myelin, a fatty substance that coats nerve cells and plays a crucial role in transmitting messages to the central nervous system. However, it is unclear what triggers the breakdown of myelin. There are various theories, including an autoimmune attack upon self, exposure to a virus in childhood, vitamin D deficiency, hormones – and now, a buildup of iron in the brain because of poor blood-flow out of the brain. It is postulated that this iron buildup is destroying the myelin.

It is of vital interest to note that the rubella and mumps virus can infect pancreatic islet cells and that the infection can severely reduce levels of secreted insulin. Rubella and mumps disease have been strongly associated with the development of Type I Diabetes. This study should be noted and remembered the next time your friendly pediatrician tells you how important it is to give Hep B to your hours old baby:

Evidence of serious health consequences was recently confirmed in the Journal of Pediatrics in which CRP levels were measured after vaccination. CRP, short for C-reactive protein, is a blood marker indicating a heightened state of inflammation throughout the body. The study involved infants in a neonatal intensive care unit who were given two or more vaccines on the same day (Criminal!). A separate group of (preemie) infants were given one shot at a time, every three days. The vaccines administered were DTaP, Hib, polio [IPV], hepatitis B, and Prevnar (pneumonia). The findings were disturbing:

· An abnormally elevated CRP occurred in 85 percent of infants who received simultaneous vaccines and nearly 70 percent of infants who received the shots one at a time.

· Gastroesophageal reflux (GERD) and severe intraventricular hemorrhage (bleeding in the brain) also occurred in infants who received multiple vaccines at the same time.

· Cardiorespiratory events (stopped breathing) occurred in 16 percent of all infants within 48 hours after receiving the vaccines.

· Infants who received DTaP, Prevnar, and Hib as single injections experienced the largest number of cardiorespiratory events overall. - REF: Pourcyrous, M., et al. Primary Immunization of Premature Infants with Gestational Age <35 Weeks. J of Pediatrics, Vol. 51, Issue 2, Pages 167-172. August, 2007.

There are further concerns about elevated CRP levels. It was found in a study of 62 children who were part of the Diabetes Autoimmunity Study that when infants and young children have an elevated CRP level, they have an increased risk of developing Type 1 (insulin-dependent) diabetes in childhood. - Chase HP, et al. Elevated C-reactive protein levels in the development of type 1 diabetes. Diabetes. 2004 Oct;53(10):2569-73.

It has been found that 85% of children with Type I diabetes have antibodies against the enzyme that converts glutamic acid into GABA (the GAD enzyme-Glutamic Acid Decarboxylase) contributing to the excitotoxicity of excess glutamate. These should avoid MSG/glutamic acid sources, and supplement magnesium, zinc, and vitamins B_1, B_6, and B_{12}, and work to correct other dietary shortfalls. In a newborn that developed seizures at 8-days, GABA levels were only at 13 pmol/ml (picomoles per milliliter) before vitamin B_6 injections. It increased to 124 pmol/ml after vitamin B_6 treatment. Children without any neurologic disease have a GABA level at 174 pmol/ml. In addition to supplements to enhance GABA, one can supplement GABA that is available at the healthfood store. Excess GABA will lead to lethargy, and if long continued, Long-Term Potentiation will be adversely affected, reducing memory enhancement, that is, learning capacity. Seizures induced by low GABA levels appear to be pyridoxine dependent.

One Mom wrote: “I am a parent of two children with pyridoxine dependent seizures. I was very pleased to see the inclusion of a trial of pyridoxine for unexplained seizures in children under two years old. Our first child was initially diagnosed as having idiopathic, infantile spasms at six months of age. It was not until eight years later when his sister developed infantile spasms at the age of six months that the correct diagnosis was made in both children. (I had to suggest the trial of pyridoxine.) Our son had been seen at several major medical centers across the United States but pyridoxine dependency was not considered because the seizures were controlled by very high doses of Klonipin. Even though pyridoxine, 100 mg/day, completely stopped the seizures in our daughter within three days, increasing the dose to 150 mg/day (10 mg/kg/day) in two divided doses had an even more remarkable effect, especially in improving her verbalization and alertness. She is now almost three years old and doing very well. Our son has improved by several grade levels in the last two years on a similar dosing schedule.

“Both children started having seizures within a few weeks of my stopping breastfeeding. Since I had continued my prenatal vitamins and large amounts of pyridoxine are secreted in breast milk, this probably had a protective effect. Therefore, a history of severe seizures beginning soon after breastfeeding stops may be worth noting. I have found about twenty families over the last several months who have children with this disorder. Almost always, there have been significant delays in getting to the correct diagnosis. Several families had already lost a child before having the correct diagnosis made in a sibling later. Pyridoxine dependency is probably more common than previously

thought, and significant improvement may be seen with appropriate treatment even if the diagnosis is delayed."

One of the more recent studies on Type I diabetes was published in 2001 in the Lancet. This particular report concerned a 31-year prospective study of over 10,000 children born in 1966 in northern Finland. The parents were advised to give the children 2,000 IU of vitamin D per day. A year later, the researchers followed up with the families to determine which children had been given the vitamin D), which had not, and if any of them had signs of rickets (caused by severe vitamin D deficiency). The children who were regularly given the supplement during their first year had approximately 80% less type I diabetes diagnosed over the next 31 years! In sharp contrast, those children who showed signs of rickets at age one had 300% more type I diabetes diagnosed over the next 31 years. A study from Italy confirms the lack of vitamin D in newly diagnosed Type 1 diabetes. Moreover, it is thought that vitamin D_3 supplementation, in particular its activated form, 1,-dihydroxyvitamin D_3 [1,25-(OH)2D3], may act as an immunomodulator facilitating the shift from a Th2 to a Th1 immune response, according to scientists writing in the journal, Hormone and Metabolic Research.

Recent research by Marshall, et al, in sarcoidosis and Crohn's shows that the active form of the vitamin D hormone (1,25 D) is present in excessive levels relative to the inactive 25 D form in patients diagnosed with a number of inflammatory illnesses, such as chronic fatigue syndrome, fibromyalgia, and Lyme disease. Evidence suggests that this is due to unregulated production of 1,25 vitamin D by macrophages in the course of an excessive Th1 immune response. Research indicates that this occurs in response to cell-wall-deficient (L-form) bacteria parasitizing (taking up residence within) immune cells and other tissue. Testing for the active 1, 25 (OH) D must be done with frozen urine samples by LabCorp who uses a more reliable, low cost test method. A high 1,25 (OH) D to 25 (OH) D would suggest infection by L-form bacteria.

Usually, the inflammation caused by autoimmunity (sic) is treated by suppression of the immune system. This seems to work, but with a high, price tag in side effects. It would surely be better to get at the cause. Researchers from Einstein College of Medicine of Yeshiva University, and others, recently conducted a study of autoimmune mice. These mice usually get fatal, autoimmune, kidney disease and die by age 2 months. Those receiving normal dietary amounts of Indole-3-carbinol (I3C), a plant compound from cruciferous vegetables, lived to the human equivalent of 120 years! (This substance is found in Phyt-Aloe® by Mannatech, Inc.) It is probable that this effect is due to the modulation of the process of methylation by the I3C. Methylation decreases with age, is disrupted by autoimmunity, and I3C enhances this life-sustaining process. These cruciferous vegetables also greatly enhance production of Glutathione and Glutathione Peroxidase that strengthen the immune function and the detoxification (cleansing) capabilities of the body. Indole-3-carbinol is important in normalizing chemically sensitive people, for the food and chemicals these days are high in pseudoestrogen compounds and dioxin. The antidote for dioxin (TCDD) is indole-3 carbinol. This might help normalized some children's behavior. "My research has shown that the chief therapeutic intervention to prevent weight gain (regardless of age) is the anti-inflammatory diet. I have observed significant weight loss in thousands of individuals who follow the simple formula of avoiding foods that are pro-inflammatory and choosing in their place foods with anti-inflammatory properties." - Dr Nicholas Perricone, MD.

Reed Warren, et al, mention how the IgA findings relate to infections and report a fascinating double susceptibility in that six of eight autistic kids with low IgA levels also had null alleles of the complement C4b: "...IgA is also important in protection against pathogenic infections and participates in the clearance of pathogens via the alternative "complement" pathway. C4 proteins [e.g., from the C4a and C4b genes] are involved in the other "complement" pathway, the classical complement pathway. Therefore, it is interesting that of the eight autistic subjects with decreased IgA levels, all but two also had a C4b null allele suggesting that, in these patients, both pathways of complement activation [and response to infections] are probably operating at less than optimal level."

“If they are vitamin A deficient, are they producing secretory IgA? Many of these children have had recurrent gastrointestinal and/or respiratory infections and otitis media beginning at 15-18 months. Adequate vitamin A is needed to produce secretory IgA and to heal ciliated membranes, including those that secrete IgA. To replace your mucous secreting cells, you need vitamin A. To create secretory IgA, you need those cells healthy and these children need vitamin A to rebuild retinoid receptors associated with G-protein all over the body” - Dr. Mary Megson, MD.

A test of thirty-six children revealed grade I or II reflux esophagitis in 25 (69.4%) (vaccine induced?), chronic gastritis in 15 (42%), and chronic duodenitis in 24 (67%). Low intestinal carbohydrate digestive enzyme activity was reported in 21 children (58.3%), although there was no abnormality found in pancreatic function. Seventy-five percent of the autistic children had an increased pancreatico-biliary fluid output after intravenous administration of Secretin (indicating hypersensitivity of the pancreas) - Gastrointestinal abnormalities in children with autistic disorder. J Pediatr 1999 Nov;135(5):559-63.

Children with autism produce higher levels of pro-inflammatory cytokines (a localized, protective reaction of tissue to irritation, injury, or infection, characterized by pain, redness, swelling, and sometimes loss of function.) than children without autism. A lack of sleep markedly increases inflammatory cytokines, especially IL-6, with an average of 40-60% increase in men and women. Men observed a 20-30% increase in TNF(a) also.

During the progression of Mg deficiency in a rodent model, dramatic increases of inflammatory cytokines were observed particularly in interleukins 1 and 6 (IL-1, IL-6) and tumor necrosis factor (TNF). (In addition to attacking tumor cells selectively, TNF is active against virus-infected cells. Excess TNF is known to reduce vascular blood flow, increase oxidative stress, reduce glutathione levels, increase bone resorption, suppress myelin formation, compete with insulin at receptor sites, damage pancreatic-beta cells with aldehydes, and induce cell death.)

A landmark in our understanding of cytomegalovirus (CMV) pathogenesis came from studies done in Berlin by Hans-Dieter Volk and his wife, Petra Reinke, who demonstrated that the most important mediator that arouses the virus from latency is the elaboration of tumor necrosis factor (TNF). This results in reactivation of CMV (a necessary step to its elimination).

An increased production of various inflammatory peptides--such as Substance P (SP), CGRP (calcitonin-gene related peptide), and VIP (vasoactive intestinal peptide) which increases nitric oxide--is also observed in Mg-deficient rats. VIP and CGRP are potent vasodilators. This is caused by the release of nitric oxide from the endothelium. Its release can cause hypotension. Substance P is elevated up to threefold in the spinal fluid of those with fibromyalgia. This might be increasing the brain’s perception of pain in fibromyalgia. Nevertheless, TNF and SP are not the enemy. It appears that the lack of necessary nutrients, particularly Mg and enzymes, allows inflammation and creates the problem. These “inflammatory” peptides are then produced to control the initial cause of inflammation, whether viral or irritation, however, obese people produce more than seven times as much TNF from their adipose tissue as do normal weight people. Additionally, levels of these inflammatory cytokines were 60% higher in those who get no exercise. Children diagnosed with mental retardation and with autism have very high percentages of their numbers with these inflammatory cytokines (90% excess VIP, 81% excess CGRP).

Our problem is to boost the immune system activity (primarily the Th-1, Natural Killer cells) while controlling the pro-inflammatory activity (Ambrotose Complex is a proven modulator of the immune function). Sadeghi, et. al., has demonstrated that coconut oil in combination with fish oil (preferably cod-liver oil [CLO]) decreases levels of pro-inflammatory cytokines such as Tumor Necrosis Factor

(TNF(a)) and Interleukin-6 (IL-6), while stimulating production of anti-inflammatory cytokines such as Interleukin-10 (IL-10). Interleukin-10 has been approved for treating IBD, but it is difficult and expensive to produce. DHA fraction of fish oil is the best-documented supplement to suppress TNF-a, IL-6, IL-1(b), and IL-8 (Jeyarajah et al. 1999; James et al. 2000; Watanabe et al. 2000; Yano et al. 2000). A study on healthy humans and those with rheumatoid disease shows that fish oil suppresses these dangerous cytokines by up to 90% (James et al. 2000). DHA is essential to memory and to retinal function, and should be favored over EPA in our supplements.

Dr. Weston Price observed that a few drops of CLO with a few drops of Butter oil under the tongue revived the ill, but singly they did not! We now know the butter oil is rich in vitamin K_2, and that the three nutrients are essential to the handling of calcium. Lauric acid of butter, coconut oil, and Mother's milk improves the function of the Omega-6 pathway, and enables the fatty acids to accumulate in the tissues where the prostaglandins are formed. Vitamin A supplementation in patients with low vitamin A levels resulted in increased interleukin-10 (IL-10) and decreased TNF(a) levels. Additionally, others tested CLO and measured a 12% reduction of platelet aggregation, improving circulation. In a small series, Lee et al. tested the hypothesis that because nitrous oxide (NO) has pro-inflammatory effects on bronchial epithelial cells, supplemental iron, an inhibitor of NO synthase, may reduce the cough associated with the use of ACE inhibitors. Patients treated with iron, but not those with placebo, had significant reductions in cough scores.

Autistic children have been shown to exhibit many anomalies in cell-mediated immunity, including abnormal T-cell activation (Warren et al, 1995), decreased relative numbers of helper-inducer lymphocytes, and a lower helper-suppressor ratio. (Denney et al, 1996) These last 2 measures were inversely correlated with severity of autistic symptoms. Cytokines can be reduced by long-chain (n-3) polyunsaturated fatty acids (PUFA) and vitamin A, making cod-liver oil a good choice. This, in turn, results in reduction of the severity of certain autoimmune, inflammatory, and atherosclerotic diseases, and reduces cytokine-induced anorexia (loss of appetite). Autoimmune diseases associated with vitamin A deficiency include rheumatoid arthritis, juvenile arthritis, Lyme disease, systemic lupus, and insulin dependent diabetes mellitus.

Vitamin A is crucial to a very sophisticated bi-directional mechanism that takes place in the digestive system and leads to immune tolerance across the entire gut lining. Immune tolerance is the essence of good health. An intolerant immune system will lead to a wide range of illnesses, and the gut is where many people first lose immune tolerance. Vitamin A (retinoic acid) is key to our ability to consume a wide range of antigens (food) and yet not react adversely.

Eskimos, Irish, and Northern European Seacoast dwellers who subsist largely upon fish have lost the Delta-5 and -6 Desaturase enzymes! Thus, if removed from their high-fish diets, their prostaglandins are in disarray for want of these enzymes necessary to conversion of Omega-6 oils. Could this not be a strong contributing cause to the fact that Autism is at its highest rates among the Northern Europeans and Irish? In other peoples, stress, a vitamin-deficient, high-grain (carbohydrate) diet, and trans-fatty acids shut down Delta-6 Desaturase! Linoleic acid also decreases the body's conversion of alpha-linolenic acid to EPA. However, the Delta-6-desaturase has a higher affinity for a-linolenic acid than it has for linoleic acid. This is known as Competitive Inhibition. Insulin resistance in adult-onset diabetes is associated with fewer membrane, long-chain, unsaturated fatty acids due to this impaired desaturase and elongase enzyme function.

Steven Maier, PhD, (Neal Miller Lecture, APA 2001) told how he can disrupt learning and memory in rats by injecting bacteria into rats' digestive tracts or by injecting interleukin-1 into their hippocampus. This infection triggers a nonspecific immune response often called the "sickness" response, because it triggers a series of physiological and behavioral changes, including fever, changes in liver metabolism,

reduced food and water intake, reduced sexual activity, reduced exploration, and increased anxiety. It also activates a classic, stress response releasing stress hormones such as cortisol and pro-inflammatory cytokines, which include interleukin-1, interleukin-6, and tumor necrosis factor alpha. Immune cells called macrophages, which are the first on the scene of any infection, create these molecules, and experiments showed that they act inside the brain to trigger the sickness response. It is of interest to note that cadmium stops healthy macrophages from gobbling up bacteria, leaving you more vulnerable to infections; whereas, viruses cause the body to retain heavy metals, particularly mercury.

Maier also showed that high levels of stress alone could produce these same immune responses and make you sick! Excess cortisol has been shown to produce hypertension, poor wound healing, bone loss, muscle wasting, thin skin, and sleep fragmentation. High cortisol, induced by stress, causes both insulin resistance and thyroid hormone resistance, which increases the estrogen burden! Unfermented soy contributes a high estrogen input as well. "Dysbiosis and poor digestion prevents the body from eliminating unnecessary estrogen. Excess estrogen binds the thyroid transport proteins so the thyroid hormones cannot get to the cells causing hypothyroid symptoms." - Dr Datis Kharrazian, DHSc, DC, MS. Iodine disarms estrogen and reduces your cancer risk! This also helps restore an older man's testosterone/estrogen balance, preventing many symptoms including big boobs! Cortisol is a killer of brain cells, especially in the hippocampus, affecting memory adversely; but it also drains your immune function and makes you depressed (excess cortisol suppresses cellular immune responses and destroys immature T-cells, shifting to Th2 dominance)! Chronic stress, such as these children (and you Moms) suffer, increases behavioral, biochemical, hormonal, physiological, and psychological responses and puts any excess fat on your middle (visceral fat, the most dangerous kind)!

Additionally, isolation without social support also raises cortisol. Moms, take time to relax and socialize! Do a daily relaxation-meditation exercise. Take a vigorous 20-minute walk in the sun, bring the child; he needs the exercise and the sun as much as you. He will eat and sleep better, as will you. You might want to consider Rhodiola Rosea, an herbal adaptogen that enhances energy (burns calories) and mental functions, and take 200 to 400 mcg of chromium (not picolinate) that reduces Cortisol by 47%. Tests with vitamin C (1000-3000 mg/day) showed significant lowering of cortisol and blood pressure after physical and psychological stress. Three mg of melatonin before bedtime reduces visceral fat.

7-Keto DHEA was shown also to reduce diastolic blood pressure, increase neutrophils, the first white blood cells to respond to infection; and it counteracted the effect of glucocorticoids, such as cortisol. When mice with compromised immune function were subjected to mild stress for one month, a long time in a mouse's life, their white blood cells and thyroid hormones were decreased, however, when they given 7-Keto DHEA at 15 mg/kg their blood cells proliferated and Natural Killer Cell activity was dramatically enhanced. Thyroid levels returned to normal. Unlike DHEA, 7-Keto does not affect sex hormone levels. Life Extension Foundation has a combined supplement of DHEA and 7-keto (DHEA Complete).

When cellular immune function (Th1) is decreased, antibodies are greatly increased. Conversely, when cellular immune function is restored, antibodies decrease. The pattern of antibody response also will vary as the antigen load changes qualitatively and quantitatively. I understand this to mean that high antibodies to an antigen indicate a present, heavy load of that infectious agent. (Low lymphocytes and high monocytes may be similarly indicative of chronic infection/inflammation.)

Intractable childhood epilepsy is associated with low blood values of IgG-2 and IgG-4; replacement therapy may lead to remission of symptoms. IgG-4 may also be low in some children with febrile convulsions. The antiseizure drug carbamazepine (*Tegretol*^{TM}) may cause a reduction in IgG-2 while phenytoin (*Dilantin*^{TM}) may be associated with decreases in IgA, IgG-3, and IgG-4. Anti-IgA antibodies

have been detected in epileptic patients with low serum IgA concentrations. In children with these abnormal antibody patterns, selenium (Se) supplementation at a dose of 10-mcg/kg bodyweight for six months significantly increased IgG-2 and IgG-4 levels and reduced the number of infections. Low blood values of these two immunoglobulin antibodies are associated with intractable seizures. Selenium and vitamin E supplementation have overcome intractable seizures that were resistant to drugs. Under normal conditions, a Se intake of less than 1,000 µg/day (or 15 µg/Kg bodyweight) does not cause toxicity. People in parts of China, the US, Venezuela, and Greenland have ingested Se at this level for their entire lives without ill effects.

Both selenium and vitamin E deficiencies are known to independently stimulate the formation of antibodies. Studies have suggested that Se provided in certain forms can neutralize carcinogens and heavy metals, enhance thyroid and immune system function, prevent harmful mutation of viruses, favorably alter gene (including p53) expression, inhibit tumor cell metabolism and neo-angiogenesis (blood vessel development around tumors), and promote apoptosis (programmed cell death). Other symptoms of selenium (Se) deficiency may be muscle aches, pains, and weakness, tender thighs, and discomfort in walking. There may be skin problems and infertility. Children may not grow properly. Se appears to be influential in the brain, and several studies that indicate low Se levels are associated with cognitive impairment, depression, anxiety, intolerance, and hostility. These conditions can be alleviated in individuals with low baseline Se levels by Se supplementation. Recent studies suggest that selenoprotein P, selenoprotein W75, and selenoprotein M76 have important roles in the brain. The vital need for selenium in the brain is indicated in that it hoards the available selenium when it is lacking. Se forms selenides with all metals, and detoxifies mercury, cadmium, lead, silver, thallium, and arsenic. This effect can be enhanced by vitamin E. New Zealand, Finland, Serbia, and certain counties in China have the lowest selenium in the world. The Northwest, Northeast, and Southeast United states have low levels in the soil. Selenium levels plummet after surgery, injury, infection, blood loss, and with advancing age (Am Journal of Clinical Nutrition, Oct 1979). A lack of selenium induces T3 deficient hypothyroidism. Fish and wheat are the richest sources of selenium. Though fish is high in selenium, taking 50-mcg selenium with a fish meal ensures binding of the mercury.

Human populations exposed environmentally to arsenic have a high incidence of bladder, kidney, liver, and skin cancer (Kitchin, 2001). One study showed that those with Type 2 diabetes had 26% higher levels of arsenic than those who were free of the disease. Those with the highest levels of arsenic were four times more likely to have the disease than those who had the lowest levels of arsenic. Mothers often ask where the high arsenic levels found in their children come from. It can come from playgrounds where wood was treated with arsenic that has now contaminated the sand in the sandbox, from the decking around your house, plastic playpen padding, wool rug and underlays, but largely, it may come from your drinking water. Many waters have significant amounts of arsenic. Ask your agency for a lab report on water content. Arsenic exposure in mice suppressed the IgM and IgG antibody–forming cell response, inhibited antigen driven T-cell proliferation and macrophage activity, decreased CD4þ splenic cell number, and suppressed contact hypersensitivity responses (Burns and Munson, 1993; Patterson et al., 2004; Sikorski et al., 1989). In other words, it destroys the normal immune response. One possible mechanism for enhanced tumorigenesis in arsenic-exposed populations is that damage to the immune system impairs the responses to transformed cells (Andres, 2005). In fact, inhibition of lymphocyte proliferation in response to phytohemaglutinin (PHA – a lectin found in legumes) stimulation has been reported in adult human populations exposed to arsenic contaminated drinking water. Now, Soto-Pena et al. (2006) demonstrated that proliferation of peripheral blood mononuclear cells in response to PHA was significantly decreased in association with an increase in arsenic concentration in urine of children 6–10 years of age exposed chronically to arsenic. Release of interleukin-2 (a T-cell growth factor) from these cells was also significantly suppressed. Studies that

demonstrate significant immune suppression in children exposed to environmentally relevant levels of a toxicant are not a common occurrence, so this case is particularly notable.

The antibody response to diphtheria toxoid decreased at age 18 months by 24% for each doubling of the cumulative PCB exposure at the time of examination. At 2-years of age, 21% of children had diphtheria toxoid antibody concentrations below the limit for long-term protection. The Heilmann study suggests that children exposed to PCBs in utero or soon after birth are at greater risk of infection, and in fact, studies have shown an increased frequency of childhood infections in children who have been exposed to PCBs and other organochlorine pollutants via their mother's contaminated diet (Dallaire et al., 2006; Dewailly et al., 2000; Nagayama et al.,1998; Weisglas-Kuperus et al., 2000). Similar studies with cigarette-smoking mothers and in animals with toxins of many kinds show suppression of the immune function in offspring.

Additionally, in workers exposed to fluorine, those with subclinical hypothyrosis [reduced tri-iodothyronine (T3) in 51%] had immune alterations that were more evident. T-lymphocytes count rose, but their functional activity declined, indicating impaired cooperation of immunocytes as a result of imperfect control under low concentrations of T3 (Balabolkin, 1995). Some convert T3 into the inactive 'reverse T3', and thus have a relative deficiency of the active hormone (Wilson's Syndrome). Their immune system is driving with no brakes! Additionally, in absence of T3, a nerve fiber will not conduct an impulse! Vitamin A is also needed to convert T4 to T3, making this abstract of interest:

> Vitamin A deficiency increases inflammatory responses. Wiedermann U, Chen XJ, Enerback L, Hanson LA, Kahu H, Dahlgren UI-Department of Clinical Immunology, University of Goteborg, Sweden.
>
> The authors studied the influence of vitamin A deficiency on immediate and delayed type hypersensitivity as well as granulocyte-mediated inflammatory reactions in vitamin A depleted and control rats. The number of circulating leucocytes was 43% higher in the vitamin A deficient than in the control animals. The leucocytosis was a result of a general increase of white blood cells and was not due to an increase in one particular type. The ratio between CD4+ and CD8+ T cells was unchanged. The vitamin A deficient rats had a four times higher T-cell proliferative response and a two times higher interferon-gamma production in vitro than the control animals. In accordance, the DTH reaction was consistently higher in the vitamin A deficient rats. The granulocyte dependent inflammation, induced by olive oil injection, was also strongly enhanced in the vitamin A deficient rats compared with the controls. In addition, the spontaneous release of nitric oxide from the peritoneal phagocytes was five times higher in the vitamin A deficient animals. The number of peritoneal mast cells was about one and a half times higher in the vitamin A deficient than in the control animals. The density of IgE-receptors on the mast cells, the IgE receptor occupancy, and the histamine release from the mast cells did not differ between the groups, however. The vitamin A deficient, immunized rats displayed a consistently stronger immediate skin reaction after intracutaneous antigen injection than the immunized control rats, despite lower IgE antibody levels. The skin reaction, after intracutaneous injection of histamine, was also significantly greater in the deficient animals. Despite the stronger reaction to antigen and histamine, the passive cutaneous anaphylaxis reaction was lower in the vitamin A deficient rats. In conclusion, the study shows that vitamin A deficiency aggravates the clinical manifestations of inflammatory reactions. Thus, vitamin A deficiency might lead to a higher risk of acquiring irreversible tissue damage and disabling destruction. End of Abstract

A young medical intern at Harvard had a young man die in spite of his best efforts to save him. His white blood cells were stippled with bizarre, angry-looking granules that had been defined much earlier as "toxic" leukocytes. These indicated a widespread inflammatory condition. Could this not have been a simple or an imbalance of fatty acids, or both? Be aware that being overweight contributes to system-wide inflammation, as fat cells give off substances that not only prmote more fat accumulation, but that exacerbates inflammation. Make sure you are all getting enough vitamins A and D and omega-3 fatty acids, all present in cod-liver oil. Nevertheless, Dr Floyd H. Chilton, Ph.D., (*Winning the War Within*) has shown in his research that you can't affect inflammation by attempts to balance fatty acids alone. You must reduce the amounts of carbohydrates typically consumed, especially those of high-glycemic index. It is an excess of carbohydrates (especially the high-glycemic ones) that cause inflammation in the first place by elevating insulin that imbalances the fatty acids. Request my paper on Glycemic Index of Common Foods.

We have observed the chronic infections present and the effect upon them of various nutrients. This abstract is so vital to the recovery from autism that I quote it in its entirety:

> Early Diagnosis of Alzheimer's Disease and Autism by Non-Invasively Measuring Acetylcholine, Ã¢ -Amyloid (1-42), Al, Hg, and Viral and Bacterial Infection; particularly CMV, Chlamydia trachomatis, and Mycobacterium tuberculosis: Safe and Effective Treatment With Compatible and Effective Medication (including "Substance Z"), and Selective Drug Uptake Enhancement Method.
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>
> ABSTRACT
>
> Even when one can prevent or survive major causes of death, cardio-vascular diseases, and cancer, once an individual manages to reach 80 years old, more than 20% of the people over 80 develop Alzheimer's Disease. Although there are some medications, which can slow down the progress of Alzheimer's disease, there is no reliable method of reversing Alzheimer's disease. Since old age population is increasing every year in developed countries, expenses and burden of taking care of Alzheimer's disease will become astronomical. Similarly, the population of autism patients among children is also increasing every year, and there is no reliable treatment for autism available. As a result, these people become an additional burden for the families and society.
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> During the past 5 years, the author has been evaluating both Alzheimer's patient and Autism patient and found that they have a significantly similar abnormal findings in the brain. The author often found the following to be common between Alzheimer's and Autism patients:
>
> - Excessive deposit of metal such as Al and Hg, with or without Pb, in Hippocampus & the rest of brain, particularly motor cortex

- Acetylcholine is markedly reduced in Hippocampus & rest of brain, particularly motor cortex
- Ã¢-Amyloid (1-42) is markedly increased in Hippocampus & rest of brain, particularly motor cortex
- Strong Viral infection exists often due to CMV and HHV-6 in Hippocampus & rest of brain, particularly motor cortex.
- Bacterial Infection exists often due to Chlamydia trachomatis and Mycobacterium tuberculosis in Hippocampus & rest of brain, particularly motor cortex.

To remove excessive metals, Cilantro extract (made by Hayashibara Biochemical Lab of Okayama, Japan), originally discovered for its chelating effects on metals such as Al, Hg, and Pb is used. To enhance removal of heavy metals, and as a safe, natural, effective, antiviral agent, a mixture of EPA 180mg and 120mg DHA (Omega–3 fatty acids), 4 times/day, was used for adults (a relatively low amount); however, for autistic children, optimal dose is measured individually using Bi-Digital O-ring Test.

Selective Drug Uptake Method to the brain is performed either by stimulation of the brain representation area at the 1st segment of the middle finger, either mechanically or by red spectral light from LED. More than 95% of the excess metal deposit in hippocampus and rest of brain can be removed using Cilantro and Selective Drug Uptake Enhancement to selectively deliver the Cilantro to the brain within several hours. Once the major part of excessive deposit of metal is removed from brain, Acetylcholine often increases 2 or 3X of the original, abnormally-reduced amount without any other treatment. Within the past 2 years, the author discovered that the two major causes of the increase in water insoluble Ã¢-Amyloid (1-42) is due to brain infection (particularly hippocampus) of Chlamydia trachomatis and Mycobacterium tuberculosis. The author also succeeded in reducing, in a majority of the patients, Ã¢-Amyloid (1-42) to normal level and in more than 70% of the patients not only stopped the progress of Alzheimer's Disease and Autism; but also often was able to successfully revert to normal condition by treating Chlamydia trachomatis and Mycobacterium tuberculosis successfully if the patient was diagnosed within 2 or 3 years.

Two years ago, the author found that the most common major cause of increase in Ã¢-Amyloid (1- 42) in brain is Chlamydia trachomatis infection of the brain. In 2002, the author found, in a woman patient, that he was able to reduce the amount of Ã¢-Amyloid (1-42) from 12ng to 6ng by treating her Chlamydia trachomatis infection of more than 1500ng, but he could not reduce it any further. Upon further evaluation of the brain, the author found extensive Mycobacterium tuberculosis infection of 40 Ãg; and the short-term memory deficiency could not be eliminated in this 30-year-old woman. In addition, she had CMV infection and HHV-6, both of which were sensitive to mixture of 180mg of EPA and 120mg of DHA, and she had a bacterial infection sensitive to Trimox (Amoxicillin made by Bristol Meyers). When multiple mixed infections co-exist, ideally, all the infections should be treated at the same time as it is often observed when only one infection is treated, other bacterial or viral infections are often increased; however, in the past it was often not possible due to the drug interactions when multiple drugs are given at the same time. For example, for Chlamydia trachomatis infection, Azithromycin is among the most effective antibiotics for Chlamydia trachomatis, but it is not compatible with a mixture of EPA+DHA as well as Trimox, and therefore due to canceling effect. Azithromycin cannot be used with these medications to treat multiple infections.

However, Doxycycline, which is also effective for Chlamydia trachomatis is compatible with a mixture of EPA+DHA as well as Trimox. On the other hand, the most commonly used medication for the treatment of Mycobacterium tuberculosis is Isoniazide, often with additional Rifampin, but Isoniazide is not compatible with a mixture of EPA+ DHA which we use as a safe and effective anti-viral agent, and also not compatible with Trimox which is one of the broadest spectrum anti-bacterial agent. In addition, in order to get a good result, one has to continually use Isoniazide 2 times a day, for at least 1 or 2 years; but it often produces liver toxicity, and many people cannot continue treatment full term. Even a small amount of alcohol, such as a 1/2 cup of beer, produces liver damage, and the patient often feels completely exhausted. To solve this problem, the author evaluated about 150 different traditional Chinese and Japanese herbal medicines made by Tsumura Pharmaceutical Company of Japan, and one herbal medicine called Saikokeishito (Tsumura Product No. 10) was found to have a more efficient anti-Mycobacterium tuberculosis effect, and up to now, has shown no significant side effects.

Saikokeishito was found to be compatible with a mixture of EPA+DHA and compatible with Trimox, but it is not compatible with Doxycycline used to treat Chlamydia trachomatis; because of this limitation, we could not simultaneously treat all the viruses and bacteria including Chlamydia trachomatis, and Mycobacterium tuberculosis at the same time. The Indigo plant is known empirically to have beneficial effect on some of Diabetic patients. According to the author's clinical research, the most common cause of Diabetes is CMV infection, Chlamydia trachomatis infection, or mixed infection of the CMV and Chlamydia trachomatis. Since the author found that Indigo Plant is beneficial for Diabetes only due to Chlamydia Trachomatis infection while it is not effective for Diabetes due to CMV alone, Hayashibara Biochemical Laboratory extracted 9-major components of Indigo Plant for the author to evaluate. All of the original 9-extracts were toxic, and had no beneficial effects. However, after the author diluted all of 9-extracts 2X, 3X, and 4X, then the author found only one of 9 to be beneficial for Chlamydia trachomatis infection. This substance, Indigo 9-1, is an effective form of one of the 9-major components of Indigo plant that the author found to have an anti-Chlamydia trachomatis effect.

Originally, when components were isolated by Dr. Fukuda and his associates of Hayashbara Biochemical Laboratory of Okayama City, Japan, the author found that it has a definite anti-Chlamydia trachomatis effect, but unfortunately its effective duration was an average of one hour and, therefore, we could not treat the patient effectively, as no patient wants to take medicine 12 times a day. To solve this problem, when the author and Hayashibara Biochemical researchers slightly modified original natural preparation of effective component to prolong the duration, its effective duration was enhanced to an average of 6-8 hours; as a result, the author found it had a most powerful anti-Chlamydia effect, but also, no known side effect. We named this natural substance as "Substance Z". "Substance Z" has additional advantages, namely, it is compatible with mixture of EPA+DHA, it is compatible with Trimox, and it is compatible with Saikokeishito. Thus, since 2002, it becomes possible to treat Mycobacterium tuberculosis and Chlamydia trachomatis at the same time, along with other bacterial infections sensitive to Trimox, and viral infection sensitive to the mixture of EPA+ DHA as an anti-viral agent. We found that we could treat a patient with all these multiple infections, including viral infection sensitive to mixture of EPA+DHA, bacterial infection sensitive to Trimox, Chlamydia trachomatis sensitive to "Substance Z", and Mycobacterium tuberculosis sensitive to Saikokeishito (once optimal dose of each medication is determined for each individual patient)

all at the same time without the mutually canceling effect of drug interactions. In addition, we use selective, drug-uptake enhancement, delivering drugs selectively to the pathological area of the brain by stimulating an organ representation area of the brain on the first segment of the middle fingers, or the brain representation area of the underside of the tongue, or the ear lobules by either mechanical stimulation or red spectral light stimulation. As a result, we are now able to significantly eliminate most of the infections within a few days, and to eliminate the above listed abnormal findings in the brain.

In the normal brain, Ã¢-Amyloid (1-42) is less than 3ng, but when it increases above 4 or 5 ng often people develop short-term memory deficiency, and when its increases between 7 and 12ng it is considered to be early stage of Alzheimer's disease. Acetylcholine normally should have at least 1500Ãg, but brain dysfunction began to appear, becoming noticeable by others when it's reduced below 500Ãg. In early stages of Alzheimer's disease, it goes down between 200 and 100Ãg, and in most of the advanced Alzheimer's patients, Acetylcholine is below 150-100Ãg. With the latest, effective, safe treatment described above, when we eliminate most of the infections to practically zero, such as Chlamydia trachomatis and Mycobacterium tuberculosis are <l zg (=10-21g), short-term memory deficiency will disappear particularly when Ã¢-Amyloid (1-42) become less than 2 or 3 ng. However, in the advanced, old Alzheimer's patient, when the Ã¢-Amyloid is increased to 12 or 20ng for a period of more than 3 or 4 years, often neurons are already damaged irreversibly. As a result, even when we succeed in lowering Ã¢-Amyloid (1-42) to less than 2 or 3 ng, short-term memory failure cannot be reversed; therefore it is most important to make early diagnosis and treat them as quickly as possible.

Similarly, in Autism patients the problem usually started at the time of birth, but most of the parents and physicians only recognize it when children reaches 1 1/2 or 2 years old, and thus it is important to detect non-invasively above described abnormal biochemical changes and infections. Ideally, they should be examined shortly after birth. In the case of Autism (unlike advanced Alzheimer's patient) often, it is possible to reverse partially and sometimes even significantly with more than 3 or 4-year history. End of Abstract.

Fluoride is a scourge, and putting it in city water is a criminal act against the American people! Therefore, we must take responsibility for our own health: Eat more foods high in iodine, calcium, and vitamins C and D and supplement iodinc to reduce the absorption of fluoride by the body and to promote the excretion of fluoride from the body to ensure better health for people in the high fluoride regions.

Fluorides damage the GSH and SOD enzymes and act much like dioxin, which works via this enzyme process to create reactive oxygen species (ROS) damage. There were air/lung pathway effects, soil contamination/food pathways into the gastrointestinal system, and ground and surface water pathways into communities. These pathways for fluorides connected them with the CFS-like symptoms and asthma seen in workers and communities. Asthma is directly connected to reduced GSH and SOD. The workers had high levels of calcium that is indicative of fluoride exposure. They also had high retention of metals and high porphyrin. Porphirine and porphyrins are diagnostic indicators of toxic-cell damage effects from metals and chemicals.

Fluorides are pulled into the lymph nodes and the affinity of fluoride for calcium produces an insoluble precipitate that is similar to the effects caused by the insoluble metals. The effect sets up TNF(a) and hyper-

oxygen (ROS) damage that locally lowers glutathione in the lymph cells. TNF(a) promotes viral RNA replication. Increasing viral infection in the type-I macrophages promotes more TNF(a), and this is multiplied by the repeating effect of cells in the lymph system. This activation of the T-cell helper-1 (Th1 - Natural-killer cells) process also sets up a switch to T-cell helper-2 (Th2 - antibody) mode slowly as the macrophages stop working and foreign-cell products accumulate in the tissues that trigger the Th2 mode.

The fluoride damage to the enzyme processes like glutathione (GSH), and others like it, set up factors that result in retention of the lethal metals such as mercury, cadmium, lead, nickel, and others. This results in the appearance of persons with high-fluorine effects having heavy-metal poisoning. The fluoride effect driving the retention of metals like mercury adds dramatically toward the nervous-system damage and loss of T-cells. The loss of GSH and other clearing enzymes results in a see-saw like effect where the beneficial trace elements such as selenium, zinc, magnesium, and copper are depleted and the harmful metals like mercury, lead, and cadmium are increased. Such observations often lead to chelation-type therapy, which needs to be done carefully with reintroduction of beneficial mineral cocktails and keeping GSH levels preserved or increasing.

Fluorides tend to be accumulated (integrated) over a lifetime and the same net dose occurs from a ten-unit dose over one year or that of a one unit dose over ten years! This taken from the DOE's coverup on CFS, Fluoride, and its massive effect on human health: THE CHRONIC FATIGUE SYNDROME REPORT By: J. E. Phelps Copyright 2004, 2005.

How then to get rid of this scourge? Pamela from Washington writes:

> I have suffered with Fibromyalgia/Rosacea and TMJ for over 10 years... My first symptoms appeared shortly after I began taking Paxil. After about 8 months when I found the Paxil side effects intolerable, my doctor switched me to Prozac. Well...within 2 years, I had gained 75 pound, couldn't get my temperature to a normal 98.6 (it wouldn't budge above 96.6), broke out with a fierce case of Rosacea (skin blistering & pealing in layers off my cheeks), was chronically fatigued and suffered from TMJ symptoms.
>
> After reading the FLUORIDE information on EarthClinc and researching the chemical formulas of the many antidepressants that I had taken over the last 10 years, I had an epiphany...My problem was FLUORIDE! Incidentally, the symptoms of FLUORIDE TOXICITY are the same as Fibromyalgia; so, it wasn't surprising to learn that FLUORIDE is the primary ingredient in MANY widely prescribed antidepressants, including PAXIL and PROZAC!
>
> Without delay, I began adding 1/8 tsp of BORAX and 1/8 tsp of NATURAL (UN-bleached) SEA SALT to a liter of DE-CLORINATED water. (A similr amount in bath water should work wonders.) This regimen just happens to both neutralize the FLUORIDE and KILL the nasty mites that cause Rosacea. I began drinking 1 liter per day for 5 days. On the two off days, I simply drank purified, bottled, spring water.
>
> The results were nothing short of MIRACULOUS, within two weeks my face cleared, the redness faded and best of all, my temperature normalized to 98.6, and my energy level began to steadily increase. (Do expect the break out to get worse before it gets better as the mites die off.)
>
> In just one month, without dieting or changing my daily routine (other than adding BORAX & SEA SALT to my drinking water), I dropped 4 pounds and I continue to drop weight at

about a pound a week. I attribute this to my increased body temperature and elevated metabolism.

ALSO...when I eliminated the FLUORIDE in my toothpaste, my gums stopped swelling and bleeding and all PREVIOUS phantom tooth/jaw pain simply disappeared. I have had only POSITIVE results and absolutely NO SIDE EFFECTS! Incidentally, this BORAX & SEA SALT water is extremely ALKALINE with a pH between 8 - 9 pH.

The only other way I know to control fluoride is to filter your water supply with a quality filter and to supplement iodine as heavily as you dare, up to 50 mg per day, (adult), subject to other considerations herein. Dr. Bruce West's Health Alerts Newsletter, June 2006 states, "People with stubborn arrhythmias get better on 10, 20, even up to 50 mg of iodine daily for three to four months". Start at 3-6 mg daily and gradually increase until the heart smoothes out its beat at a proper 60-70 beats per minute when resting. One can also control the TNFa and other cytokines as outlined elsewhere in this paper. For those who are extremely sensitive to other supplements, lesser amounts of iodine should be used, and the dose reduced if any increased palpitations are experienced.

One should never supplement iodine or do the iodine skin test if iodine allergy is suspected unless on a doctor's advice. Though allergic to medical solutions injected, one will rarely be allergic to oral iodine. Further, rarely, some may experience mild side effects as the body adapts to the new adequacies of iodine. Often, it is a detox response (bromine, fluoride, or heavy metals) that will clear shortly. Sensitive individuals may note skin irritations (especially where painted on the skin), watery eyes and nose, sneezing, increased saliva - perhaps nervousness or headache. Some highly sensitive persons may note racing heart or irritation of the esophagus. This does not mean that iodine is not needed. Have your NAET practitioner neutralize your allergy and then proceed. These same symptoms, especially a leaky nose and sneezing, could mean you have taken the high dose of iodine long enough and you should cut back. Incidentally, iodine supplementation can cause extremely bad breath due to the breakdown and release of bromine in the gut. Bromine from bread causes reflux - iodine causes gastritis and reflux by disengaging the bromine in the gut. Chlorophyll capsules relieve these symptoms, including bad breath. Lack of iodine causes achlorhydria (lack of stomach acid), which results in a host of digestive problems and eventual protein deficiency.

Both organic and inorganic fluoride compounds have been shown to inhibit zinc-containing enzymes, such as carbonic anhydrase (Dugad et al 1988,1989; Gelb et al, 1985) that is not only necessary to digestion, but is now used as a marker for thyroid dysfunction (Hori et al, 1998). Zinc-dependent enzymes control the release of vitamin A from the liver; thus, their being inhibited may well lead to a vitamin A deficiency and a paradox of hepatotoxicity of vitamin A. Another study found that large, oral supplements of vitamin A preserved mucosal IgA level during protein malnutrition, possibly by stimulating Th2 cytokine production and thereby, inducing resistance against infection. Fluoride causes damage to the fat in your body (lipid peroxidation), which is counteracted by the antioxidants beta-carotene and superoxide dismutase.

In Wilson's Disease, researchers have shown that a persistent copper toxicity can overload and disable MT proteins. Copper is neurotoxic at lower levels than recently thought and it produces large amounts of free radicals. In rabbits, excess copper induces accumulation of beta amyloid and senile plaques, the hallmarks of Alzheimer's Disease that often affects Down's and older autistics. Autopsy of Brains of Alzheimer's victims shows hallmark pathological changes caused by free-radical activity, including DNA damage and oxidation of proteins and fats. The leading Wilson's Disease therapy involves removal of excessive copper from liver, kidneys, and brain followed by restoration of normal zinc

levels. Dr. W. Walsh proposes that the same treatment may be effective in treating autism. Test for copper in tap water: mix half a glass of water with a half-ounce of household ammonia - ½-ounce would be a tablespoon. If it turns blue, you need your water tested further.

Elevated serotonin levels have been consistently found in 30%-50% of autistic patients, and may represent a marker for familial autism. Hyperserotonemia in autism appears to be due to enhanced 5-HT (serotonin) uptake, as free 5-HT levels are normal and the current report of an excess of the long/long 5-HTTLPR genotype in autism could provide a partial molecular explanation for high platelet serotonin content in autism-PMID: 11378854. Serotonin synthesis is decreased in the brains of autistic children and increased in autistic adults, relative to age-matched controls (Chugani et al, 1999), while whole blood serotonin in platelets is elevated regardless of age (Leboyer; Cook, 1990). One study reports that a decrease in cortical 5-HT2A receptors is the main neurochemical event underlying the impairing effect of hypothyroidism on 5-HT neurotransmission (Kulikov et al, 1999). Dr. Ward Dean, MD, states that 5-HTP does not raise peripheral levels of serotonin as it is converted to serotonin in the brain. This would seem to provide a solution to the need for enhanced serotonin in the brains of children while restricting it in the blood stream. Adequate magnesium would prevent premature destruction in the synapse also contributing to increased presence in the brain.

Low brain serotonin levels are associated with increased sensitivity to pain, and chronic pain sufferers appear to have reduced serotonin functioning. Serotonin is known to have an effect on pain awareness, in part by controlling the release of a pain-signaling, brain chemical called Substance P.

Researchers have found a mutation in the human serotonin transporter gene, hSERT, in unrelated families with OCD. A second variant in the same gene of some patients with this mutation suggests a genetic "double hit," resulting in greater biochemical effects and more severe symptoms. Interviews of the patients' families revealed that 6 of the 7 individuals with the mutation had OCD or OC personality disorder and some also had anorexia nervosa, Asperger's syndrome, social phobia, tic disorder, and alcohol or other substance abuse/dependence.

The combination of these changes, both of which increase serotonin transport, may explain the unusual severity and treatment resistance of the illnesses in the subjects and their siblings. "This is probably the first report of a modification in a transporter gene resulting in a gain rather than a decrease in function," said NIMH Director Thomas Insel, M.D.

SERT allows neurons, platelets, and other cells to accumulate the chemical neurotransmitter serotonin, which affects emotions and drives. Neurons communicate by using chemical messengers, like serotonin and dopamine, between cells. The transporter protein, by recycling serotonin back into the neuron, regulates its concentration in a gap, or synapse, and thus, its effect on a receiving neuron's receptor. This mutation removes available serotonin from the synapse, having the effect of a serotonin deficiency.

Transporters are important sites for agents that treat psychiatric disorders. Drugs that reduce the binding of serotonin to transporters (selective serotonin reuptake inhibitors, or SSRIs) are used (with apparent, initial success) to treat mental disorders. This prevents normal reuptake into platelets and other cells (as well as into neurons), and as a result, could contribute to bleeding, as a certain level of serotonin is needed for platelets to aggregate normally in controlling bleeding. This previously unreported information indicates that SSRIs are all the more dangerous when taken with coumadin, NSAIDs, or aspirin (8 fold risk). Combining NSAIDs, aspirin, and and SSRIs increase risk to 28-fold! The study found this increase risk continued even after discontinuing SSRIs! About half of patients with OCD are treated with SSRIs (with apparent initial success), but those with the hSERT gene defect do not seem to

respond to them as expected, according to the study. Any vulnerability to OCD from gene effects most likely interacts with events in the environment like stresses, gender, and treatments, Murphy said.

A related study, reported in the August 2003 Molecular Pharmacology, tested consequences of the hSERT variant. Researchers found that the I425V mutation of hSERT increased the transport activity of this protein, capturing more serotonin and most likely reducing effects at the receiving neuron's receptors, outperforming the common transporter. The mutant molecule was not regulated normally, and did not respond to cell signals that activate the common form of the transporter.

Finally, these kids are hypersensitive to everything: sound, light, touch, and colors. Typically, bright yellow will drive them up the wall leading to all sorts of aberrant behavior. This sensitivity is usually related to a deficiency of vitamin B_6, zinc, and magnesium. It can be from a G-protein defect.

> First of all, it seems important to discriminate between the two types of magnesium deficit: magnesium deficiency and magnesium depletion. In the case of magnesium deficiency, the disorder corresponds to an insufficient magnesium intake. It merely requires oral, physiological magnesium supplementation (5mg/kg). In the case of magnesium depletion, the disorder that induces magnesium deficit is related to a dysregulation of the control mechanisms of magnesium metabolism, either failure of the mechanisms that insure magnesium homeostasis or intervention of endogenous or iatrogenic, perturbating factors of the magnesium status. Magnesium depletion requires more or less specific correction of its causal dysregulation (see the abstract on right hemisphere dominance and autism near the end of this paper for further insight). Although acute and chronic magnesium deficiencies are specifically reversible through oral magnesium supplementation with physiological doses, the experimental and clinical symptoms may differ. The typical pattern of chronic magnesium deficiency is latent, whereas overt signs are observed in acute magnesium deficiency. The discrepancy between the patent and latent nervous forms of magnesium deficiency suggests that in the latent form there are compensatory factors that antagonize the nervous hyperexcitability (NHE) observed in the overt form…The main mediated compensatory factor is taurine (TA) with the help of its peptidic congener: L-glutamyl taurine (GTA)…When these direct and mediated compensatory factors are effective, Nervous Hyperexcitability (NHE) remains latent. It is patent when compensatory factors are insufficient.
>
> A pharmacological load of Mg (10mg/kg) increases release of calcitonin and nitric oxide (NO). In contrast, physiological Mg supplementation (5mg/kg), far from acting similarly, reduces high levels of calcitonin (as well as of calcitonin gene-related peptide, and of Nitric Oxide released in the case of Mg deficiency)…Mg-deficient animals show an increased susceptibility to in-vivo oxidative stress, and the tissues of these animals are more susceptible to in-vitro peroxidation, affecting lipids particularly…Mg deficiency frequently alters protein biosynthesis and induces enzymatic hypoactivity...Protein oxidation in Mg-deficient rat brains occurs early. A significant increase of protein carbonyls is observed within 2 to 3 weeks on a Mg-deficient diet…These changes take place prior to any detectable tissue damage, dysfunction, or changes in cellular glutathione. Mg deficiency may increase formation of free radicals directly, but also indirectly through free-radical-triggered mechanisms…NHE due to Mg deficiency mainly depends on modifications in the turnover of several neuromediators and neuromodulators. They associate an increased turnover of the monoamines: serotonin (5HT), acetylcholine, catecholamines (dopamine and noradrenaline, mainly), and of

> excitatory amino acids (aspartic and glutamic acids, mainly) with a decreased turnover of inhibitory amino acids (Gama-amino butyric acid [GABA] and taurine, mainly) (magnesium acts as an inhibitor of neurotransmitter destruction-WSL)…Neuromuscular hypoexcitability due to hyper-magnesemia only occurs when plasma Mg is more than twice normal levels…With all the psychometric evaluations, and with the DSM III R interview particularly, the clinical pattern induced through Mg deficiency was always neurotic (for example: generalized anxiety, panic-attack disorders, and depression) but never psychotic. Neuroses are preeminently conditioning factors for stress. Neuroses may therefore very frequently produce secondary Mg depletion.

These brain chemicals, called neurotransmitters, generate the electrical impulses that deliver energy and instruction through the nerves to the entire body, enabling it to maintain normal function. Deficiencies in the primary neurotransmitters cause specific "short circuits" that show up in families of symptoms and conditions. For example, serotonin deficiencies have been associated with headaches, depression, palpitations, anxiety, hypertension, and insomnia. (GABA deficiencies are associated with racing thoughts that keep people awake; so, if you awake in the wee hours take a GABA tablet and don't worry about not awaking fully alert a couple of hours later.) If you are tired all day and have trouble sleeping at night, you likely have a copper overload. Acetylcholine deficiencies relate to dry mouth, senility, and Alzheimer's. Aberrant neurotransmitter levels can be assessed in a primary-care setting with a simple brain-electrical-activity map (BEAM), a test similar to an EKG. The brain's electrical activity is represented by brainwaves, and a specific electrical measurement corresponds to each primary neurotransmitter. The brain's voltage is also a vital value measured.

This whole series of metabolic problems in the autistic child causes a homeostatic alteration that produces biological stresses that starts from within the child. The level of stress controls many variations of behavior, and these children (and their Moms) are stressed to the breaking. Animals fed high levels of excitotoxic glutamate have lower thyroid hormone levels and higher cortisone levels than normal. **Glutathione levels also are reduced.** Glutamate is presently excessive in canned soups and in restaurant-prepared soups and in restaurant and frozen entrees that can trigger arrythmias, sometimes fatal ones. Aspartame (NutraSweet™) has the same deleterious effect. Additionally, stress, cadmium, and mercury reduce the conversion of thyroid hormone T4 to the more active T3. Stress is the cause of hyponeofagia, the aversion to trying new foods. This limited alimentary choice disappears in animals given anti-stress therapy. Teeth grinding, also known as bruxism, is a well-known, stress symptom. It is present in a high percentage of cases, and it too responds to antistress therapies such as relaxation-meditation exercises, massage, and supplementation of 200-400 mcg of chromium (for adults, half that for children. Chromium reduces the stress hormone, cortisol, which in excess, severely depresses the immune system and kills neurons by the billions. Corticosteroids and endogenous cortisol suppress cellular immune responses, and this excess cortisol destroys immature T-cells. Poor immune response is something found in all autistic children.

Animal experiments and human studies have demonstrated that the first phase of marginal chromium deficiency manifests itself by slightly elevated circulating insulin levels in response to glucose loading. Largely due to an increased hormone production, in this phase, most insulin-dependent, physiological functions tend to remain intact. The second phase, well characterized in both animal experiments and human studies, begins to show signs of the metabolic disorders associated with low chromium intake that includes significantly abnormal glucose fluctuations and disturbances in lipid metabolism. The final phase of inadequate chromium intake manifests itself by a marked insulin resistance to glucose loading, resembling a diabetes-like syndrome, which eventually leads to an exhaustion of pancreatic insulin production and ultimately to the development of insulin-dependent diabetes.

Research has already established that insulin-dependent, diabetic children exhibit a significantly lower hair

chromium concentration compared to controls. Other studies have found that chromium absorption and excretion in diabetics is two to four times greater than in healthy individuals. Also, subjects who died with diabetes had significantly lower hepatic chromium concentration compared to non-diabetics.

A new study conducted by Dr. John Vincent at the University of Alabama at Tuscaloosa shows that **chromium picolinate** enters the cells directly and stays there—where it can cause problems (picolinate is an effective carrier, and it takes too much into the cell—WSL). In fact, the chromium picolinate reacts with vitamin C and other antioxidants in the cells to produce a "reduced" form of chromium capable of causing mutations in DNA, the genetic material (potentially causing cancer). It's the combination of chromium and picolinate (particularly the reduced form) that can produce dangerous compounds—not the chromium alone. Moreover, the picolinate eventually breaks off and has adverse effects—UC Berkeley Wellness Letter, June 1999. Chose chromium in combination with niacin (Chromiacin™ by CountryLife is my choice). Lest you be concerned about the safety of Chromium itself, Dr. Richard Anderson, researcher with the US Department of Agriculture, who has studied Chromium for over 20 years, states, "If I had diabetes, I'd take 200 mcg at least two or three times daily." He personally takes over 200 mcg per day. Studies in China have used 1000 mcg per day with good results in Type II diabetes. It is most effective when combined with niacin.

"With a high aluminum (Al) diet alone, Al content in the nervous system in rats showed no difference with a control group although serum Al was high. No degenerative process was observed. However, with an insufficient intake of Mg, the same Al load induced an increase in Al and calcium concentrations in the nervous system and neurodegeneration with precipitation of insoluble hydroxyapatites (calcium)…The pituitary gland, located at the base of the brain, is believed to regulate the functions of all the other glands of the body. It is the gland through which magnesium works as a prime component of pituitary secretions to regulate the functioning of the other glands. If magnesium is not available or the pituitary is not functioning properly, the body will suffer symptoms of a magnesium deficiency or a pituitary malfunction, depending on how you look at it…Fluoride bonds with magnesium in the blood into the insoluble magnesium fluoride. This means that the magnesium cannot be assimilated by the pituitary, with the consequent failure of the pituitary to function properly that leads to the symptoms of magnesium deficiency…It is necessary to highlight the curative and preventive importance of oral, physiological, **maternal,** Mg supplementation, not only during pregnancy but also in the child throughout life from infancy to older age, to possibly prevent the so-called constitutional factor of neurolability, some cases of sudden infant death syndrome, infantile convulsions, or psychiatric diseases, and even in adult cardiovascular diseases and noninsulin-dependent diabetes mellitus."—*Mineral and Metal Neurotoxicology*, ed. M. Yasui, M .J. Strong, K. Ota, & M. A. Verity, CRC Press, 1997.

Although chromium has received considerable media attention, scientific literature shows that magnesium has a more important role in regulating carbohydrate metabolism. Magnesium is involved in a number of reactions required for cells to uptake and metabolize glucose. Magnesium deficiency causes insulin resistance and elevated blood sugar levels (Paolisso et al 1990; Nadler et al 1993; Nadler et al 1995; Lefebvre et al 1994). High blood sugar depletes magnesium leading to many symptoms including irritability and chronic anger commonly seen in Diabetics - www.lef.org/protocols/metabolic_health/obesity_01.htm

The lack of magnesium with high calcium and aluminum has been confirmed in the brains of Alzheimer's victims and of all other neurological diseases such as Lou Gehrig's! Aluminum not only inhibits the enzyme that produces acetylcholine, but it prevents magnesium from entering the neuron. (Aluminum hydroxide antacids deplete calcium and phosphorus) This produces a condition in which the brain suffers from magnesium depletion while the rest of the body may have normal magnesium! Without magnesium, the NMDA receptor has no protection against excessive glutamate, which leads to damage through excitotoxicity! A lack of magnesium in the brain enhances the damage of aluminum and mercury, and is a major factor in Alzheimer's. Nevertheless, glutathione, a potent antioxidant and free radical scavenger, is said to also protect neurons by preventing the NMDA receptor

response to excess glutamate. Additionally, silymarin, curcumin, and Ginkgo biloba block glutamate receptors – Dr. Russell Blaylock, MD.

It should be noted that NMDA, the most important "switch" in the brain, has receptors that must be activated for learning or memory to occur or for any message to be transmitted to the body. Glutamate is the major activator; magnesium the major inhibitor against overactivation; because magnesium can block the NMDA glutamate receptor. That's its natural function, so it significantly reduces toxicity. Vitamin E succinate is powerful at inhibiting excitotoxicity, as are all of antioxidants. A combination of B-vitamins also block excitotoxicity.

Low energy available to the cell [hypoglycemia, poor blood supply to portions of the brain, a high metabolic rate, strenuous exercise (especially for more than an hour), a failure of energy production by the mitochondria of the cells], and/or low magnesium in the spinal cord and brain makes cells highly vulnerable to excitotoxic (aspartates, glutamates, MSG, heavy metals, amphetamines) damage. Additionally, excess glutamate lowers the glucose allowed into the brain by 35% (lead also decreases glucose uptake)! MSG triples the amount of insulin the pancreas creates, causing rats (and humans?) to become obese. They even have a title for the race of fat rodents they create: "MSG-Treated Rats". Glutamate hides under many label terms such as hydrolyzed protein (soy). One must restrict the amount of MSG, flavor enhancers, and aspartates (Aspartame™ and aspartate supplements) in the diet. This toxicity can manifest itself as anxiety or confusion, and as episodes of anger! These nutrients have been shown to be protective against this damage (listed in probable order of importance): Vitamin B_6 and Magnesium, N-acetyl cysteine, Manganese, Zinc, Lithium, Melatonin, the amino acids Theanine (from Green Tea), Acetyl-L-carnitine, the antioxidants Glutathione, NADH, CoQ10, Alpha Lipoic Acid, vitamins C, E, and K, the drug Deprenyl™ (an MAO-B inhibitor), the amino acids glycine and taurine, omega-3 oils (CLO), and kynurenic acid. A magnesium gel (Essence of Life Brand) of condenced seawater is available from Iherb.com. This can be rubbed on the skin, preferable after a warm bath, to quickly replenish magnesium levels and to quickly diminish many types of pain.

When the pituitary is not getting the magnesium it needs, it fails to control the adrenals that then overproduce adrenaline (a major stress hormone). Obviously, there is a need to enhance magnesium intake, but t**he omega-3 fats in foods reduce the output of adrenaline and noradrenaline favorably affecting behavior and reducing anxiety and aggression also. Long-term deficiency of Omega-3 fatty acids adversely raises the dopamine levels in an area of the brain closely linked to addictive behavior.** The fetal and infant brain is unable to convert the alpha linolenic acid found in plants and plant oils; so, it is dependent upon the Mother to eat enough Omega-3 oils. Omega-3 deficiencies in the Mother can lead to increases in deficiencies in the infant with each successive birth. Studies have shown a DHA brain deficiency of about 30% in the first child, but by the third, brain DHA levels can fall as much as 85%! Furthermore, it has been shown that DHA levels fall between the ages of six and twelve months due to a continuing lack in the dietary (even when breast fed). This can have a profound effect on retinal and brain development. Feeding DHA-enhanced egg yolks increased DHA levels by 34%! Reisbick et al, at the Oregon Health Sciences University found that rhesus monkeys fed a long-term deficient diet developed stereotyped behaviors during early life. These are the type of repetitive behaviors seen with social deprivation and autism. Another study of fatty acids in the umbiblical cords and veins of infants found that infants with neurological abnormalities at birth had significantly lower levels of arachidonic acid and DHA as well as higher levels of transfatty acids. Tests indicate that enriching of the diets with these fatty acids can reverse the negative effects after about six weeks to 12 weeks!

It is known that danger, as well as the mentioned magnesium deficiency, incites the activity of the adrenal glands, but anxiety or worry, even watching most TV shows, also incite the adrenal glands, which then pour hormones through the body that increase heartbeat, release sugar from the liver, and contribute to a host of problems not the least of which is hyperexcitability and an inability to cope. In a double-blind, placebo-controlled pilot study of

children diagnosed with autism, accompanied by severe tantrums, aggression, or self-injurious behavior, daily supplementation with 1.5 g/d omega-3 fatty acids (0.84 g/d EPA, 0.7 g/d DHA) was found to reduce hyperactivity and stereotypy. Additionally, theanine is believed to influence the production of alpha waves in the brain, for it generates a sense of deep relaxation and mental alertness in humans (Mason 2001). It is believed to exert a positive effect on formation of Gamma-aminobutyric acid (GABA) that is an offset to the Excitotoxins mentioned above. Therefore, supplementing the diet with theanine, magnesium, Omega-3 fatty acids (fish and CLO), and vitamin B_6 would surely prove beneficial. Only Suntheanine™ by Taiyo International, Inc is recommended. DHA is a component of the vital brain chemicals phosphatidylethanolamine (lecithin) and Phosphatidylserine, with lower levels in phosphatidylcholine (lecithin), suggesting other supplemental sources for DHA.

Additionally, another part of the body that responds positively to L-theanine is the liver. Theanine is a powerful antidote to the effects of alcohol and yeast toxins. If given to mice before or after they drink alcohol, it significantly lowers blood levels of alcohol. Alcohol converts to a toxic chemical known as acetaldehyde that is more toxic than alcohol itself. Theanine accelerates the breakdown of acetaldehyde and blocks toxic free-radicals. The Japanese study showed that it not only blocked radicals caused by alcohol, but kept them low for five hours. This is apparently because theanine helps counter the alcohol (acetaldehyde) induced loss of glutathione. The importance of this is in the realization that Candida produces acetaldehyde in abundance and many of these children actually are drunk much of the time from a high-carbohydrate diet! Yes, their pancreas makes alcohol! Is he giggly and boisterous about an hour after eating? This calls for restoring flora balance and reducing the carbohydrate levels of the diet. Some other ways to reduce acetaldehyde levels include flooding the system with vitamin C and B-vitamins, potassium, vitamins A and D, and lots of water. If lacking these nutrients, try 4-ounces of water with juice of half a lemon and a drop of fennel essential oil. Peppermint or ginger can settle an upset stomach.

Magnesium, selenium, and melatonin protect the cells from aluminum, mercury, lead, cadmium, beryllium, and nickel, and gives significant protection against excitotoxins. Evidence is mounting that low levels of magnesium contribute to the heavy metal deposition in the brain that precedes Parkinson's, multiple sclerosis, and Alzheimer's. Lead toxicity disrupts the blood-brain barrier allowing heavy metals and toxic substances, including MSG, glutamate, and other excitotoxins, into the brain; however, it is vital to note that children do not really have a blood-brain barrier. It develops slowly, coming to maturity at maturity. Thus, it is probable that low, total-body magnesium contributes to heavy-metal toxicity in children, and is a participant in the etiology of learning disorders. As indicated above, if you have low taurine you can't hold on to magnesium, and you need it for detoxification and protection against excitotoxins. Taurine increases bilirubin and cholesterol excretion in bile, critical to normal gallbladder function and fat digestion. Bile is also needed to extract the flavonoids, carotenes, and folates from vegetables! So, eat your greens with some high-fat, salad dressing or other source of fat, needed to trigger bile release. You will get 8-13 times more nourishment from them! Yes. Documented.

Additionally, in Parkinson's, specific damage found in Substantia Niger that is not affecting other areas, such as high iron and zinc, low NADH (Complex I activity), evidence of free-radical damage, and significantly lower levels of glutathione, indicate a weakness of this area to damage. Taurine is protective of these areas against damage by excitotoxins. What comes first? It has been shown in early stages that the other values are basically normal, with NADH being only slightly reduced, but the powerful antioxidant glutathione is drastically low! In the chain of antioxidant activity, vitamin E is spent and then rejuvenated by vitamin C that is in turn rejuvenated by lipoic acid and glutathione. Here is the limiting factor in the antioxidant chain. In autism, typically, glutathione levels are 1/3 normal! Glutathione levels are quickly depleted by oxidative stress during times of illness, infection, trauma (physical or emotional), surgery, and ingestion of Tylenol™. Glutathione is also lacking in cases of low protein intake, diabetes, liver disease, cataract, HIV, respiration distress syndrome, cancer, idiopathic pulmonary fibrosis, and all other conditions that produce high oxidative stress.

Taking glutathione orally raises serum levels modestly, but cellular levels hardly at all unless there is adequate alpha lipoic acid present to chemically "reduce" the GSH and to elevate its cellular levels. **This makes a supplement of lipoic acid imperative for it enhances glutathione production and recycles spent glutathione, CoQ10, and vitamins C and E.** R-lipoic acid, the metabolically active form, is preferred. It is doubly effective. When R-lipoic acid and acetyl-L-carnitine were joined, they significantly improved spatial and temporal memory performance, significantly reduced the extent of oxidized RNA, and reversed age-associated mitochondrial structural decay. (Ninety percent of oxygen reduction occurs in the mitochondria, generating the majority of all free radicals, thus it is vital to have adequate antioxidants in mitochondria!) R-dehydro-lipoic acid (R-DHLA), the reduced form of R-lipoic acid, has been shown to be the only form that is effective against superoxide and peroxyl reactive oxygen species. Additionally, only R-DHLA is capable of actually repairing oxidative damage! Lipoic acid is best taken three times a day, not to exceed 100 mg/day, unless monitored by a doctor. Potentially, lopic acid can increase copper to toxic levels and build excess calcium and zinc levels by reducing bile output. It is thought that larger amounts may move copper from kidneys to other organs of the body, including the brain.

A study from the University of California at Berkley found that combining Acetyl L-carnitine (ALC) with alpha lipoic acid not only eliminates the concerns about oxidative stress, but also magnifies ALC's anti-aging effects. Further, combining ALC with CoQ10 boosts the power and total effectiveness of CoQ10! Apparently, a major benefit of ALC is to trigger enzymes to perform their jobs. In its relation to CoQ10, carnitine also pumps fatty acids into the mitochondria where CoQ10 is involved with energy production and is the major antioxidant. It increases blood and oxygen supply to the heart, reducing angina. It appears that CoQ10, carnitine, and alpha lipoic acid should be supplemented together for maximum results. It is preferable, however, to stimulate your body to produce more CoQ10 by increasing intake of certain nutrients, such as the amino acid, tyrosine, and the mineral, magnesium.

It is now understood that Carnitine has two active forms, active to different purposes. ALC is especially active in neuronal tissues, whereas, propionyl-L-carnitine is especially active in lean muscle tissue. The form of carnitine used must correspond with the particular condition or reason for its use. Propionyl-L-carnitine is used to manage peripheral vascular disease, atherosclerotic and diabetic angioplasties, and congestive heart failure. In combination with ALC, it is used for symptoms of chronic fatigue syndrome and age-related testosterone deficiency. It seems to lessen symptoms of male hormone decline in older men, lessening sexual dysfunction, fatigue, and depression without the side effects of hormonal replacement.

It is apparent that free radicals are a natural byproduct of normal metabolism, and we are lacking even the minimum amounts to protect our cells, but trauma, wounds, infections and other serious illnesses, often treated with deadly drugs, kick reactive oxygen species (ROS) into high gear, leading to severe depletion of antioxidants. Researchers at Vanderbilt University Medical Center gave a seven-day course of high-dose antioxicants to acutely injured patients and compared them with patients who received no antioxidants. The differences were astounding. Those taking antioxidants had dramatic reductions in catheter- and surgical-site infections, abdominal complication, and pulmonary failure. They were able to leave ICU and the hospital faster, and death rates were reduced by 28%! (Better take your own when hospitalized!) Today's environmental stresses, pesticides, drugs, and other toxins demand that we all take significant amounts of antioxidants, and that we increase them when illness or trauma strikes. Need I repeat that parents and special-needs children are stressed to the breaking?

It has been known for many years that 20% to 40% of patients treated chronically with certain tranquilizers (neuroleptics) will develop Parkinson's. One of the worst offenders is Haloperidol™, frequently prescribed for autistic children! This is a powerful inhibitor of Complex I activity, having been shown to reduce activity as much as 42%! By using nutritional supplements, where indicated, to increase mitochondrial energy production, the neurons are protected against excitotoxic injury. Both L-carnitine and acetyl-L-carnitine can by-pass the defect in Complex I that is seen in Parkinson's and Huntington's diseases. Riboflavin, niacinamide, thiamine, alpha lipoic acid, carnitine, ENADA™

(NADH), CoQ10, and vitamin K all improve mitochondrial energy production and protect against ROS.

Additionally, researchers at the University of Oregon claim that the combination of acetyl-L-carnitine and lipoic acid has made an incredible difference in aging rats. They were far more energetic, they learned new tasks more easily, and their short-term memory drastically improved. A major task for Carnitine is to balance the secretions of the body's key hormones, adrenaline and insulin. People who take Carnitine are much more easily able to transform fats into energy, and the level of fatty acids and triglycerides in their blood diminishes in direct proportion to the amount of Carnitine taken. There were significant increases in HDL (Rossi 1982), there is reduced heart irregularities (Singh 9196), and improved heart function (Davini 1992), with dramatic increase in exercise tolerance (Kobayashi 1992). Acetyl-L-carnitine facilitates the release and synthesis of the neurotransmitter, acetylcholine, and enhances the release of dopamine from neurons while helping it to bind to dopamine receptors. A new form of acetyl-L-carnitine from Life Extension Foundation (www.lef.org), Acetyl-L-Carnitine-Arginate, acting together with Acetyl-L-carnitine, stimulates growth of new neurites (dendrites and axons) by an astounding 19.5%, more than three times that of acetyl-L-carnitine itself, and the neurites were 21% longer! They have now included Propionl-L-carnitine in the formula.

Prior to L-carnitine treatment of aged rats, the levels of lipid peroxides were remarkably increased and the activities of antioxidant enzymes significantly decreased when compared to younger controls. Administration of L-carnitine for 21 days significantly decreased the levels of lipid peroxides and improved the activities of antioxidant enzymes such as superoxide dismutase, catalase, glutathione peroxidase, and glutathione reductase. L-carnitine also enhanced the action of T-cells and significantly reduced DNA damage and cell death in the lymphocytes of aged animals.

Additionally, a Japanese study with rats drinking water enhanced by a special "Wellness" filter showed they lived 25% longer! Examination of controls drinking tap water revealed enlarged cellular mitochondria due to calcification…a primary cause of ageing. The enhanced-water rats exhibited well-formed, normal mitochondria! Adequate vitamin D3 is needed to properly utilize calcium, keeping it out of soft tissue.

Additionally, recent research has associated an excessive aluminum concentration in the brain structure, in some people suffering from Alzheimer's disease, despite this toxic element having a low permeability of the blood-brain barrier, suggesting that some form of membrane defect may permit the excessive influx of aluminum into the brain. It is already known that an adequate zinc supply is necessary to maintain the integrity of all biological membranes. For example, it was found, when experimenting with rats fed with sub-optimal zinc, that aluminum concentrations increased three-fold in the frontolateral cortex and eight-fold in the hippocampus. **This aluminum is relatively harmless unless there is mercury there also.** Therefore, it has been suggested, that a reason for Alzheimer's disease could be suboptimal zinc nurture, leading to 'leaky' blood-brain barrier and thereby to increased transfer of aluminum and other toxins (including mercury) into the brain. Additionally, a lack of magnesium coupled with the same aluminum intake, increased the load of aluminum in the brain and nervous system. Fluoride increases the amounts of aluminum in the brain also. Autistic children are universally lacking in zinc and magnesium, and show toxic levels of aluminum and mercury. Those mercury poisoned and those magnesium deficient are notoriously low on vitamin B_1 and B_6. Scary.

Dr. Derek Birchall reported that in Atlantic salmon exposed to acidic water containing high levels of aluminum, but low levels of silica, the gills of the fish were severely damaged. However, with high amounts of silica in the water, the fish remained healthy. Rats on a low-silicon diet accumulated aluminum in the brain. Those on a high-silicon diet did not. If you drink beer, or take many supplements (with silica filler), you get enough silica; otherwise, you would be wise to supplement it for it has been shown to remove aluminum from the body and brain.

Additionally, alkaline water (including the water in cells) can hold a lot of oxygen. Acidic water (or cells) can hold very little oxygen. So the more acidic your cells are, the less oxygenated they will be (and autistic children are frequently lacking in oxygen to the brain, in particular). Sang Whang, in his book "Reverse Aging", points out that toxins are acidic. If the blood is already overly acidic, toxins will not be released into the blood, which must happen in order to detoxify your cells. This buildup of toxins causes acidic, poorly oxygenated cells. An increasingly popular way to oxygenate these children is to use a long, expensive series of oxygen-chamber treatments. One might want to look at less expensive methods first. Exercise With Oxygen Therapy (EWOT) involves 15 minutes on a treadmill while breathing oxygen. The exercise increases the osmotic pressure and dissolves more oxygen into the intercellular water and into the cells. Oxygen saturation is restored to optimum levels, even in the very old. Nevertheless, to facilitate best results, work to restore normal pH of the saliva and urine.

Research shows that a magnesium deficiency, such as in Diabetes, can produce pain that is only relieved by replenishing magnesium. Restoring magnesium levels can be difficult when taurine is deficient or when the oral magnesium overstimulates the bowel. I have found a remarkable solution to that problem of oral magnesium, a magnesium-glycerol oil used transdermally. Order "Essence of Life Magnesium Oil" (or gel) from the Internet. Eight-ounce bottles sell for $22.00. This is magnesium chloride from concentrated seawater. It can be rubbed on several times a day (after a warm bath is most effective), or used in bath water. I have seen it quickly relieve pain in a diabetic. Many others, not diabetic, testify to this experience.

These above-enumerated, medical facts show that every symptom of these dear children is treatable! These kids are sick. They are not usually brain damaged. What seems to be occurring is an immune-mediated, abnormal "shut down" of blood flow in the temporal lobe area of the brain, and therefore an interference with central nervous system function. Total brain perfusion is significantly decreased in autism subjects (range, 58% to 72% of controls). In addition to the globally decreased perfusion, the autism group also had regionally decreased flow in the right lateral temporal and right, left, and midfrontal lobes compared with controls. Additionally, there are many critical deficiencies such as vitamins B_1, B_6, zinc, and magnesium, and heavy metals are blocking many enzymatic functions. Removing heavy metals and restoring blood flow should be a priority.

This paper is not meant as a medical prescription, nor do all the conditions and suggested interventions apply to every child. You must study this paper until you see your child's face in it, and then use the parts that are applicable to him. In all instances, it is good to consult with your nutritionally-oriented professional when making any major nutritional changes.

Immune 101

There are three major classes of Immune Cell types: granulocytes, monocytes, and lymphocytes. Lymphocytes are divided into three subgroups: B-Cells, T-cells, and Natural Killer Cells. T-cells are divided into CD4, helper cells, CD8, suppressor cells, and cytotoxic, CD8, Killer T-cells. That is, they show the Cluster Determinant (CD) glycoproteins on their surface. During the first two years of life, a delicate one-to-one ratio between CD4 (helper) and CD8 (suppressor) cells forms. CD4/CD8 ratios that do not equal 1:1 are indicative of abnormal immune systems. All these produce cytokines, chemical messengers that tell the other cells what to do. Cytokines, also called growth factors, are the common language of the immune, hormonal, and nervous systems regulating the growth and development of cells and tissues. Scientists state that: "Stimulation of the developing immune system (by early childhood diseases—WSL) can prevent auto-immunity" with clinical evidence proving that immune stimulation prevents auto-immune disease by up-regulating growth factors that bring the body back into balance with normal cell-to-cell communication.

Growth factors are biologically active, biochemically well-characterized, small proteins (cytokines) that regulate cell growth, repair, renewal, and cell death throughout the body, including the developing nervous and immune systems. Growth factors need not enter cells to exert their effects upon DNA and cellular activities because they use specific cell receptors that carry their signals into the genes. Specific growth factors, such as platelet-derived growth factor (PDGF), insulin-like growth factor-1 (IGF-1) and transforming growth factor-beta (TGF_B) play critical roles early in the four-stage, cell cycle during what is called G1 phase. These growth factors determine the cell's fate by regulating what genes are turned on or off. If a gene is "turned on", it will be read and its message translated into protein. If a gene is "turned off", its message will remain dormant. Many viruses compete for the same DNA gene regulatory (transcription) sites as growth factors do since viruses need to overcome the growth factor's control of the cell's fate so that the virus can multiply and infect more cells. Growth factors contribute to healthy communication between the protective systems in the body, such as the nervous, immune, and hormonal systems. If growth factors do not work appropriately, there is aberrant cell-to-cell communication throughout the body, and a type of chaos ensues—Dr. Barbara Brewitt, Chief Science Officer, Biomed Comm, Inc.

DHA binds to a vitamin A receptor along with vitamin D and goes into the nucleus of cells, where it decides which genes in the brain to turn on and which ones to turn off. Protein from lean meat (especially fresh, wild-caught fish high in omega-3s) and minerals from vegetables and fruits are even more critical for a developing brain than for an adult brain because children are building new structures and shaping relationships among parts of the brain. So it's key to feed children premium fuel every day. - James Dowd and Diane Stafford, The vitamin D Cure. Vitamin D, which forms when your skin is exposed to sunlight, regulates the expression of more than 2,000 genes throughout your body, including ones that influence your immune system to attack and destroy bacteria and viruses. Get the kids, and yourself, into the summer sun, without sunscreen, and take a vitamin D supplement in the winter, or if otherwise not taking the sun.

The CD4+, lymphocyte helper-cell activities are divided into Th1 (Cell-mediated immunity), and Th2 (humoral immunity). Th1 is the first-line of defense primarily against viral, fungi, and protozoa, while Th2 helps the B-cells to produce antibodies. The T-cells are separated into these two classes depending upon the specific cytokines the cells secrete in response to antigenic stimulation. Th1 cells primarily produce interferon (IFN) and interleukin-2 (IL-2), whereas Th2 cells produce IL-4, **IL-5**, IL-6, IL-10, and IL-13. These two helper T-cell classes also differ by the type of immune response they produce. While Th1 cells tend to generate responses against intracellular parasites such as bacteria and viruses, Th2 cells produce immune responses against helminths and other extracellular parasites. Interestingly, the cytokines produced by each Th subset tends to both stimulate production of that subset, and inhibit development of the other subset. Th1 and Th2 represent two, separate, counterbalancing functions of the immune system, and problems occur when they are out of balance.

In a study published in the January issue of The Journal of Clinical Investigation, Marc E. Rothenberg, M.D., Ph.D., has established a link between reflux and allergy - not only food allergies but also environmental allergens such as pollens and molds. Dr. Rothenberg, the study's senior author, and his colleague Anil Mishra, Ph.D., have developed the first experimental system, a mouse model, for eosinophilic esophagitis - a disease whose numbers have exploded in recent years.

"We're saying that what a person breathes in can actually affect the gastrointestinal system," says Dr. Rothenberg, who directs the section of allergy and clinical immunology in Cincinnati Children's division of Pulmonary Medicine, Allergy and Clinical Immunology. 'There is a direct link between exposure to allergens that go to the lungs and development of esophageal inflammation.'

Moreover, Dr. Rothenberg has discovered that a molecule called interleukin-5 mediates this pathway. When Dr.

Rothenberg's research group gave mice an allergen that induced asthma, all the mice developed esophagitis. But none of the mice **deficient** in who were given the allergen developed esophagitis. "They were completely protected," says Dr. Mishra, Ph.D., the study's lead author.

After a strong Th1 response to infection gets on top of the search-out-and-kill activity, Interleukin 4 and 10 promotes a change of a class of antibody (IgG1) produced by memory cells and suppresses the activity of the killer cells and starts to shut down the Th1 immune response. The production of memory cells is dependent on this strong Th1 immune response. For example: the immunological action taken against a primary attack of measles is primarily Th1, with a later back-up by a Th2 antibody that is dependent on the initial Th1 response, and then a dampening down of the Th1 system by the Th2 antibody. However, "These alterations support the hypothesis that the immunologic alterations induced by immunization do activate type-2 cell responses leading to improved antibody production, while suppressing type-1, T-cell responses leading to reduced lymphoproliferation." (JID 1996, Vol 173, pg 1324-1325) Do you understand the implications of this? There are plenty of antibodies at the expense of the ability to "search-and-destroy"—to fight other infections. This is the key—the difference between natural Th1, and vaccine induced Th2 immunity—and yet, some fail to show antibodies even when vaccinated and boosted and revaccinated! Could that be because they had no sufficient Th1 response? Possibly, but magnesium deficiency has been shown to decrease antibody production and lymphocytes, the body's defense against invaders, are inhibited by magnesium deficiency, and most of these children are deficient in magnesium.

To avoid rejection of the fetus, a Mother's immune system shifts quickly to Th2, and the baby is born with this skew to Th2. After the baby is born, the healthy mother's immune system changes back to normal Th1 dominance very quickly, and breast milk quickly starts the process of changing the baby's balance towards Th1 dominance. The vaccinated Mother's immune function is likely to stay Th2 predominant, robbing her of her natural immunity to infections and allergies, and she passes this skewed system to her baby! The poor, bottle-fed child gets no help at all to restore Th1.

It's most revealing to learn that the same insult given to those of different genetic makeup will cause some to have a Th1 response, whereas others will have a Th2 response! The balance of adrenal steroids, notably cortisol and DHEA, determines the ratio of these two. Since cortisol is an antagonist of DHEA (and vice versa), stress-induced cortisol production shifts the number of CD4+ lymphocytes to predominantly Th2 expression. Excess cortisol also impairs liver detoxification, allowing buildup of environmental and physiological toxins. "Thus, even a potentially Th1-inducing virus may fail to induce Th1 during a time of stress"—Lancet, 1997, Volume 349, pg 1832.

When Th1 is diminished, Th2 predominates leading to a host of chronic diseases. Conditions are pro viral, pro Candida. **As long as this bias exists, the chronic viral infection, whether measles or other, cannot be cleared.** Additionally, and somewhat frightening are the studies that show when the Th1 is suppressed, viral infections can mutate (especially if selenium deficient) and a relatively harmless virus will become virulent enough to overcome the ineffective Th2 system and cause serious illness or death! Furthermore, Candida can enhance Th2. This increases IgE, causing Candida to really flourish. An IgE reaction can cause an immediate reaction, hives, itching, or throat constriction, that can be life threatening; so, keep a box of Alka-Seltzer Gold™ on hand for it will often stop a reaction (1 tablet age 6-12, two tablets 12 and up). The Th1 (cellular) response is the most important in controlling Candida. Studies show an increase in Th1 cells and activity is associated with enhanced yeast clearance. When a healthy individual develops a compromised cellular immune response, there is a strong likelihood of developing a yeast infection that will be resistant to antifungal therapy. One will likely also begin to react to mold. When the cellular immune function is repaired, Candida overgrowth tends to disappear. Removal of mercury is one example of this. **Modulating the immune function with Ambrotose AO™ and Phyt•Aloe®**

from Mannatech, Inc., the use of a thymus glandular and a good multivitamin/mineral supplement to support the thymus, supplemental vitamin E and fish oil, and the use of Transfer Factor all support the return to Th1 dominance and control of Candida and viruses. Direct action against Candida, viruses, and bacteria to reduce their load is also highly desirable. People in Asia have been treating Candida using just one teaspoon of sea salt to 1/2 glass of water plus some citric acid and/or vitamin C. It reverses Candida in many cases. Taking pure lemon juice without sugar is also alkalizing and will not make Candida worse. Please, make every effort to balance and support the immune system as outlined herein!

One of the things primarily responsible for maintaining the balance between Th1 and Th2 is a healthy balance of gut microflora. When beneficial microflora are depleted or destroyed you're going to become more Th2 dominant, and have more tendencies towards allergies, and asthma. A strong presence of IgE in the blood is evidence of prominent Th2 activity and of a deficiency of vitamins B_6 and E. Elevated IgE is associated with a history of numerous allergies. Often, the detrimental effects of Candida are from an allergic reaction to the yeast as well as from a reaction to its toxins. Additionally, Yeast also produces serotonin and may interfere with normal neuroregulation (excess serotonin). - Candida albicans As a Producer of Serotonin. Sokoloff, etal., Growth, 1967;31,297-300. Antifungals alone may not overcome the problem until Candida extract is administered. Allergies are indicative of an overactive (reactive) immune system. So, if you have high IgE, suspect that Candida and stress are at work, and supplement zinc, vitamin B-complex, and vitamin E. IgE mediated allergies have disappeared with removal of mercury. "The authors concluded that thymus extract was useful in modulating IgE dysregulation in atopic children" (Cavagni 89). Other studies have shown a general improvement in the overall condition of atopic children receiving thymus extracts (Kouttab 89, Kaliuzhnaia 90). The addition of calcium and vitamins A and D and K_2 are indicated where there is asthma and allergies. These three vitamins work together also to prevent tooth decay, and to heal existing caries!

Stress is a major factor in the Th2 skew, and is considered a major cause of depression. Any type of stress raises a hormone called cortisol and a secondary hormone called epinephrine (adrenaline), your stress hormones, and this will make you more Th2 dominant and more prone to allergic type situations. Cortisol will put a "tire" of fat on the belly and hips, and, in excess, it damages and kills neurons by the billions. It also decreases levels of growth factors needed for brain cells to thrive, and it reduces levels of serotonin needed to promote neurogenesis (growth of new neurons). A diet high in refined carbohydrates is going to alter the slow hormonal collective that includes cortisol, epinephrine, and insulin and create Th2 dominance. Adrenal exhaustion will promote a cytokine shift from Th1 to Th2. Additionally, there are chemicals and heavy metals, such as mercury, that will make you more Th2 dominant. **To reduce stress-produced cortisol by 47%, give the child 100-200 mcg of chromium each day (200-400 mcg for adults).** A 45-minute massage (back rub?) will give a like reduction. Chromium alone may not be effective without adequate niacin being present, so supplement niacin also. Solaray, Inc. makes Chromiacin™ that also eliminates the infamous niacin flush. Magnesium, vitamins B_6 and C, and pantothenic acid also reduce cortisol and should be supplemented. In case you missed it, this is saying reduce stress, or how you relate to it, take 200 mcg of chromium with niacin, with magnesium, pantothenic acid, and vitamins A, B_6, and C, and support the adrenals.

One study shows that glutathione levels in antigen-presenting cells determine whether Th1 or Th2 response patterns predominate. "Raising glutathione levels has been shown to alter the cytokine balance in favor of a Th1 immune response"—"The immune system", Peterson, JD, et al., 1998. A new way to increase glutathione quickly is with a transdermal lotion from Kirkman. Another interesting way has been developed to aid those with respiratory problems. Doctors at the Tahoma Clinic have observed remarkable improvements in many with chronic bronchitis or with emphysema who used 60 mg of nebulized, inhaled glutathione two times daily.

If you have a problem metabolizing sulfur, supplementing glutathione may cause your body to accumulate too much sulfite, creating a wheezing symptom, among others (a supplement of vitamin B_6 and molybdenum should alleviate that). It can also overload one with cysteine, and that is very toxic. For an appointment with a physician at Tahoma Clinic, call (253) 854-4900. For a doctor in your area, inquire at (800) 532-3688. Furthermore, to reverse emphysema and bronchitis supplement Retinoic acid (vitamin A).

Additionally, when patulin, a sulfhydryl-binding chemical that conjugates glutathione rendering it unavailable for monochlorobimane (mBCl) interaction, was applied to cells that were treated with the glyconutrient Ambrotose AO™ by Mannatech™, the glyconutrients protected the cells from glutathione depletion. This shows the potential of glyconutrients to not only increase glutathione production as reported elsewhere, but to protect it from loss leaving twice as much glutathione available—Proceedings of the Fisher Institute for Medical Research, November 1997, Page 14. Do you recognize the significance of this? Mercury, cadmium, lead, and arsenic are sulfhydryl-binding agents that destroy glutathione! Ambrotose AO™ by Mannatech™ protects against the loss of glutathione by as much as 50%! Additionally, glyconutrients "…boost the workings of the immune system, including increasing the production of the enzyme glutathione synthetase in cells, which, in turn, produces the powerful antioxidant, glutathione." "…adding glyconutrients can protect kidneys from the damage that antibiotics sometimes cause, particularly in immune-compromised or older adults."—"Sugars that Heal" by Dr. Emil I. Mondoa, MD.

The sulfhydryl-reactive metals (mercury, cadmium, lead, arsenic) are particularly insidious, and they can affect a vast array of biochemical and nutritional processes. Metals not only have strong pro-oxidative effects but they inhibit antioxidative enzymes and deplete intracellular glutathione. They also have the potential to disrupt the metabolism and biological activities of many proteins due to their high affinity for free sulfhydryl groups—Cysteine Metabolism and Metal Toxicity by David Quig Ph.D. Despite considerable overlap in symptoms associated with accumulation of these metals in the body, it is clear that the metals do vary somewhat with respect to primary sites of deposition. For example, Hg and Cd are deposited heavily in the kidneys; however, unlike Hg, Cd does not readily cross the blood brain barrier in adults and, in contrast to Hg, Cd is associated more with peripheral neuropathy than disorders of the central nervous system. Lead is deposited primarily in bone, and disrupts erythropoiesis (formation of red blood cells). Methyl mercury has a high affinity for sulfhydryl groups, which contributes to its effect on enzyme dysfunction.

Cadmium (major source is white flour products and cigarette smoke) targets the kidneys causing, among other things, generalized wasting of amino acids and deficient metabolism of vitamin D leading to rickets and osteomalacia. Vitamin D is a fat-soluble substance, so, if there is very little fats and oils in the diet, the absorption of this vitamin will be very poor. When fat absorption is poor, the amount of vitamin D absorbed will also be poor. Vitamin D is absorbed only in the presence of bile, and absorption occurs in the duodenum, so if the stool is light in color, vitamin D will not be absorbed well. Additionally, studies show that increasing vitamin A intake interferes with the body's absorption of vitamin D; so, one must ensure adequate intake of vitamin D in all these circumstances. Adults, especially those living North of the 33rd parallel, must take 2000 to 4000 IU vitamin D daily. The higher figure is for those over age 40. Children receiving 2000 IU of vitamin D supplementation from age one had an 80% decreased risk of developing type-1 diabetes. Getting your vitamin A and D from cod-liver oil solves the problem. Nevertheless, recent research shows that the active form of the vitamin D hormone (1,25 D) is present in **excessive levels** relative to the inactive 25 D form in patients diagnosed with a number of inflammatory illnesses, such as certain autoimmune illnesses, sarcoidosis, chronic fatigue syndrome, fibromyalgia, Crohn's, ulcerative colitis, and Lyme disease. Evidence suggests that this is due to unregulated production of 1,25 vitamin D by macrophages in the course of an excessive Th1 immune response. Research indicates that this occurs in response to cell-wall deficient forms of bacteria

parasitizing immune cells and other tissue. It may be wise to test both forms of vitamin D and calculate the D ratio (1,25 D:25 D) if any inflammatory autoimmune condition exists. Additionally, women who took a lot of vitamin D, but had a low intake of vitamin K, doubled their risk of hip fracture!

Hypervitaminosis D symptoms include: fatigue, weakness, mood changes, insomnia, inability to concentrate, sleepiness, irritability, feeling of intoxication, metallic taste, difficulty swallowing, muscle and joint pains, and a number of other symptoms.

One enzyme that is inhibited by heavy metals is choline acetyl transferase that is involved in the final step of acetylcholine production. There has been observed a marked decrease in acetylcholine often reaching less than one fifth of normal concentration contributing to the signs and symptoms of motor dysfunction. This probably accounts for the report that 70% of autistic children show high choline. Cadmium also appears to inhibit sulfhydryl-containing enzymes so that relatively low doses depress levels of norepinephrine, serotonin, and acetylcholine. The major consequence of reduction of acetylcholine in the hippocampus area is a short-term memory disturbance. This can become a major source of incomplete understanding of communication with other people, which may contribute to illogical, antisocial, and irritable behavior. The main cause of the reduction of acetylcholine is a result of the abnormally accumulated, excessive deposits of metal such as Al, Pb, and Hg. When these metals were removed, acetylcholine suddenly increased towards a normal level, and often increased to more than two or three times the pre-treatment concentration—Abnormal Deposits of Al, Pb, iron, and Hg in the Brain, particularly in the Hippocampus, as One of the Main Causes of Decreased Cerebral Acetylcholine, **Electromagnetic Field Hypersensitivity**, Pre-Alzheimer's Disease, and Autism in Children...Source: Acupuncture & Electro-Therapeutics Research, 2000, Vol. 25 Issue 3/4, p230, 3p. Author: Omura, Yoshiaki AN: 5974837 ISSN: 0360-1293. Supplementing choline to enhance acetylcholine (using lecithin) may be contraindicated in seizure prone children.

EMF exposure from electrical power lines, telephone relay stations, cell phones, air travel, fluorescent lights, computer terminals, and household appliances have been found to cause high levels of stress. According to Dr. Hans Selye, eighty percent of illness in high-tech societies is stress related accounting for up to 90% of doctor visits and 50% of absenteeism from work. Parents of special needs children are stressed to breaking, as are the children themselves. During stress reactions the gut is passively permeable for many substances that are normally rejected. For example, oral adrenalin and histamine are toxic to an animal under stress, but are not normally toxic. Horse serum, given by mouth, is sensitizing when an animal has first been stressed, but normally it is not. Endogenous metabolites that do not normally produce immune reactions will do so under stress (Selye, 1950). A new study shows that 60-hertz signals from these common household appliances damage DNA of the brain, even breaking both strands! Glutathione levels are reduced by EMF, and the heart rate is also affected adversely. EMF-microwave stressors weaken the hypothalamic-pituitary-adrenal axis. Tests were also made on cell phones. Researchers were surprised to see that the EEG of teens was affected adversely for eight hours after only a few minutes conversation using the phone. Tests show that using the phone in the evenings will disrupt normal sleep patterns! ONLY a microwave gives a stronger milligauss output, and we foolishly hold that tiny destructor to our ears for hours! Thus, EMF stress causes fatigue, sleep problems, and even coagulation of the blood cells (easily seen in live-cell photography) reducing circulation. Even the activity of white cells is affected adversely. Hand-held computer games produce frontal lobe abnormalities, while media and video games affects behavior, violence, and suicide. **Researchers gave some rats drugs that either neutralize free radicals or decrease free iron before exposing the animals to the electromagnetic field. Both treatments effectively blocked the effects of the fields and protected the rats' brain-cell DNA from damage!** It seems that one should enhance glutathione production and continuously detoxify heavy metals with cilantro, cellulase, garlic, melatonin, zinc, glutathione, and selenium, and supply a significant antioxidant supplement like *Ambrotose AO*^{R} and *Phyt•Aloe*® (that also enhance GSH and cleanses). To enable taking of garlic, mince a clove or two and mix it into a small glass of orange juice. This avoids breath odor that occurs when chewed, and covers the taste as well.

The result of the above mentioned loss of acetylcholine is to create a relative excess of dopamine. Cigarette smoke (including secondhand smoke) reduces MAO (B), an enzyme that breaks down dopamine and other chemicals, compromising the ability to deactivate potentially harmful substances. Additionally, zinc and magnesium deficiencies can lead to a significant elevation in brain catecholamines. (Studies in animals have shown that a magnesium deficiency causes a depletion of brain dopamine without affecting brain serotonin and norepinephrine.) Anything that enhances insulin production (high carbohydrate/sugar intake) induces the release of dopamine and NE from the hypothalamus. Additionally, when we eat a lot of sugar, the body transfers the amino acid tryptophan from the blood stream into the central nervous system where it is converted into serotonin. Continued high, daily use of sugar (including fruit juices) can result in a chronic state of serotonin and dopamine excess resulting in irritability. The result may be an out-of-control, panic-stricken child suffering Environmental (Exposure) Anxiety. This behavior is often dramatically controlled by ¼ to ½ mg Risperdal™, continued use of which may damage the liver. It's better to build acetylcholine, though this may be difficult in view of cadmium suppressing the needed enzyme. DMAE may be the most effective choice of supplements. Dopaminergic dysfunction may also be the primary biological of ADHD. Iron serves as a coenzyme in the synthesis of dopamine, so iron deficiency may be partly related to symptoms in patients with ADHD and autism. Iron deficiency may have more pronounced central nervous system (CNS) effects because iron in the CNS is bound to ferritin, which decreases with iron deficiency anemia that is common in autism, being related to hypothyroidism. Additionally, copper enzymes form vital neurotransmitters, such as dopamine and norepinephrine. The brain, other than the cerebellum and hypothalamus, has these transmitters decreased 30% to 60% in various sectors by a copper deficiency [Feller 1983]. Elsewhere, in this paper, I have indicated how to increase acetylcholine production. So, why not supplement totally safe vitamin B_6, magnesium, and zinc, with iron and copper (if needed), and other nutrients instead of using liver-toxic Risperdal™? An interesting observation: the blink rate varies with the amount of dopamine; less dopamine means fewer blinks! The average number of blinks is 15-30 per minute. Do the test when not focused on anything. Supplement tyrosine and vitamin B_6 with less than 20 blinks.

Another protective factor is mentioned in this excerpt: "We injected rats intramuscularly with lead acetate (10 mg/kg body weight) daily for 7 days**, which significantly abolished heme synthesis as evidenced by decreased blood hemoglobin,** liver delta-aminolevulinic acid synthetase, erythrocytic delta-aminolevulinic acid dehydratase, and hepatic iron content. These effects were accompanied with marked elevation of hepatic lipid peroxidation and decreased enzymatic antioxidants such as glutathione reductase, glutathione-S-transferase, superoxide dismutase, and catalase, as well as non-enzymatic antioxidants such as total sulfhydryl groups and glutathione. Furthermore, lead treatment (injections) caused hepatic deficiency in copper and zinc accompanied by a significant elevation of lead concentration in both plasma and liver. Daily pretreatment with melatonin (30 mg/kg body weight - these amounts should be used only under medical supervision) intragastrically (orally) prevented the suppressive effects of lead on heme-synthesizing enzymes and iron deficiency. In addition, preadministration of melatonin reduced the inhibitory effect of lead on both enzymatic and non-enzymatic antioxidants. This was accompanied by marked normalization of lipid peroxidation and modulation of copper and zinc levels in liver"—J Biochem Mol Toxicol 2000;14(1):57-62 Prophylactic effect of melatonin on lead-induced inhibition of heme biosynthesis and deterioration of antioxidant systems in male rats. El-Missiry MA. Department of Zoology, Faculty of Science, Mansoura University, Egypt. Elsewhere, in this paper, the protective effect of melatonin in mercury poisoning is mentioned. Zinc in adequate quantities keeps lead from being absorbed, and **melatonin aids in zinc absorption and normalizes zinc levels.**.

Melatonin metabolizes hydrogen peroxide radicals by stimulating the production of glutathione peroxidase and glutathione reductase. It is known that melatonin binds mercury and inhibits tumor necrosis factor alpha, thus enhancing production of vital sulfates. It enhances growth hormones, reduces blood pressure, and decreases cortisol levels. Another abstract with no title credits says in part: Recent data indicate that melatonin inhibits brain glutamate receptors and nitric oxide production thus suggesting that it may exert a neuroprotective and anti-

excitotoxic effect. Melatonin given in the drinking water has increased life-span in various experimental animals by about 20%. It also helps control the onset of puberty during adolescence. This can be most helpful in these troubled children.

Stressed-out Mothers, please take serious note: all women, in particular those who had shown individual, low night-levels of melatonin in their saliva, had a very remarkable improvement of latent and unsuspected conditions of low thyroid function (hypothyroidism). In fact, a significant increase of the active thyroid hormone triiodothyronin (T3) was observed in all women independent of their night levels of melatonin, and to a minor extent independent of its precursor thyroxin (T4). The effect of melatonin does not depend on pituitary TSH (thyrotropin stimulating hormone), but on the direct effect of melatonin on the thyroid gland (conversion of T4 into T3, the active hormone). In the course of six months, evening administration of three mg melatonin produced a clear-cut decrement in blood of the pituitary leutinizing hormone (LH) (which increases progressively in the course of aging). This was most noticeable in the younger women (43 to 49 years of age). Therefore, the recovery of pituitary function to a more juvenile pattern of regulation is more pronounced and rapid in younger women. This equaled an arrest and even a reversal of brain aging and restoration of reproductive functions in the women taking evening melatonin. Previous studies with laboratory animals had shown that evening administration of melatonin in senescent animals, as well as transplantation of a young pineal into old animals, produces a true reversal of sexual decay. Finally, 96% of women who had taken melatonin, declared a total disappearance of morning depression, which is typical in perimenopausal and menopausal women. The earier the introduction of this protocol, the more effective it is.

"Our findings have been elaborated and have recently been published. Nocturnal melatonin alone can deeply modify the hormonal and psychosomatic conditions in the perimenopausal years, which can extend from 40 to 60 years of age. Here we only mention what is published in an official scientific journal, to inform all women about it in order to alleviate the countless problems they face daily in family and society. Menopause is simply the end of the hormonal 'fertility program' of women, but this program is perfectly amenable to modification. It is not true that 'the ovaries are depleted!' They simply atrophy according to their 'genetic program.' But the expression of that program is purely hormonal, and we can restore the juvenile hormonal control of the ovaries. Certainly the juvenility and health of women are linked to the maintenance of a juvenile hormonal status, which can be supported with nocturnal melatonin administration. In perimenopausal women, melatonin, in the most striking fashion, reconstitutes the juvenile hormonal conditions and produces a rapid regression of all the neurovegetative and psychic alterations of menopause, in particular the states of nervousness, anxiety, and depression. In addition, we can now address the issue of an impressive combination of melatonin with zinc. Zinc is a basic mineral in the body and essential for the function of over 200 enzymes that are fundamental for the respiration of all cells in the body. The combination of melatonin and zinc dramatically accelerates the effects of melatonin and boosts a depressed immunity. This is all documented. The answer to our queries is clear, simple, and strictly scientific. Nocturnal administration of melatonin can resynchronize the entire hormonal system and, by protecting the pineal from aging, can maintain the juvenility of the pineal and its capacity to synthesize other very remarkable molecules. This is all published in excellent scientific journals. Nothing I have stated is casual or extemporized! "- Dr. Walter Pierpaoli, MD.

A recent study showed that NO autistic patient had a normal melatonin (MLT) circadian rhythm! Moreover, autistic children showed significantly lower mean concentrations of MLT, mainly during the dark phase of the day, with respect to the values observed in the controls (causing sleep problems for sure). CONCLUSION: The results of this preliminary study suggest the existence of a pineal endocrine hypofunction in autistic children—Neuro Endocrinol Lett. 2000;21(1):31-34. Methinks every child and his Mom should take 1-3 mg melatonin whether he has a sleep problem or not!

While on the subject of melatonin, this abstract is so vital that I quote it in its entirety:

Neuropsychopharmacology (2007) 32, 284–288. doi:10.1038/sj.npp.1301093; published online 10 May 2006

Olanzapine-Induced Weight Gain and Increased Visceral Adiposity is Blocked by Melatonin Replacement Therapy in Rats

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Abstract
The atypical antipsychotic drug olanzapine (Zyprexa[tm]) increases body weight and visceral adiposity in schizophrenia. In rats, **aging-associated increased body weight and visceral adiposity are reversed by administration of the pineal hormone, melatonin.** We asked if melatonin similarly would reverse olanzapine-induced increased weight and visceral adiposity in rats. Four groups (n=11/group) of female rats (240–250 g) were treated for 8 weeks with olanzapine, melatonin, olanzapine+melatonin, or vehicle alone in drinking water. Body weight and food and water consumption were determined weekly, locomotor activity at weeks 3 and 6, and nocturnal plasma melatonin concentration at week 7. At week 8, the rats were killed and visceral (perirenal, retroperitoneal, omental, and mesenteric) fat pads dissected and weighed. Olanzapine treatment reduced nocturnal plasma melatonin by 55% ($p<0.001$), which was restored to control levels by olanzapine+melatonin. Body weight increased 18% in rats treated with olanzapine alone, but only 10% with olanzapine+melatonin, 5% with melatonin alone, and 7% with vehicle control. Body weight and visceral fat pad weight increases in rats treated with olanzapine alone were greater than in each of the other three groups (all $p<0.01$), which were not significantly different. These results suggest that olanzapine-induced increases in body weight and visceral adiposity may be at least in part secondary to olanzapine-induced reduction of plasma melatonin levels, and that melatonin may be useful for the management of olanzapine- (and other psycotic drug) induced weight gain in humans. End of Abstract.

Additionally, a recent study conducted by researchers from the University of Minnesota (Dr. Shalamar Sibley) found that overweight people have better success in losing weight when their vitamin D levels are in high-normal range. Vitamin D, in conjunction with calcium and sunlight, helps to properly assimilate food and regulate normal blood sugar levels. When there is a lack of calcium, oftentimes due to a vitamin D deficiency, the body increases production of synthase, a fatty-acid enzyme that coverts calories into fat. Calcium deficiency can cause synthase production to increase by up to 500 percent, explaining the correlation between low levels of vitamin D and obesity. When combined with a reduced-calorie diet, it appears that supplementation with vitamin D helps to promote increased weight loss among those whose levels are low to begin with. **For each nanogram per milliliter increase in vitamin D precursor in the blood,** it was observed that an extra half-pound loss in weight was achieved while on the diet plan.

Metals like mercury have a toxic effect on the heme biosynthetic pathway also. This pathway can be examined and its disruptions interpreted to indicate toxin exposures. **Regulatory heme is increased by vitamin A, melatonin, and zinc. It is decreased by exposure to gasoline, benzene, mercury, lead, arsenic, and cadmium.** Heme is synthesized primarily in the liver, the red blood cells, and blood-forming cells in the bone marrow. A necessary facilitator of Cytochrome p450 (Phase I) liver detoxification enzymes, heme is made deficient by heavy metal poisoning which lowers p450 levels and decreases ability at the cellular level to clear chemicals and drugs, especially those concentrated in the liver and kidneys.

Reduced heme likewise affects other metabolic pathways in the body through depleted p450. Those who

suffer from various types of Environmental Illness and Multiple Chemical Sensitivities will exhibit symptoms of porphyrin excess and reduced p450 activity. Those struggling with mercury poisoning, in particular, will be similarly affected. "Persons with a metallothionein disorder are especially sensitive to toxic metals, and **overmethylation is associated with severe chemical sensitivities.** Effective treatment requires a three-part approach: (1) avoidance of additional exposures, (2) biochemical treatment to hasten the exit of the toxic substance from the body, and (3) correction of underlying chemical imbalances to minimize future vulnerability to the toxic material"—Dr. Wm. Walsh.

Some of the vitamin and mineral cofactors required for cytochrome P-450 mediated reactions include riboflavin, niacin, magnesium, iron, and a number of trace minerals. One Mom reports that the almost day-to-day fluctuation between good and bad days (depending on the severity of his dark circles) was from apparent chemical sensitivity. "I gave him 1,500 to 2,000 mg. of niacinamide divided into several doses during the day. It has been a godsend. We have gone three straight weeks without any fluctuation, no dark circles, and more importantly, none of the "off" and spacey behavior that were his biggest problem". This may not require that much, so start smaller and increase until desired results are received. Niacinamide was the treatment of choice for Pyrroluria before Dr. Pfeiffer showed the need for vitamin B_6 and zinc. Reduced antioxidant defense may characterize a group of individuals who are demonstrably more sensitive to the effects of a range of toxic chemical exposures, and may shed light on increasing rates of related learning and behavioral disorders. A small, follow-up group of children have benefited markedly when their impaired antioxidant defense was restored. Niacinamide is used to demethylate the overmethylated.

"Acemannan® (Manapol®), and reishi mushrooms among others, have been shown to increase the enzyme glutathione synthetase, which in turn produces the powerful antioxidant glutathione (providing the substrates glycine, glutamine, and cysteine are available—WSL). Acemannan® (from aloe) improved food digestion and absorption and enhanced 'good' bacterial flora in the digestive tract by reducing yeast and pH levels"—Sugars That Heal, Dr. Emil I. Mondoa, MD. "This aloe extract (that is found in Ambrotose® and Ambrotose AO™ by Mannatech™) also significantly inhibits superoxide anion formation. This is one type of free radical that can have dangerous effects on the fragile DNA in our cells"—Kim, HS et al. In Vitro Chemo-protective Effects of Plant Polysaccharides, Carcinogenesis, Aug 1999, 20:8, 1637-40.

In addition to stress-induced, immune suppression, the body's natural defense system is also susceptible to stress-induced malnutrition. When the body begins to suffer from stress-induced malnutrition, the cells of the immune system are deprived of critical nutrients necessary for their function. In addition to the macronutrients, myriad micronutrients that include zinc, selenium, vitamins A, C, E, and B_6, the amino acids glutamine, cysteine, and arginine, and proper ratios of Omega-3 and Omega-6 fatty acids are known to be necessary for a functional immune system. Observations indicate that Fatty Acids (FA) can modulate immune responses by acting directly on T-cells, and suggest that alteration of cellular FA toward Omega-3 may be a worthwhile approach to control inflammation that often tends to cancer. Intake of Omega-3 fatty acids in childhood is vital and has been shown to play a role in preventing ADHD and in improving learning and academic performance. The polyphenols found in extra-virgin olive oil have been shown to significantly increase levels of vitamin E indicating that they improved antioxidant defense systems. This had marked effect on cholesterol as it decreased LDL oxidation and improved HDL levels. Taking adequate amounts of both oils (cod-liver and olive) showed a synergistic benefit in anti-inflammatory effects. Additionally, fatty acid imbalance contributes to reductions in peripheral nerve conduction velocity and blood flow. Without proper blood flow, neurons begin to die. This imbalance may be corrected by a supplement of GLA (Omega-6 fatty acid found in Evening Primrose Oil). Blood flow improvement to nerves increased by 34.8%, **but when combined with antioxidants, the result was a synergistic 72% improvement!**

It is vital to note that MMR vaccine, and the chronic measles infection so often following, depletes the body of vitamin

A, and like all vaccines, reduces blood flow to some brain areas that are being damaged by the vaccine effects. In fact, recent work has shown that children and adults with severe infections may excrete substantial quantities of vitamin A in the urine, whereas healthy subjects excrete little or no urinary vitamin A. The cause of such urinary losses appears to be impaired functioning of the kidney tubular epithelial cells, which normally reabsorb vitamin A during severe infections. This phenomenon may help explain the longstanding observation that severe infections often precipitate clinical vitamin A deficiency (xerophthalmia) in young children with marginal vitamin A stores. In addition, vitamin A deficiency impairs certain aspects of the immune function; in particular, the secretory IgA response is dramatically impaired. A deficiency of vitamin A and zinc hinders cell-mediated immunity (Th1), and "our" kids are universally lacking in these vital nutrients (vitamin A requires zinc for its mobilization [Ogiso et al, 1974]). Scrimshaw, et al. (1968) reviewed over 50 studies of infection and nutrition and wrote, "No nutritional deficiency in the animal kingdom is more consistently synergistic with infection than that of vitamin A". In South Africa, it was found that injection of 200,000 units of vitamin A reduced near 50% measles-vaccine deaths to virtually zero. Children with vitamin A deficiency are more susceptible to the effects of DDT, hydrocarbon carcinogens, and PCBs.

Additionally, the Australian, Archivide Kalokerinos, M.B., B.S., Ph.D., noted for his work among the Australian aborigines, reduced an infant-morality rate from near 50% to virtually zero. Noting features of scurvy among some of the infants and children, and observing that many deaths followed vaccinations, he hypothesized that the vaccinations provoked death by throwing the infants into fulminating scurvy. Based on these observations, he improved the nutrition of the children, provided generous amounts of vitamin C, and avoided vaccines when children were ill with colds or other infections. As a result of this work he was awarded the Australian Medal of Merit in l978. You would be wise to provide your child a high intake of vitamins A and C before contemplating any vaccination and to restore the child that has been vaccinated.

Cell-mediated immunity (CMI) in many infants is probably low, and the vaccines lower CMI further. One vaccine decreases CMI by 50%, two together by 70%. Three? Yet, repeated immunizations with three vaccines simultaneously from four weeks to 12 or 18 months are given. All these triple vaccines markedly impair CMI, yet some uninformed doctors, solely for convenience and profit give 10 viruses into these struggling immune systems in one sitting! Don't let this happen to your child! The longest safety trial of the triple vaccine MMR (all live, attenuated viruses) was three weeks!

Repeat DPT is given at 12 months. In mice, spectrally assayed cytochrome p450 was decreased by 50% for 7 days following DTP vaccination. Phospho-sulfotransferase, a Phase II detoxifying enzyme was also decreased as was the RNA necessary to their production. Children receiving DPT show three times as many seizures as is the norm for children. A similar increase 3.3 times the norm occurred within four to seven days following MMR. This decrease of p450 enzymes tends to harbor toxins within the system, leading to toxicity through a build up of heavy metals and other poisons, including the thimerosal (mercury), aluminum, formaldehyde, and other poisons in the vaccine. Mercury has also been found to play a part in neuronal problems through blockage of the p450 liver enzymatic process. Cadmium has a toxic effect on many enzymes dependent on iron as a cofactor, including the cytochrome p450 enzymes (Maines, M.D., 1984). Mercury has been shown to diminish and block sulfur oxidation thus reducing sulfates and glutathione levels which is the part of this process involved in detoxifying and excretion of toxics like mercury.

Glutathione is produced through the sulfur oxidation side of this process. Low levels of available glutathione have been shown to increase mercury retention and increase toxic effects. Pretreatment with of a specimen with 100 microM glutathione ethyl ester or N-acetylcysteine (NAC), but not methionine, resulted in a significant increase in intracellular GSH. Further, pretreatment of the cells with glutathione ethyl ester or NAC prevented cytotoxicity with exposure to 15 microM Thimerosal— PMID: 15527868. If you are determined to be vaccinated with a Thimerosal-bearing vaccine, it would be wise to take a gram of NAC before and after along with a high amount of vitamins A and C.

The cytochrome p450 (Phase I) enzyme pathway is the only way a baby has to deal with endotoxins from the gut. The Phase I system is one of several shut down temporarily by the DPT and other vaccines. Toxins from E. Coli (and those of Candida), being given off when the liver is impaired by DTP, can have severe consequences, having been associated with Sudden Infant Death Syndrome! This is all the more likely when there is a chronic deficiency of vitamins A and C as might be induced by a poor diet or by a chronic measles infection of the gut. No effort should be made to eradicate bacteria and fungi, releasing as it does large amounts of endotoxins, without ensuring the child is adequately supplied with antioxidant nutrients, particularly vitamins A and C. Use of Alka-Seltzer Gold™, bentonite clay, and charcoal is said to reduce the impact of this die-off.

"The repeated use of vaccinations would tend to shift the functional balance of the immune system toward the antibody-producing side (Th2), and away from the acute inflammatory discharging side (the cell-mediated side or Th1). This has been confirmed by observation especially in the case of Gulf War Illness: most vaccinations caused a shift in immune function from the Th1 side (acute inflammatory discharging response) to the Th2 side (chronic auto-immune or allergic response).

"The wise use of vaccinations would be to use them selectively, and not on a mass scale. In order for vaccinations to be helpful and not harmful, we must know beforehand in each individual to be vaccinated whether the Th1 function or the Th2 function of the immune system predominates. In individuals in whom Th1 predominates, the cellular immune system is overreactive causing many acute inflammations, thus a vaccination could have a balancing effect on the immune system and be helpful for that individual. In individuals in whom Th2 predominates, causing few acute inflammations, but rather the tendency to chronic allergic or autoimmune inflammations, a vaccination would cause Th2 to predominate even more, aggravating the imbalance of the immune system and harming the health of that individual"—Philip F. Incao, MD.

Multiple vaccinations, in shifting this delicate balance to a predominant Th2 response, favor the development of atopy (asthma, eczema, hay fever, and food intolerances) and, perhaps, autoimmunity, through vaccine-induced, polyclonal activation leading to autoantibody production. An increase in the incidence of childhood atopic diseases may be expected as a result of concurrent vaccination strategies that induce a Th2-biased immune response. Additionally, studies in New Zealand showed a 4-fold increase in asthma as a teenager in infants who had received antibiotics. Similarly, antibiotics used in the first two years of life increase risk of allergies five-to-six fold. Feeding microflora products as yogurt or capsules of flora may prevent this.

The literature shows an association between antiviral vaccination and onset of childhood asthma. We have noted that attenuation of viral target by conventional vaccine preparation does not completely remove or degrade viral nucleic acids such as double-stranded RNA (dsRNA). It is known that viral dsRNA can induce activation of a host's antiviral protein kinase (PKR). We have shown that activation of PKR by dsRNA leads to expression of Th2-type immune responses, e.g., allergy and asthma—Farhad Imani, M.D., David Proud, M.D. Recent discovery shows the gamma-delta group of T-cells are responsible for allergic responses through their production of interleukin-4 (IL-4).

The odds of having a history of asthma were twice as great among (DTP) vaccinated subjects than among unvaccinated subjects (adjusted odds ratio, 2.00; 95% confidence interval, 0.59 to 6.74). The odds of having had any allergy-related respiratory symptom in the past 12 months was 63% greater among vaccinated subjects than unvaccinated subjects (adjusted odds ratio, 1.63; 95% confidence interval, 1.05 to 2.54). The associations between vaccination and subsequent allergies and symptoms were greatest among children aged 5 through 10 years—Hurwitz, E.L., Morgenstern, H; UCLA School of Public Health, Department of Epidemiology, Los Angeles, California. Additionally, in 1990 Pediatric neurologist Dr. John H. Menkes,

professor emeritus at UCLA, reported on 46 children experiencing neurological adverse reaction within 72 hours of a DPT shot. Over 87% of the children reacted with a seizure, 2 children died, and most surviving children became retarded, with 72% having uncontrollable seizure disorders.

One study published in the "Journal of Infectious Diseases" documented a long-term depressive effect on interferon production caused by the measles vaccine. Interferon is a chemical produced by lymphocytes (a type of white blood cell) that renders the host resistant to infection. Vaccination of one-year-old infants with measles vaccine caused a precipitous drop in the level of alpha-interferon produced by lymphocytes. This decline persisted for one year following vaccination, at which time the experiment was terminated. Thus, this study showed that measles vaccine produced a significant long-term immune suppression. This suppression lays the child open to all sorts of infections.

For example: a study published in the "American Journal of Public Health Investigators" on children who contracted polio, a total of 1,300 cases in New York City and 2,137 cases in the remainder of New York State, discovered that children with polio were twice as likely to have received a DTP vaccination in the two months preceding the onset of polio than were the control children. More recently, in a polio epidemic in Oman, DTP vaccination caused the onset of paralytic polio. The report in the British medical journal "Lancet" confirmed that a significantly higher percentage of these children with polio (43% compared to 28% of the controls) had received a DTP shot within 30 days of the onset of polio. The DTP vaccine suppresses the body's ability to fight off the poliovirus.

Usually then, the autistic child needs to boost Th1 cells. This can be done with Omega-3 fatty acids [EPA at 1000 to 1500 mg a day (two to three teaspoons of CLO), and DHA between 1500 to 2500 mg a day (3 to 5 teaspoons of CLO or fish oil)]. Extra Virgin Olive oil contains oleic acid (four tablespoons a day of fresh oil that's been refrigerated) is very supportive of Th1, as is vitamin A, 25,000 IU, for adults, with a lot of carotenoids, a lot of vegetables, carrots, and things like that, but these also contain phenolic acids that may be adverse for a phenol-sulfotransferase deficient (PST) child. In addition to that, L-glutamine, 10 to 20 grams (adult) a day, will strengthen Th1 (but could be very excitotoxic for some). Use Lactobacillus, two or three different kinds, and Bifido bifidus, and magnesium, zinc, chromium, and silica. Those who may become pregnant should limit vitamin A to 10,000 IU to avoid possible fetal damage in the first eight weeks of pregnancy.

Scientists at Institut Pasteur de Kyoto showed lactobacilli enhanced natural body defenses in 10 healthy adults by increasing their capacity to produce alpha interferon by 65% after two weeks and by 59% after four weeks. The U.S. Food and Drug Administration (FDA) has approved alpha interferon for use in treating certain types of cancer, hepatitis, and genital warts.

Hepatic glutathione (GSH) is a key substrate for reducing toxic oxygen metabolites and oxidized xenobiotics in the liver enabling their clearance from the body. Depletion of liver glutathione is a common occurrence in Tylenol™ usage and in mercury and cadmium toxicity and Leaky Gut Syndromes contributing to liver dysfunction and liver necrosis. It has also been demonstrated that mercury (Hg) not only directly removes GSH from the cell, but also inhibits the activities of two key enzymes involved in GSH metabolism, GSH synthetase and GSH reductase. Hg also inhibits the activities of the free-radical-quenching enzymes catalase, superoxide dismutase, and perhaps GSH peroxidase. Inside the cell, Hg0 is oxidized by catalase to the highly reactive Hg2+. Once assimilated in the cell, Hg2+ and MeHg+ form covalent bonds with glutathione and cysteine residues of proteins. **GSH is thus depleted in chelating and removing these heavy metals.** Many factors can affect liver function and glutathione availability. For instance, a recent or chronic-active infection can deplete glutathione, as does a single dose of Tylenol™. Studies have found that heavy metals, especially mercury and cadmium, deplete glutathione and protein-bound sulfhydryl (SH) groups resulting in inhibiting SH-containing enzymes and the

production of reactive oxygen species such as superoxide ion, hydrogen peroxide, and hydroxyl radicals. **These reactive oxygen species result in increased lipid peroxidation, enhanced excretion of urinary lipid metabolites, modulation of intracellular oxidized states, DNA damage, membrane damage, altered gene expression, and apoptosis.** Increased fragility and decreased sulfhydryl content in cell membranes follow closely, within 4-5 days, a decrease in plasma zinc concentration. **These latter signs are readily reversible within 1-2 days by zinc supplementation.**

"Cathepsin D is the predominant lysosomal protease (protein digesting enzyme within the lysosomes of a cell that digest the old organelles allowing new ones to form) and is abundantly expressed in the brain. It plays an important role in regulation of cellular apoptosis (programmed cell death) and has been shown to mediate apoptosis induced by (the) cytokines tumor necrosis factor (TNF)-alpha and interferon (IFN)-gamma. Cathepsin D is involved in apoptosis that is initiated by the oxidation of reduced glutathione (GSH) to oxidized glutathione (GSSG). It is my hypothesis that unnatural oxidation of GSH to GSSG would also cause cell death that was not naturally induced. It is well known that autistics suffer from oxidative stress (which leads to elevated GSSG levels and apoptosis that is not really programmed but induced by some toxicant)." – Professor Boyd E. Haley, Ph D.

We found that cathepsin D protein expression was significantly increased in the frontal cortex, in pyramidal and granule cells of the hippocampus, and in cerebellar neurons in autistic subjects as compared to controls. In addition, we found that the expression of the anti-apoptotic protein Bcl-2 was significantly decreased, while caspase-3, a critical executioner of apoptosis, was increased in the cerebellum of autistic subjects. Previously our studies have shown that Bcl-2 expression is decreased and the BDNF-Akt-Bcl-2 pathway is compromised in the frontal cortex of autistic subjects, which suggested that **increased apoptosis (destruction of neurons, typically induced by the stress hormone, cortisol –WSL) may be involved in the pathogenesis of autism. Our current finding of decreased Bcl-2 and increased capase-3 in the cerebellum of autistic subjects further supports this suggestion.** In addition, the finding of increased cathepsin D in the cerebellum of autistic subjects suggests that, through its regulation of apoptosis, the altered activities of cathepsin D in the autistic brain may play an important role in the pathogenesis of autism. - PMID: 19854241

"This is why I think it is important to address the oxidative stress issue in these children as well as older patients with other illnesses. Elevated cathepsin D may just be a secondary effect of oxidative stress induced by a toxic exposure that leads to brain inflammation." – Professor Boyd E. Haley, PhD

To counter these high oxidative-stress loads, one must supplement antioxidants, particularly Ambrotose AO^{R} (Mannatech), vitamins C and E, selenium, and glutathione, and enhance the body's production of glutathione as outlined elsewhere in this paper. Some foods, such as avocado and asparagus, supply GSH.

The displacement of zinc in the presence of a toxic-metal burden may explain in part why increased levels of zinc are so commonly seen in the scalp hair of patients exhibiting significant levels of toxic metals Hg, Cd, Pb (Quig, unpublished observations). **Such high zinc readings in hair tests would indicate an actual lack of systemic zinc!**

Platelets from zinc deficient rats exhibit abnormal aggregation (failure to aggregate normally), a defect that is associated with impaired calcium uptake. This is probably due to a lack of sun and vitamin D. The evidence suggests defective calcium channels in the plasma membrane of cells. Similar observations have been made in brain synaptic membranes from zinc deficient guinea pigs. As in the red cell, membranes from platelets have a lower than normal concentration of sulfhydryls. **Treatment of zinc deficient blood with glutathione increases the aggregation response of platelets isolated from the blood of zinc-deficient rats, bringing it back to normal.**

Chelation with DMSA needs GSH or NAC to metabolize out as disulfide-bound DMSA-GSH or DMSA-NAC. **If**

replacement NAC/GSH is not supplied, DMSA and DMPS (3-4 times more so than DMSA) consume available stores of these antioxidants leaving a dangerous deficiency. In humans, oral glutathione is readily absorbed by the gut mucosa, repleting its glutathione supply; but all remaining GSH is then broken down by the mucosa preventing systemic absorption. This may explain why oral glutathione has been of help to autistic children even when there is apparently little systemic absorption. This being true, one must support the body in its manufacture of GSH to avoid a dangerous lack due to chelation. Nevertheless, given the gut dysfunction found in many autistic children, oral glutathione at 250 - 500 mg/day may be of significant help. Additionally, a glutathione cream has become available. I think this means of replenishment of cellular glutathione is highly desirable. Further, it seems both forms should be used. Nevertheless, Dr. Woody McGinnis has this to say: "It is unfortunate that we have this myth about oral glutathione not absorbing. There are many good articles on this, and just no question that it gets absorbed, and much of it intact, and especially by the intestine, which is especially where you want it." Other reports state that glutathione given orally does raise GSH intracellularly in vivo. This has been demonstrated both in animals and in humans. An oral bolus of 15 mg/kg to the human appears to raise plasma GSH two-to-five-fold, with great variability in effect between the five subjects tested; however, in another study that used healthy, fasted subjects, plasma GSH did not rise following oral administration of GSH. Perhaps plasma GSH is so well buffered in healthy subjects that with them, it is difficult to influence by oral dosing.

Cysteine is deficient in a majority of Autistic children, especially younger than six, and especially before vitamin B_6 supplementation. An important point should be emphasized regarding the potential for DMSA to contribute further to depletion. Ninety percent of the DMSA absorbed is excreted in the urine as a cysteine-DMSA-cysteine disulfide complex. Therefore, between days of oral administration of DMSA it is important to replace cysteine, except in those instances where the child is cysteine toxic. Cysteine, in excess, can penetrate even a healthy, blood-brain barrier and become an excitotoxin to the brain. Additionally, pharmacological doses of cysteine/NAC, in the range of 1500 mg daily, have the potential to exacerbate the adverse neurological effects of toxic metals since it moves mercury into the brain in rats. It is of interest to note that intravenous glutathione removes mercury from the brain. Giving cysteine or too much NAC can be like an atom bomb to an autistic. The reason is that these agents result in sudden production in the G.I tract of metallothionein that temporarily absorbs most of the available zinc. So, while the gut is healing, the bloodstream and brain become dramatically zinc deficient; thus the terrible response sometimes seen to NAC. MT promotion must NEVER be attempted in a zinc-depleted person. Otherwise, you are likely to get the same terrible reaction as commonly occurs with cysteine or too much NAC. Additionally, cysteine is probably unsafe for routine oral administration, because when circulating in the blood, it readily auto-oxidizes to potentially toxic degradation products. Saez and collaborators demonstrated that the highly reactive hydroxyl radical is among the products formed from the auto-oxidation of cysteine. Cysteine also has "excitotoxin" activity in the brain, similar to that of the amino acids glutamate and aspartate, and can be toxic to the retina. This excitotoxicity of cysteine is completely blocked by adequate amounts of zinc! A study of patients with Parkinson's, ALS, and Alzheimer's found a significant elevation of their cysteine to sulfate ratio that is often seen in autism! This ratio may well be improved by a supplement of Vitamins C, B_6, and molybdenum.

Methionine, betaine (TMG), and choline enhance liver function and increase the levels of SAMe and glutathione. In addition to the above supplements, use these that build glutathione: Mannatech Products (Ambrotose®, Phyt•Aloe®, and PLUS), garlic, dandelion, Colostrum, Schizandra, Vitamins A, C, and E, wheat grass, whey, shark-liver oil, rice-bran extract, lysine, NAC, and SAMe. All are totally nontoxic, though NAC has some considerations mentioned earlier. Carotenes enhance immune response and "spare" the glutathione, a Phase II detoxification enzyme in the liver that we rely on to safely eliminate pollutants and toxins from the body. You might even want to add, after careful testing, Pregnenolone or DHEA (both suppress cortisol), because the higher the levels of DHEA,

within normal, the better Th1 performs.

Dr. Nestler, from the University of Virginia, has spent the last eight years doing multiple studies to show that DHEA levels are directly correlated with insulin levels, or I should say, insulin resistance. The more insulin resistant you are, the higher your insulin levels are and the lower your DHEA levels. He firmly believes, and has a lot of studies to back it up, that the decline in DHEA is strictly due to the increase in insulin resistance with age. If you reduce the insulin resistance, the DHEA rises. This is vital, for when insulin levels are elevated you cannot produce glucagon; thus, you cannot burn stored fat for energy. The insulin stores excess calories of a meal as fat, and locks it there! DHEA will help to burn off some of that fat and, being precursor to the adrenal and sex hormones, will support that aspect of aging. A study found that measuring insulin levels in the blood predicts heart attack better than any other risk factor! **High, resting insulin increases arachidonic acid levels and creates inflammation, and inflammation and the increased cytokines increase insulin resistance**. You must not allow yourself or your children to eat a high carbohydrate diet that often includes lots of sugar, fruit juices, and soft drinks. You must eat low Glycemic-Indexed foods to avoid sharp rises in insulin levels, and strive to reverse insulin resistance. If you cannot avoid sugar, substitute vegetable glycerine and Xylitol. Glycerine is not quite as sweet as sugar but it is safe. It is made from coconut or palm, and it will not feed Candida. Researchers report that 1332 IU of vitamin D per day reduced insulin resistance of diabetic women by 21.4%! More is usually better. See information herein about reducing cytokines (Il-6 and TNF). Strength training is more effective than aerobic exercises in this endeavor.

For you Moms struggling with perimenopausal or menopausal problems, it is not estrogen therapy you need (the medical approach), but progesterone (usually). Progesterone (a product of the adrenas) declines first (estrogen dominance) in the late 30s (a common cause of miscarriage) with an estrogen decline taking place, usually in the late forties, and then testosterone declines. Progesterone declines at 120 times the rate of estrogen decline, so the problem grows worse with time. Ask the health-store manager for information on use of progesterone cream, or if available, sublingual progesterone (90% absorption against 15% transdermally). Additional help can be had with the herbs red raspberry, chasteberry, black cohosh (may adversely affect the liver of some), and/or maca. Buy only quality herbs, preferably standardized. Ambrotose AO™ and PLUS from Mannatech are very effective in restoring this and other declining functions noted in these years. The Indole-3-carbinol of cruciferous vegetables found in Phyt•Aloe® modulates high estrogen levels. Fresh-ground flax seed (compound Linum Usitatissimum), but not flax oil, and magnesium will have a similar good effect. Since fat cells are estrogen factories, the best way to reduce estrogen dominance is a life-style change that reduces fat, especially visceral.

Vanadyl Sulfate is an insulin mimic; so, it can basically do what insulin does. It has been shown to use a different mechanism to lower blood sugar; so it spares insulin and helps improve insulin sensitivity. To really lower insulin levels, give 7.5 mg twice a day. More can be used short term.

Thyroid hormones, along with the retinol form of vitamin A, are needed to create progesterone; so, it may be better to support the thyroid and use cod-liver oil as suggested herein than to supplement DHEA. Chromium (200 mg) reduces cortisol by 47%. Vitamin E, vitamin B-complex, Panax ginseng, digestive enzymes, Transfer Factor™, even some things called arabinogalactans and glyconutrients (AmbroStart™ by Mannatech™), all build Th1 (enhances macrophage action and Natural Killer Cell [NKC] function). Aloe (Manapol™—a stabilized, standardized Aloe contained in Ambrotose®), Ambrotose®, AmbroStart™, Phyt•Aloe®, PLUS, and ImmunoSTART® (all from Mannatech, Inc.) are without peers in producing glutathione, and in modulating this function of the immune system. Arabinogalactan is metabolized to short-chain fatty acids acetate, butyrate, and propionate and reduces ammonia production. Dr. Michael Currieri, Ph. D., in his "Personal Story of Victory Over Tongue Cancer" tells how these Mannatech™ products

helped his NK Cell function improve and go from 1,027 to 51,545 NKC numbers in 30 days. Further, the anti-inflammatory effects of digestive enzymes strip away the protein camouflage of cancer cells allowing the immune system to recognize and attack the aberrant cells.

Additionally, it is known that vitamin C (1000 mg or more) seems to suppress the Th2 system and promote the Th1 system, which is why asthmatics on vitamin C have fewer and less severe attacks than those who don't take vitamin C (Trop Geogr Med 1980;32:132-7). It has also been shown that the mean vitamin C level in patients with asthma is significantly lower than in healthy controls (Afr J Med Sci. 1985;14:115-120), and that vitamin C can have a protective effect and block Exercise-Induced Asthma (Arch Pediatr Adolesc Med Vol 151, April 1997, pg 367). Nothing is as effective in restoring Th balance and natural breath function as is Mannatech Products.

Other than vaccines, Candida, and stress, what causes Th2 to be elevated? Faulty digestion, a leaky gut, over consumption of glucose (sugar) and processed foods (that weakens systemic resistance to infection), transfatty acids, a diet high in the Omega-6 fatty acids like linoleic acid (cut Canola™, use olive and coconut). All of these promote over-functioning of Th2. This makes the cell membranes porous, and very vulnerable to infection. Adrenal exhaustion or a lack of glutathione may promote a cytokine shift from Th1 to Th2. Adrenal dysfunction can lead to hypoglycemia, increased allergy symptoms, weight gain, increased menopausal symptoms, mood swings, and mental confusion. Any suffering allergies, including asthma, undoubtedly have three conditions undiagnosed: hypoglycemia, hypothyroidism, and hypoadrenocorticism. These must be corrected by temporary elimination of allergens, a low carbohydrate, high protein intake, and a supplement of nutrients chosen to support the adrenals, thyroid, and pancreas, including desiccated, whole-adrenal glandular. If not needed, the adrenal tablets may make you feel weak. **Do not use Tylenol™ (Acetaminophen™, Paracetamol™) for this will make asthma worse, and do not accept cortisone or prednisone! Tylenol™ contains a sulfite that can cause problems with those who are sulfite sensitive (PST deficient), and it drains the lungs and liver of their supply of glutathione within 30 minutes! Tylenol can use up the liver's available activated sulfate in one to two minutes, and it takes a long time to recover. Tylenol™ is the leading cause of liver failure! GSH is the body's principal agent for safeguarding against lung damage (Kim 2002). A study reported in the European Respiratory Journal showed that people with poor respiratory function have insufficient GSH. GSH and sulfate are the two substances used by the liver to detoxify the system. Do not fail to heed what you have just read! Should you feel a NSAID is necessary, use Ibuprofen™. Should you be forced to use cortisone, moderately large doses of vitamin A have an immunostimulatory effect, and can reverse the suppression produced by pharmacological agents such as cortisone.**

Dr. Eli Selfter of Albert Einstein Medical College demonstrated that in mice under heavy stress without adequate pantothenic acid (a B–vitamin), the adrenal glands enlarged and the thymus glands (which are responsible for proper immune function) shrunk. Large amounts of vitamin A and pantothenic acid restored these glands to normal size!

Additionally, vitamins B_6, B_{12}, A, C, D, E, para-aminobenzoic acid, pantothenic acid, and the minerals zinc, magnesium, and calcium aid the adrenals in conditions of hypoadrenocorticism (adrenal cortex deficiency). Pantothenic acid (300 mg), vitamin C (2000 mg), and chromium (200-400 mcg), for adults, will support the pancreas. The bioflavonoids will reduce allergic reactions to foods and other substances. Specifically, magnesium and MSM reduce allergic responses. Ensure that all these nutrients are being supplied in adequate quantities. Many find Manna-C™ from Mannatech™ to be tremendously effective in restoring normal breath and sinus function under these conditions. Use of Mannatech's Optimal Health Plan (Ambrotose AO, PLUS, and Catalyst) will help significantly.

A major cause of adrenal dysfunction is sudden, extreme or chronic, prolonged stress (and our kids are chronically stressed to breaking). We tend to think of stress as emotional, but it can be physical (e.g.,

accidents, surgery, prolonged illness or pain, and especially a toxic liver and/or congested kidneys), nutritional (long-term use of synthetic vitamins—especially ascorbic acid in high dosage—, deficiencies or excesses of nutrients, and food allergies), environmental (chemical sensitivities and allergies, metal toxicities, electromagnetic fields), thermal (prolonged excessive heat or cold), many medical drugs (especially hormones), and overwork, all of which adversely affect the adrenals.

A toxic, congested liver leads to all kinds of health problems including the accumulating of toxic metals mercury, cadmium, lead, arsenic, and antimony. The person with a congested, toxic liver is usually an allergic person. They slowly become allergic to everything, because their liver is not filtering properly! Anything entering the blood from the gut must pass through the liver. Unmetabolized molecules that should not be there end up in the bloodstream. The Immune system releases histamine and cytokines in reaction to these foreign bodies. Increasingly, your body will react to just about everything, and you will become Multiple Chemical Sensitive, exhausted, arthritic, asthmatic, and face adrenal failure if your liver is not attended. A person with a toxic liver will have all kinds of digestive problems, bilious, nauseous, diarrhea and/or constipation, gallbladder problems with stones, increased cholesterol, and more.

The first move is to "Unload the Donkey". Stop poisoning yourself with a wholly, cooked-food diet of largely processed foods, sugar, cigarettes, booze, drugs, whether street or prescription, (never take Tylenol™ [Paracetamol] as it drains all glutathione from lungs and liver within 30 minutes. Other painkillers all adversely affect the liver), and reduce your stress load as excess cortisol is damaging to the liver. This alone may be enough to cause the liver to bounce back as it is very resilient.

The foods that enable the liver to function efficiently contain biochemicals and enzymes that the liver uses to rid the blood and itself of toxins. These include lots of garlic, onions, kale, broccoli, Brussels sprouts, beets (roots and leaves), black radish, red peppers, cabbage, celery, eggplant, asparagus, eggs, organic liver, and green tea. Those are not on your plate? Then you must take the equivalent in food supplements, like Ambrotose® Complex, PLUS, and Phyt-Aloe® by Mannatech, or Livaplex™, Spanish Black Radish™, Cholacol II™, and Phytolyn™ from Standard Process (available from your natural health doctor). If dealing with Hepatitis or other serious liver condition, add ImmunoSTART® from Mannatech or Zymex Wafers™ and Betacol™. To detoxify the kidneys as well, add Albaplex™, all from Standard Process. A frequent bath using two cups of Epsom salts to the tub will supply additional necessary magnesium and sulfates to enable the Phase II liver enzymes to function. A supplement of MSM and molybdenum may be helpful in generating additional sulfates. Be aware that molybdenum and sulfate as well as vitamin C and zinc will tend to induce secondary copper deficiency; so, unless you are copper toxic, supplement 2-3 mg copper daily. Sulphites also destroy thiamine (vitamin B_1) in the body leading to thiamine deficiency when eaten in large quantities. In the USA, sulphites have been banned in meats in the since 1959. In other English-speaking countries, sulphites are permitted in sausages but have been illegal in mince for many decades.

Since you are heavily toxic, and the liver is hampered in its detoxifying ability, start these supplements at the lowest level and gradually increase to recommended amounts or you can get very sick for a short time. Old symptoms can worsen, or long-gone ones return briefly. Rest, drink lots of water, and if necessary, reduce amounts of supplements being consumed to keep this Herxheimer's reaction only mildly uncomfortable. It's better not to overload these sluggish pathways. To protect the liver itself, supplement Phosphatidylcholine.

Cortisol (also known as hydrocortisone) is the most important adrenal hormone, having many functions including: 1) Transporting amino acid building blocks of proteins to the liver where they are converted to glucose; 2) Increasing blood sugar levels; 3) Decreasing the rate at which cells use glucose; 4) Helping the body burn fats instead of glucose. If in too great supply, glucocorticoids (steroid hormones) can raise serum

glucose levels to a point where a diabetes-like condition ensues.

Insufficient cortisol output, however, is associated with many other symptoms, including: 1) Craving sweets, soft drinks, fruit juices, tobacco, marijuana, etc.; 2). Dizziness on standing up too fast; 3) Headaches, blurred vision, irritability, erratic energy levels; 4) Conditions over time such as Addison's disease, arthritis, bursitis, bronchitis, colitis, allergies, and frequent infections. This condition is often addressed by cortisol injections, but potassium supplementation would be a lot safer way of increasing cortisol than use of injections. Too much cortisol (common in people in early stages of adrenal exhaustion) increases the rate at which bone and muscle mass is lost (among the first symptoms of physical aging). Additionally, cognitive impairment, loss of brain cells, and many serious diseases, including, it seems, diabetes, cancer, stroke, heart problems, ulcers, multiple sclerosis, retinitis pigmentosa, and Alzheimer's and Parkinson's diseases, and a fat tire on your waist and hips.

To determine if you have adrenal exhaustion, have your blood pressure checked after lying quietly for five minutes, then stand up and immediately recheck the pressure. If the blood pressure reading is lower when you are standing, suspect reduced adrenal function. The degree to which the blood pressure drops upon standing is often proportionate to the degree of hypoadrenalism (low adrenal function).

Cellulite is one of the signs of potassium deficiency. Raisins can help banish cellulite. Healthy adrenals need ten times more potassium than most of us get in a day. Depending upon its size, a banana has 370 to 600 mg (370 mg per 100 grams). That is excellent, but raisins have 763 mg per 100 gram! (Patrick Holford, UK Nutritionist.) Supplements have only 99 mg!

Dr. Wm. Shaw reports instances of severe yeast overgrowth (indicated by high arabinose readings) causing severe hypoglycemia and pancreas damage. He finds low blood sugar in instances of fibromyalgia where yeast overgrowth is common. If the amino acids threonine, glycine, and serine are all low, it may indicate hypoglycemia. Yeast overgrowth is a serious condition that Dr. Shaw has correlated with high oxalate and acetaldehyde levels that poison your child and quite possibly yourself. Yeast also produce serotonin and may interfere with normal neuroregulation. (Candida albicans As a Producer of Serotonin. Sokoloff, etal., Growth, 1967;31,297-300.) Restoring intestinal flora balance must be addressed aggressively.

A "Journal of Allergy and Clinical Immunology" article from McGill University and the Institute Pasteur in France says, "A new study has found additional evidence that a chemical involved in inflammation may play a role in asthma. The study found more of the chemical known as Interleukin 9 (IL-9)." IL-9 is one of those Th2 substances that gets overactive, suppresses Th1, and you wind up with asthma. They believe that if you can lower IL-9 this is going to help treat, and even prevent, asthma. It says, "Interleukins have been known to play a role in regulating the immune system, and in particular, to be responsible for causing the early stages of inflammation." They found that if you can lower the Th2, especially these Interleukins, and boost Th1 with all the nutrients we've been speaking about, they're going to help dramatically in the management of a wide range of illnesses, including multiple sclerosis, psoriasis, rheumatoid arthritis, inflammatory bowel disease, AIDS, Chronic Fatigue, Candida, multiple allergies, multiple chemical sensitivities, hepatitis, Gulf War Syndrome, cancer, and other autoimmune diseases, like autism. Just the elimination of Candida has been found to cure a third of all eczema, irritable bowel, some asthma, joint pains, and virtually all psoriasis.

Cytokines (hormone messengers secreted by immune cells), actively transported into the Central Nervous System (CNS), play a key role in this immune activation. It was recently observed that cytokines activate astrocytes and microglia cells (immune system cells in the central nervous system and brain) that in turn produce cytokines by a feedback mechanism. Where T-cells are over stimulated, they produce large numbers and amounts of cytokines that cause inflammation in the body, muscular pains, headaches, and often malnourishment and weight loss. The

free radical damage to "self" is great. Rosemary Waring (2001) outlined the possibility that cytokines, which are peptides produced in inflammatory processes, may be responsible for low sulfate levels. It was found that autistic children often have high cytokine levels, and this would have the indirect effect of greatly reducing the production of sulfate. Children with autism were found to excrete roughly twice as much sulfate in their urine so that they had only 1/5 the normal level of sulfate in their bodies. (Tumor Necrosis Factor is elevated in many, which can inhibit the conversion of cysteine to sulfate. Many enzymes are impaired when sulfate is low, and the ability to detoxify heavy metals and phenols is severely impaired. Additionally, red blood cell formation is inhibited, reducing oxygen to cells—WSL). Moreover, cytokines strongly influence the dopaminergic (dopamine), noradrenergic (noradrenaline), and serotonergic (serotonin) neurotransmission. There are indications that neuronal processes can activate the cascade of cytokines. These findings close a theoretical gap between stress and anxiety and their influence on immunity (they greatly lower the natural-killer-cell function). "When we are fit and healthy it means our bodies are working properly and keeping the germs and bugs at bay. It is only because the immune system falls down that we get ill," said Michael Endecott, research director of the Institute for Complementary Medicine in London.

"Low plasma Cysteine, a sulfur-containing amino acid that metabolizes to sulfate, is commonly seen in autism. When cysteine is as low as reported above, it seriously limits the production of sulfates, glutathione, and metallothionein, all dependent upon available cysteine. This results in increased oxidative stress, lowered immune function, neurotransmitter dysfunction, vagal nerve dysfunction, accumulation of heavy metals, especially lead, cadmium, and mercury, and viral persistence, all commonly seen in autism. Repairing this damage is key to recovery"—Dr. Jeff Bradstreet. One must not supplement cysteine arbitrarily as it may be in excess, and that is severely toxic, especially for the zinc deficient.

Gluten (from grains) and casein (from milk) have immune and neurotransmitter impacts. Therefore, they have the ability to cause immune dysregulation and neurotransmitter imbalance. In experimental studies, opiate drugs such as morphine have been found to bind to brain opioid receptors and this binding leads to decreased glucose (sugar) utilization and decreased metabolic rate. In other words, substances that bind to opioid receptors in the brain slow the brain down. The one finding that stands up in the brains of autistic children is that the brain is slowed down (metabolically less active) as shown by decreased blood flow, especially in speech areas. Chemicals in the diet that slow the brain are Barley Malt, the raw material for making beer, and vinegar. Malt contains twenty chemicals that slow the brain, and vinegar also contains such chemicals—Dr. Bruce Semon MD, Ph.D, Website.

Opioids decrease T-cell proliferation via the mu-receptors, and this may cause a mild, immune suppression. Opioids can increase levels of gamma interferon also. When an opioid molecule attaches to a receptor in which it "fits", adenylate cyclase is inactivated leading to a decrease in intracellular Cyclic AMP (cAMP). Magnesium deficiency reduces 3',5'-cyclic adenosine monophosphate (cAMP) concentration and increases 3',5'-cyclic guanosine monophosphate (cGMP) concentration, perhaps through inhibition of adenylate cyclase and activation of guanylate cyclase. Cyclic AMP is an important messenger system in the brain and body. When intracellular cAMP levels have been lowered because of constant (inappropriate) stimulation of opioid receptors on the cell surface or due to a magnesium deficiency, less tryptophan hydroxylase is phosphorylated, and therefore more of the enzyme is inactive. When this happens, tryptophan is not converted into serotonin, but is shunted down alternate pathways, eventually leading to urinary IAG (indolyl acryloyl glycine) and 3-indoleacetate. It is reported this affects 93% of autistic children. Urinary excretion of IAG in 15 normal subjects was significantly increased in June-September against the November-April collection in the same subjects. Elevated levels of IAG are also found in Hartnup's and SAD (seasonal depression from darkness).

Organo-phosphate pesticides cause paralysis by inhibiting certain enzyme systems. One of these pesticides,

Diazinon, has been shown to seriously interfere with the metabolism of tryptophan in a way that might force tryptophan metabolism towards the IAG route. Are these pesticides contributing to the increased IAG in the urine samples from the majority of people with autism and related disorders? In England, about 80% of those with autism or ADD/ADHD have high IAG levels. Increased IAG could contribute to increased intestinal permeability (leaky gut), and perhaps increased blood-brain barrier permeability. In animals, high opioid levels cause indifference to mother and others in the family.

When a foreign substance enters the body, the immune system produces antibodies against it. These antibodies are grouped into biological categories called immunoglobulins. There are five classes (IgA, IgD, IgE, IgG, and IgM) each responsible for a specific role in the immune response. Often, one or more of these classes of antibodies will be low in number or missing. This leaves one vulnerable to disease or allergy. At the humoral level, the newborn has low or nonexistent levels of the immunoglobulin antibodies IgM, IgE, and IgA. The neonate is born with IgG antibodies acquired from the mother that confer protection from some specific diseases. There is a slow rise of immunoglobulin levels after 3 months of age to levels of older children.

Immune B-cells secrete these antibodies that bind with the foreign antigen and produce red-cell lysis (disintegration), inactivate the virus, or produce bacterial phagocytosis (consumed by macrophages). Most autistic children have delayed allergic reactions to some foods (show high IgG), and/or immediate, strong reactions to foods, inhaled pollens, or mold (high IgE). These allergic reactions disrupt normal immune balance and alter interleukin-2 levels exacerbating their symptoms. IgA is normally secreted into the digestive tract in response to incoming food. IgA protects the mucosal surfaces of the mouth, nose, throat, gastrointestinal tract, ears, and the eyes. Low levels indicate mucosal immune deficiency, serum antibody to food allergens, and autoimmune disease indicating a need of vitamin A and colostrum. Conversely, high levels of IgA indicate bacterial overgrowth, enterotoxins, and viral infection. Findings of elevated IgG, IgA, IgM, and decreased levels of IgE have been observed in patients with high, hair levels of nickel. Elevated IgG and IgM levels against formaldehyde, trimellitic anhydride, phthalic anhydride, and benzene are seen. These levels were usually higher in persons with elevated T4/T8 ratios, noted in almost 15% of the exposed patients.

A Mom writes: "My son tested positive for formic acid (formaldehyde), (extremely high levels that had to be reported). Another doctor tested some of his patients and found trace levels in his Gf patients, higher levels in his Gf/Cf patients, and higher levels in his non-Gf/Cf patients. He also had a few that tested negative, but their general toxic profiles were also cleaner. We found that formic acid is used as an anti-fungal in all silage grains, even organic grains! It could be that the GF kids were lowest because they were drinking regular milk where CLA, a naturally occurring FA, keeps formic acid levels low. The Gf/Cf kids would then be expected to be higher.

Is Gf diet working because a formic acid (formaldehyde) source is removed? Perhaps, but grains are also high in other anti-nutrients, lectins and phytates (IP-6), that, respectively, irritate the gut and bind nutrients. Is Gf/Cf also removing exposure to calcium propionate (an Australian study recently proved to cause hyperactivity and irritableness) used in breads? Formaldehyde causes sleep disorders and yet, "wrinkle-free" sheets and pillow covers are treated with it! Formaldehyde is cleared by the Phase I liver enzymes, and pantethine enhances a cytochrome p450 enzyme that detoxifies formaldehyde. Pantethine thus counteracts brain fog, certain allergic sensitivities, and some consequences of alcoholism. In people with alcoholism and Candidiasis, the enzyme fights off a toxic byproduct called acetaldehyde. This may be contraindicated in children with PST.

Is Gf diet working because a new, but related substance, lectin, is being removed? Lectins are a class of proteins that are found in common foods like corn, dairy, chicken, peas, bananas, beans and legumes (reduced when soaked and cooked well-done), soy (fermenting reduces), potatoes, pomegranate, nuts, cantaloupe, tomatoes, seafood, and grains (wheat, millet, rice, and many more – reduced by sprouting). Although these

foods contain a variety of very healthful nutrients, their potentially dangerous lectins can be a problem unless properly prepared. Microbes, also, carry lectins and use them for attachment to host cells. The human body contains beneficial lectins: 1) On the vascular endothelial linings (selectins) in order for blood cells to escape into the tissues; 2) In the liver to capture microorganisms, and 3) As opsonins, substances that coat foreign antigens, making them more susceptible to phagocytosis (the process where immune cells digest and destroy foreign invaders) by the white blood cells. C-reactive protein (CRP) and mannose-binding protein (MBP – also MBL – mannose-binding lectin) are two examples of opsonins. Lectins are also called agglutinins because, in their binding to many cell surfaces, they cause agglutination (cell clumping in the blood) and reduced circulation.

For those not getting enough sun, take note: Mellanby routinely induced experimental rickets in puppies by feeding them an **oat** diet. Epidemiological studies of human populations consuming high levels of unleavened, whole-grain breads show vitamin D deficiency and rickets to be widespread. A study of radio-labeled, vitamin D in humans consuming 60g of wheat bran daily for 30 days clearly demonstrated an enhanced elimination of vitamin D in the intestines.

Lectins bind to vital sugars (or "glyconutrients" - particularly mannose, fucose, sialic acid, and n-acetylglucosamine) robbing the body of these sugars and acting to either block or activate the "sugar" receptors. They contribute to arthritis by creating a deficiency of the glycosaminoglycans, which contain glucosamine. Further, **salicylates can contribute to a deficiency of these vital sugars because they depress the body's synthesis of these sugars. A combination action of salicylates making one more vulnerable to lectins by depressing xylose (a vital sugar) production, followed by the lectins binding to a now-exposed sugar is seen.** Similarly, the lack of a galactose molecule at the end of the IgG molecule exposes another glyconutrient, N-acetylglucosamine. NAG is capable of binding to mannose-binding proteins circulating in blood plasma, which subsequently causes a cascade of inflammation reactions in rheumatoid arthritis (RA). A deficiency of these sugars makes one more vulnerable to effects of lectins that are probably best described as pharmacological. Conversely, supplementing with these vital sugars can protect against lectins by binding them before they latch on to the cell receptors and by binding to their own receptors, preventing the hijacking of the site by lectins. Providing extra mannose or galactose, to block the effect of MBP in the blood, will inhibit this inflammatory cascade.

Generally, comparative trials are not conducted by Monsanto's GM (genetically modified foods) testing. One field trial did grow GM and non-GM plants next to each other, but this data was not included in the paper published. Years afterward, the original test data was revealed and showed that Monsanto's GM soy had significantly lower levels of protein, in particular the essential amino acid, phenylalanine, and of fatty acid. Also, toasted GM-soy meal **contained nearly twice the amount of a lectin**—a substance that may interfere with the body's ability to assimilate other nutrients and cause inflammation of the gastrointestinal surfaces. Additionally, the amount of trypsin inhibitor in cooked GM soy was as much **as seven-times higher** than in a cooked non-GM control! Beware of GM-foods and particularly avoid all soy (unless fermented, non-GM varieties).

Fucose, another glyconutrient, is also depressed in RA patients. As with galactose, the less fucose, the more severe the disease. The discoveries concerning galactose, mannose, and fucose suggest that a beneficial therapy for rheumatoid arthritis and other inflammations would be miminizing of salicylates in the diet and ingestion of higher levels of these glyconutrients by using Mannatech's Ambrotose$^{(R)}$, the only such supplement available.

Saliva contains a hormone, epidermal growth factor (EGF), which binds to the EGF-R (receptor). So, when you swallow saliva, you swallow a hormone (EGF) that facilitates gut healing when it binds the EGF-R. WGA (wheat-germ agglutinin) binds to the EGF-R in the gut preventing healing and mucus formation. It then passes into systemic circulation. Once WGA is circulating in the bloodstream, it has the capacity to gain entry into any cell

expressing the EGF-R. WGA has effects on activation of the epidermal growth factor receptor, mitogenesis, agglutination of red blood cells, activation of platelets and cell adhesion molecules, and on vascular permeability. WGA also has several effects related to autoimmunity, allergy, and inflammation. WGA binds to several types of mammalian cells including pancreatic-duct epithelial cells, prostatic cancer cells, arterial macrophages, arterial smooth-muscle cells, glomerular capillary walls, and mesangial cells and tubules of human kidney. Chew your foods well. Don't sip a drink when eating breads.

Human serum contains antibodies against WGA and the lectins of soybean and peanut. Hence, lectins have sufficient properties to affect the leptin (a hormone made by fat cells that regulate appetite) system indirectly through effects on metabolism central to the proper function of the leptin system, and possibly also directly through interaction with leptin or the leptin receptor. Leptin resistance tends to high leptin levels, increased appetite, and weight gain. On the contrary, a high leptin sensitivity will shut down the appetite and contribute to underweight and failure to thrive.

Raw, cow's milk is a rich source of epidermal growth factor (EGF). In contrast, the processing of milk to make fermented-milk products will greatly reduce or destroy EGF, as it is unstable when exposed to heat, light (avoid clear plastic bottles which causes losses of vitamin D and EGF), and acidity. By ingesting raw, cow's milk, one would be directly dosing with EGF, which then could compete with and displace WGA from the EGF receptors. Further, EGF from raw, cow's milk would facilitate gut healing leading to a reduction in the number of EGF receptors elicited by the destructive effect of WGA on the gut lining. The net effect of additional EGF from cow's milk would be to impede entry of WGA into the bloodstream thereby improving vitamin D metabolism, which in turn would reduce the incidence of rickets. The EGF in raw milk counters the rickets producing effects of WGA from whole-wheat consumption. You see why we traditionally put milk on cereal?

When we eat foods containing these proteins, we invite lectin attachments to the structural carbohydrates (vital sugars, and their receptors) found on the gut and immune-system cell surfaces. Our genetic make-up and state of health will determine the lectins we are sensitive to, and how we react to them. Many people may not feel any digestive disturbances, but that does not mean that they are not being affected for damage may be cumulative and show up as pathology years later. Lectins attaching to the gut initiate inflammation that may express in other parts of the body. The important point is that some of the lectins consumed in everyday foods act as chemical messengers that can, in fact, bind to the cell-surface sugars in the gut, and in the blood and tissues, initiating an inflammatory response. In wheat, gliadin, a component of gluten and an iso-lectin of wheat germ agglutinin (WGA), is capable of activating NF kappa beta proteins which, when up-regulated, are involved in almost every acute and chronic inflammatory disorder including neurodegenerative disease, inflammatory bowel disease, and both infectious and autoimmune diseases. Because wheat has been selected for higher protein (doubling the gluten), WGA needs more recognition as an important dietary problem. Scientific literature shows that dietary lectins can dramatically reduce natural killer (NK) cell activity directly and through disruption of intestinal flora.

An additional secondary toxic effect of lectin, particularly PHA (found in beans), in the small intestine, which may further reduce the efficiency of digestion and absorption of food, is a dramatic overgrowth of coliform bacteria (Wilson et al., 1980; Pusztai et al., 1993a; Bardocz et al., 1996). The mechanism by which lectins promote proliferation of coliforms, mainly Escherichia coli (E. coli), is not fully understood. However, it has been established that, in relation to PHA, the bacterial proliferation arises primarily as a result of its effects on epithelial cell metabolism (Pusztai, 1991; Pusztai et al., 1995). Indeed PHA-mediated mucus secretion, epithelial cell loss, serum protein leakage, and reduced digestion of dietary protein possibly further aid bacterial proliferation by providing a good source of nutrients (Grant, 1999). In consequence, the increase in bacterial numbers in the small intestine may lead to overproduction of bacterial toxins, which also contributes to the worsening of animal health. The fact that we possess these cell-surface sugars, such as N-acetylglucosamine, fucose, mannose, and others, means that certain lectins that bind to those sugars (and their receptor sites) will affect us all (to different degrees).

Lectins from the diet damage the delicate intestinal lining (the microvilli), and negatively influence gut permeability and protein digestion.

Glucosamine and Plant Lectins in Autistic Spectrum Disorders: An Initial Report on Six Children with Uncontrolled Diarrhoea Authors: Danczak E. MB BS BSc Dip OccH a; H. Dip a
Results: Five of the children had relief of diarrhoea, the sixth had no change in bowel habit but ate bread containing gluten without any change in behaviour. Conclusion: Gluten contains a plant lectin that binds glucosamine. Glucosamine also binds to potato lectin (Solanum tuberosum agglutinin, STA) in the same manner and may protect the gut in responsive children. This is reflected in a change in bowel habit, indicating a possible protective activity.

Researchers have long known that ingesting too much undercooked, lectin-bearing foods (especially rice and beans) can cause nausea, diarrhea, and vomiting ("Musta been something I ate"). What they didn't know was how lectins cause this food poisoning. Some lectins are resistant to cooking. As a side note, soaking beans overnight before cooking them reduces the lectin content dramatically. Most people do not know why beans prepared this way makes them easier to digest, but it is simply because the water-soluble lectins have been largely removed through the changing of the water during soaking. Organic, sprouted-grain, bread products (with no added gluten) appear to be the safest and healthiest way to reap the nutritional benefit of grain without the lectin burdens. Modern wheat contains far more lectins, as does GMO grain products (double amounts). Work published in PloS One shows that lectins disable GI-tract cells (as mentioned above concerning saliva), which are constantly bombarded while digesting food, preventing them from repairing tears in cells walls caused by all the activity. Repair normally occurs in seconds: prompted by EGF, internal membranes move up to patch the tear, the cell recovers and the one-cell layer lining of the GI tract remains intact. "If those individual cells cannot repair tears, they die," says Dr. McNeil. "That means you have gaps in the integrity of the surface area of the epithelium (leaky gut) and you are exposing the nasty, internal world of your GI tract to your blood supply." The epithelial lining is a continuous, natural barrier between the digesting food in the GI tract and the blood supply. When intact, it allows only good stuff, like fully-digested nutrients (no peptides), to pass through.

When damage is severe enough, "Your body senses that lack of barrier function and tells you to eliminate the entire contents of the GI tract," says Dr. McNeil, noting that lectin's apparent role as a natural insecticide and as a source of food poisoning are related. "If you get vomiting and diarrhea you are going to eliminate the entire contents of your gastrointestinal tract… And, you are not going to eat red beans again the next day, right?" The scientist, who first identified how injured cells patch themselves, says lectin blocks this repair mechanism better than anything else he's seen. Interestingly, he and his colleagues showed in PloS Biology in 2006 how roughage -- which includes beans -- help people stay 'regular' by causing more cell tears, which enables more mucus to escape from cells, essentially greasing the GI tract. Avoid dosing with insoluble fiber like wheat bran.

That same research team, which includes Dr. Katsuya Miyake, MCG cell biologist, and Dr. Toru Tanaka, pharmacologist at Josai University in Japan, has now shown lectin is also very good at blocking mucus expulsion from cells. In fact, they discovered lectin's role in stopping cell-patching and mucus release while researching roughage. The multipurpose lectin is a powerful stain the team used to look at mucus released by cells after tearing. They found if they used too much lectin there was no patching or mucus, just cell death.

Lectins are capable of being actively transported across the intestinal membranes into the general circulation where they attach to sugars coating other tissues (connective, nervous, bladder, glandular) causing immune dysfunction and systemic inflammation. Additionally, they contribute to food sensitivities (or food intolerances), and provoke the immune system to make antibodies against them.

The effect of plant lectins transversing the gut barrier is not limited to antibody production but can also

trigger histamine release from basophils (Haas et al., 1999). Both oral and intranasal delivery of five plant lectins, LEA, ML-1, PHA, WGA, and UEA-1, stimulated the production of specific serum IgG and IgA antibodies after three intranasal or oral doses. Accordingly, 16 common lectins, particularly ConA, PHA, PSA, SNA and LCA (Lens culinaris; lentil) were able to induce human basophils to secrete interleukin-4 (IL-4) and IL-13, the key promoters of Th2 responses and IgE synthesis. Since lectins can enter the circulation after oral uptake, they might play a role in inducing the so-called early IL-4 required to switch the immune response towards a Th2 response and type I allergy.

Lectins are chemical messengers potent enough to initiate and aggravate existing inflammatory conditions including autoimmune diseases (such as, thyroiditis, lupus, rheumatoid arthritis, scleroderma, fibromyalgia, Type I diabetes, and pemphigus). Lectins affect metabolism by mimicking hormones like insulin, and blocking digestive hormones like cholecystokinin (CCK) and secretin. This leads to an increase in appetite and impair the release of digestive enzymes, potentially contributing to weight gain (CCK is a hormone involved in appetite control). All of the hormonal influences on metabolism are affected by insulin, and thus, by lectins. In many people, lectins found in lentils, green peas, corn, and potatoes, but especially wheat germ agglutinin (WGA), are known to bind to the insulin receptor giving the fat cell the same message that insulin gives, namely to make fat. The lectin, unlike insulin, due to a lack of feedback inhibition, remains indefinitely attached to the receptor giving the cell a constant message to make fat!

Lectins overstimulate polyamine production in the gut, which decreases the natural-killer-cell population and contribute to bad-breath. Polyamines are endogenous growth factors that can overstimulate growth in the digestive organs. Studies with animals that were fed lectins show increases in the size of the intestines, pancreas, and liver.

Potato lectin activates and degranulates both mast cells and basophils by interacting with the chitobiose core of IgE glycans. Higher intake of potato may increase the clinical symptoms as a result of non-allergic, food hypersensitivity in atopic (allergy prone) subjects. The release was inhibited specifically by oligomers of N-acetylglucosamine that bound the lectin, and correlates well with serum total IgE levels (R(2) = 0.923). - PMID: 17362264. Potato lectin also binds some bacterial cell wall oligosaccharides containing N-acetylglucosamine and N-acetylmuramic acid.

Some lectins induce body fat catabolism and glycogen loss, leading to depletion of the body reserves (Grant et al., 1987, 1995). Dietary PHA (beans), for instance, induces an increase in body lipid utilization. A direct correlation between dietary PHA and increased amounts of urinary 3-hydroxybutyrate output of rats was observed, providing a strong evidence for the occurrence of a PHA-dependent, increased lipolysis (Oliveira et al., 1988). The lipid depletion occurred primarily from the adipose tissues whereas little change was observed in liver lipid levels. In contrast, the glycogen content of the liver was halved whereas the glycogen concentration in skeletal muscle was not significantly affected (Oliveira et al., 1988; Pusztai, 1989). According to Pusztai et al. (1998), ML-1 reduced body fat reserves, probably through depression of circulating insulin levels.

Dietary PHA also alters the rate of muscle protein synthesis without significantly affecting the rate of protein degradation, resulting in loss of muscle weight (Palmer et al., 1987). It is possible that PHA circulating lectin may have interacted directly with muscle cells leading to impairment of protein synthesis (Pusztai et al., 1989). Alternatively, this effect may have been indirect and hormonally mediated (Pusztai, 1991). Moreover, increased concentration of urinary N (mainly urea-N) was observed in PHA-fed rats suggesting disturbances in the protein metabolism (Oliveira et al., 1988). Increased activities of liver glutamic pyruvic transaminase (LGPT) and glutamic oxaloacetic transaminase (LGOT), indicative of increased catabolism of amino acids in the liver, were also observed when increasing amounts of dietary PLA (Phaseolus lunatus;
lima bean) were fed to rats (Aletor and Fetuga, 1985).

In summary, dietary lectins seem to interfere with the overall metabolism of body lipids, protein, and carbohydrate (Pusztai, 1991; Grant, 1999). Such effects may have a bearing upon hepatomegaly; if so, such adverse effects upon this key organ would certainly contribute to the overall toxicity of dietary lectins.

Since lectins have the ability to bind to amino sugars (glycoproteins) in the gut and on the intestinal cell surfaces, by consuming an array of these friendly sugars (no longer in abundance in our diets), which are part of our digestive makeup, "sacrificial" molecules are present to bind lectins and keep them from sticking to our cells, where they cause damage. Supplementing with these sugars at the start of a meal allows for the binding of potentially harmful lectins and their elimination through the gut. Besides this all-important lectin binding, the sugars support health in numerous other ways outlined herein.

Mucins are a family of heavily glycosylated proteins that protectively line the digestive tract; thus, they have been called digestive gatekeepers. Saliva contains mucin, which moistens and lubricates the food we eat. The dense "sugar-coating" of mucins makes them resistant to protein breakdown, which may be important in maintaining mucosal barriers in the gut. Mucins protect against yeast, bacteria, and food sensitivities. Mucin has lectin-binding capacity. It contains the sugars (mannose, fucose, N-acetylglucosamine) that lectins like to stick to, including Sialic (N-acetylneuraminic) acid. Researchers at Kumamoto University, Japan discovered that **N-acetylneuraminic acid blocks the release of histamine in respiratory allergic reactions** also. Okra, a vegetable, provides a rich source of lectin-binding, protective mucilage. It helps protect the digestive tract from lectins and harmful microorganisms. Like the other sugars discussed above, it also helps remove existing lectins that are already attached to cells. Okra, in combination with the proteolytic enzyme pepsin, may help clear away excess mucous formed in the digestive tract as a result of food intolerance or food allergy, thus allowing for better absorption of nutrients. Okra is often beneficial for ulcers, colitis, malabsorption, and other intestinal problems. It essentially helps to cleanse the intestine.

N-acetylglucosamine (NAG) is the very specific form of glucosamine that binds the disruptive lectin called wheat germ agglutinin (WGA), and the potato lectin (STA). NAG is a glycoprotein contributing to the total glycosylation of the human body, which plays an important role in optimal body structure and biological functions like immune regulation, inflammation, and cell signaling. This form of glucosamine is the most

effective for lectin-binding. One of NAG's most interesting abilities is its tendency to suppress the anti-Secretin effects of the lectin WGA. Secretin is a digestive hormone that stimulates the pancreas to secrete pancreatic juice. The lectin WGA has been shown to inhibit Secretin production by about 57%. However, administration of N-acetylglucosamine completely suppressed this effect!

Fucose is capable of binding to lectins and also to microorganisms such as viruses, bacteria, and yeast. Fucose receptors are favorite sugar-attachment sites on the surface of cells for Helicobacter pylori (the bacteria responsible for ulcers and gastritis) and Candida albicans. Microbes like these must be able to attach and anchor themselves to cells in order to become a problem. These sugars can help prevent re-infection by H. pylorri and many gram-negative bacteria, which cause bladder infections, by flooding the bacterial, lectin receptors, thereby preventing adhesion, the first step needed for infection. Therefore, supplementing fucose, mannose, and NAG (found iin Advanced Ambrotose^{R} by Mannatech) is an anti-attachment therapy.

Recurrent infections and allergies are an indication of deficient IgA. Secretory IgA (sIgA) levels are elevated in the presence of infection or overgrowth of unwelcome germs, but are depressed if the infection or overgrowth is excessive. The incidence of selective IgA deficiency is 10 times higher in those with celiac disease than in the general population. IgA protects the mucus membranes of the body; thus minimizing allergies. Comprehensive stool analysis often finds below normal levels of Secretory IgA's in the gut. One of the first things you want to do is to balance these Secretory IgA's so as to protect the first line of defense in the intestinal tract. Tribes that live mainly on animal protein have the highest levels of IgA, and they almost never have infections according to Wolfgang Lutz who wrote the book on the myth of carbohydrate. "Secretory IgA (sIgA) can be managed with the introduction of friendly yeast called Saccharomyces boulardii. This beneficially raises complement activation, macrophage activity, and increases sIgA. It is also able to prevent adhesion and development of Candida albicans. Dosing is important as too enthusiastic a programme can have detrimental effects on behaviour."—Dr. Mike Ash, DO, ND, in Issue 13, The Autism File (UK). S. boulardii also protects against Clostridia difficile and cholera, inactivates bacterial toxins, inhibits diarrhea, releases beneficial polyamines, and supports the establishment of friendly bacteria by providing a lactic-acid environment (this is vitally important if on Gf/Cf diet); thus, it helps to restore nutrient production and absorption capacity. S. boulardii stimulates numerous intestinal brush border enzymes to maintain normal digestive functions, secretes many factors including enzymes that may reduce dietary protein allergies following gastroenteritis and polyamines that stimulate brush border hydrolases, proteases, and transport carriers. It stimulates D-glucose and sodium absorption and produces short-chain fatty acids such as butyrate and acetate that nourish colon mucosa. S. boulardii enhances the numbers of healthful bifidobacteria in the colon while simultaneously suppressing populations of pathogenic clostridia. A high-count probiotic supplement such as GI-Pro™ (Mannatech™) or Pro-Bio Gold™ (Kirkman) would support that goal. Some claim to get better results with Kyo-Dophillus™ (Wakunaga), a human strain of Acidophilus. Any probiotic must have at least four-billion count and guarantee count to the expiration date. GI-Pro^{R} supplies a 4-billion count of three bacteria, total: 12 –billion count, and guarantees potency of live bacteria to expiration date.

IgA is found at very high levels in colostrum. The use of Bovine Colostrum should be very productive in overcoming these chronic infections and allergies, and should be preferred to repeated courses of antibiotics. When there is active infection, take a dose of colostrum every four hours around the clock until symptoms are fully cleared. Consistent use of colostrum for three months will normally shift the immune function back to a normal Th1 dominance. Transfer Factor has this effect also according to Dr. Ken Bock, MD, of Rhinebeck, N.Y.

Celiac disease, which is sometimes referred to as Celiac Sprue, Sprue, or gluten intolerance, makes it difficult for the body to properly absorb nutrients from foods. Symptoms include various intestinal difficulties, recurring abdominal bloating and pain, nausea, anemia, gas, tingling numbness in the legs, sores inside the mouth, painful skin rash on elbows, knees, and buttocks, cramping, hives, joint/muscle pains and

aches, diarrhea, and constipation, among others. Untreated, celiac disease more than doubles the risk of contracting certain stomach cancers. It is interesting to note that diseases that can be associated with celiac disease include lactose intolerance, dermatitis herpetiformis, insulin-dependent diabetes mellitus (IDDM), systemic lupus erythematosus, thyroid disease, and autoimmune disorders. In fact, if you have dermatitis herpetiformis (an itchy, blistery skin problem), you have celiac disease. Additionally, children with celiac disease will have pale, foul-smelling, bulky stools, and suffer painful abdominal bloating. They fail to grow and have iron-deficiency anemia. Adults often have the same symptoms. A new study published in the July issue of the American Journal of Gastroenterology by Dr. Vincenzo Toscano and colleagues at the Universita La Sapienza in Rome indicates that adolescent patients with celiac disease have elevated levels of anti-thyroid and anti-pancreatic autoantibodies.

"With celiac disease, we could never understand how a big protein (peptide) like gluten was getting through to the immune system. Now, we have the answer," explains Dr. Fasano. "People with celiac have an increased level of zonulin, a protein which opens the tight junctions between the cells causing leaky gut. In essence, the gateways are stuck open, allowing gluten, casein, lectins, and other allergens to pass into the blood. Once these allergens get into the immune system, they are attacked by the antibodies," adds Dr. Fasano. Research with diabetic rats supports these findings, Fasano added. In these animals, the intestinal lining becomes more permeable **before the autoimmune process begins**, suggesting that zonulin may be responsible for the onset of Type I diabetes as well. People with untreated celiac disease are at increased risk for other autoimmune disorders such as diabetes, connective tissue diseases, some types of thyroid disease, and hepatitis. In addition to Clostridia difficile, Vibrio cholerae, and Bacteroides fragilis, gliaden (a component of gluten) has been found to induce this increased level of zonulin! This understanding now replaces "cellular mimicry" or "innocent bystander" theories of autoimmune diseases and provides for an effective way to deal with autoimmunities.

Shan simulated the digestive process, exposing gliadin to digestive enzymes in vitro. She identified a protein fragment made up of 33-amino acids that resisted further digestion, and whose structure was known to be toxic. Most proteins are broken down into small peptides - two and six amino acids or single amino acids. The study was repeated in rats and in test tubes using tissue taken by biopsy from patients undergoing unrelated medical care. "Even with prolonged treatment (exposure to intestinal enzymes), the peptide doesn't lose the ability to induce the inflammatory response," Shan said.

Looking more closely at the large gliaden fragment, they found that it was made up of smaller fragments already known to induce human T-cells to attack the intestine. The team in Norway measured the ability of the fragment to induce autoimmune activity. "The response by T-cells was 10 to 20 times higher than to the smaller peptides that make up the fragment," Shan said.

Because the fragment is rich in the amino acid proline, investigators reasoned that a peptidase (an enzyme that breaks down proteins) with the ability to digest proline-rich chains might be able to break down the gliadin fragment rendering it harmless to celiac patients. They have shown that this is the case in test tubes and in rats. "We think that this mode of therapy – peptidase supplementation – may offer hope in treating celiac sprue." If so, it will successfully treat other autoimmune diseases. Kirkman makes an enzyme supplement that may help.

If you are gliadin sensitive, and are off of the foods for 3-6 months, parasites can be activated that were once hiding in the "holes" as there can be mucous plugs that prevented their identification previously. So, if a patient gets very sick and has various symptoms after a bout of feeling great being off gliadin, suspect

parasites and test accordingly.

One additional bit of advice: Never, ever let a child be vaccinated if he has had a recent infection/sickness, or is prone to repeat infections with the related antibiotic courses. Early and high frequency rates of ear infection are associated with greater severity of autism (J Autism and Dev Dis 17:585,1987). The children who have had three or more antibiotic courses have a 4-times higher rate of adverse vaccine reaction. It is the ones vaccinated while suffering an infection, or after a recent infection, that often regresses into autism. **Be warned.** It all has to do with the immune function. Never accept a vaccine containing Thimerosal™ (don't believe the doctor, demand to see the insert), and never accept more than one shot per day. To pump ten viruses with the related mercury, aluminum, and other toxins into a child at one sitting is asinine and stupid, and should be criminal!

Yeast species like Candida are known to induce immune changes and to produce neurotoxins, and most autistic children have yeast problems. Yeast binds the B-vitamins, and in absence of Bifidus flora, creates subclinical pellagra and beriberi. Additionally, an underactive thyroid generates a B-vitamin deficiency causing homocysteine levels to skyrocket. This lack of B-vitamins, particularly vitamin B_6 will interfere with the production of serotonin, melatonin, and other important neurotransmitters that control behavior—so normal brain chemistry in the presence of yeast overgrowth or hypothyroidism is unlikely. However, r**esearchers at the Cleveland Clinic corrected thyroid function and saw homocysteine levels normalize on their own, without any need for folate, B_6, or betaine supplements.** Clostridia, found in approximately 20% ASD patients, and other harmful bacteria, also cause neurotoxic effects. These immunological changes (altered interleukins, cytokines, histamine, neuro-hormones, and other immune factors) affect brain chemistry, especially in the cerebellar and sensory components of the brain, and most autistic children have altered sensory perception. Reactions to clostridial toxins in mice suggest that it enhances glutamate efflux, leading to seizure and hippocampal neuronal damage.

Many studies show that a high level of glutamate causes motor disturbances and changes in seizure threshold. Komulain and Tuomisto (1981) found that methyl mercury, even in low concentrations, inhibited the reuptake in synaptic nerve endings in the brain of the neurotransmitters dopamine, noradrenaline, and Serotonin exposing them to destruction. This would be both excitotoxic and tend to deplete the available neurotransmitters. The possibility of each of these imbalances should be examined, and, if present, corrected. Taurine counteracts the actions of glutamate and cysteine sulfinic acid. Amino acid levels in plasma were measured by amino acid auto-analyzer in 130 convulsive children. The levels of taurine, serine, and tryptophan were significantly lower in convulsive children as compared to normal controls; in contrast, isoleucine, homocystine, GABA, histidine, arginine, and ammonia were higher.

Drugs that block dopamine and serotonin receptors (e.g., risperidone), or inhibit serotonin transport (e.g., Clomipramine) have been used to treat ritualistic and self-injurious behaviors in autistic individuals. Autistic children, particularly those with severe hyperactivity and stereotypes, were found to have excess dopaminergic activity as measured by high levels of homovanillic acid (HVA) in the CSF (Cohen et al 1977). Excess dopamine is a vitamin B_6 antagonist. In addition, autistic children lose more HVA (a metabolite of dopamine) in their urine than typical children. Thus, it seems sensible that the administration of a dopamine antagonist such as risperidone or haloperidol to autistic patients should result in a decrease of motor symptoms such as hyperactivity, fidgetiness, and stereotypes, thereby facilitating behavior and learning. Chronic haloperidol treatment was able to reduce both the stereotypes, but often at the terrible price of tardive dyskinesia. Should you choose this drug, be aware that it depletes CoQ10, glutathione, and NADH. Supplementing Carnitine, Glutathione, and Alpha Lipoic Acid offsets the loss of NADH activity; however, one should supplement NADH (ENADA™) as well.

A high intake of vitamin B_6 and magnesium with a good multivitamin/mineral supplement would likely reduce

incidence of tardive dyskinesia. Why rely on a drug with such devastating side effects? Furthermore, these dopamine antagonists theoretically block receptors, thus reducing dopaminergic activity. I conclude that this is not necessarily a sign of excess dopamine supply, but of excess or overactive receptor sites. Likewise, the excess HVA, though possibly a sign of excess dopamine supply, may be from mercury toxicity preventing reuptake, and or a lack of vitamin B_6 and magnesium that conserve dopamine from loss at the synapse. According to a Slovakian study, *Pycnogenol*™ works by balancing stress hormones, which in turn lowers adrenaline and dopamine, thereby improving children's attention and reducing hyperactivity. In a study of 57 nine-year-olds in Slovakia, 41 patients received Pycnogenol and 16 received a placebo for one month. Stress hormones were measured in the children before, during, and after the treatment. Adrenaline was reduced by about 26 percent while taking *Pycnogenol*™, and dopamine was reduced about 10 percent. Both rose again when *Pycnogenol*™ was discontinued. "The findings acknowledge that children with ADHD have dramatically elevated levels of stress hormones known to increase heart rate and blood pressure, causing excitement, arousal, and irritability, as compared to children without ADHD symptoms." This observation applies to autistic children as well.

So, why rely on deadly drugs when dopamine can be controlled by diet and supplements? When anxious and fearful, the sympathetic nervous system kicks in, or having been made predominant, anxiety is the result. The Sympathetic Nervous System is balanced by the Parasympathetic Nervous System. The overactive Sympathetic is suppressed by magnesium and glycine, and the diminished Parasympathetic function is stimulated by potassium. Here we see a need for magnesium and potassium supplementation. Magnesium deficiency also keeps potassium from being replenished in the cell. Magnesium and vitamin B deficiencies cause a reduction in the production of dopamine and it is also wasted from the synapse. Studies in animals have shown that a magnesium deficiency causes a depletion of brain dopamine without affecting brain serotonin and norepinephrine. A supplement of magnesium and vitamin B_6 will tend to increase dopamine production and reduce its loss from the synapse. Active vitamin B_6 increases the cellular absorption of magnesium, and, therefore, it works in concert to conserve available dopamine. The excess homovanillic acid is a sign of mercury toxicity preventing reuptake into the neurons, and a magnesium deficiency that allows for a greater than normal breakdown of dopamine in the synapse. A supplement of tyrosine will renew the dopamine in the neurons, but this should not be done until the levels of magnesium and vitamin B_6 have been replenished and efforts to lower mercury levels undertaken. Since homovanillic acid is one of the amines cleared by PST enzymes, supplementing tyrosine by a PST child might be counterproductive until this has been accomplished.

Since a major consequence of this immune imbalance is allergy, it is good to note some frequent manifestations. "Toddlers have excessive infections. They whine, they pinch, they hit, they spit, they kick, and they bite in excess between two and four years. They bite their siblings, their mother, in particular, and sometimes their father. They have excessive temper tantrums. They have a lot of intestinal symptoms. They vomit clear mucous, and that means milk allergy. They dislike being held. They say the same sentence over and over again. They're hyperactive, fatigued, and they have bowel problems. These are characteristic symptoms that frequently are related to something they ate, touched, or smelled. (You can often tame the Terrible Two's with a zinc supplement—WSL.) Any food can cause diarrhea, but the food that's most apt to cause constipation in any age group is milk and dairy products. Abdominal complaints such as swelling, belching, bloating, rectal gas, that sort of thing, is the result.

"Bad breath is almost always milk, wheat, and eggs. Bedwetting, after age five, if it's related to a food, is due to milk or it's due to a fruit juice. Soiled underwear, when they leak, and they have a little bowel movement on their pants all the time, is frequently due to grapes and raisins, but other foods can also cause it (like undigested fats, shown by light-colored stool—WSL). Leg aches, called growing pains—take the milk out of the diet for a week, then add the milk back, and you'll see that many leg aches are due to milk sensitivities. Again, there are other causes for leg aches, but this is one of the causes. Clucking throat sounds—that's a milk allergy. The potbelly is very characteristic of people who have food allergies. There are many other causes; you may have parasites,

enzymatic dysfunction, or a malfunction in your gut, but one reason is allergies.

"Learning, behavior problems, and depression: Young children four and five that want to kill themselves. Again, ask what did they eat, touch, or smell? They have headaches. They make strange noises. They bark like dogs. They have asthma, hay fever, and eczema. When a person eats a food that causes eczema, which is an itchy rash in the creases of the arms and the legs, the area will get red when you're eating the food, and the next day, they have the rash. So, there's a delayed reaction, and that makes it difficult to put cause and effect together. But, if you watch the skin while they're eating, you'll be able to tell when it feels red and hot and that's when they've eaten a food to which they are sensitive.

"The adolescents have intestinal problems. Depression and fatigue are much more common. They say they have a ballooned, fuzzy head. They recognize that their head's not thinking, not feeling right. Their muscles and joints ache. They frequently have an irregular heartbeat. Take your pulse. It should be nice and regular, if it's irregular; something's wrong (it could be a lack of potassium or magnesium—WSL). What did you eat, touch, or smell? Start to pay attention to your body, especially to your pulse. It's like a smoke alarm in a room. (Get "The Pulse Test" by Dr. Arthur F. Coca, MD—WSL.)

"Irritability and aggressiveness in adults are very common. I believe that much battering—wife battering, husband battering, sibling battering, mother battering—I think a lot of that is due to unrecognized sensitivities to foods and chemicals, and things of that sort. Now, the adults tend to be too tired. The women, in particular, cry easily, and are very depressed. Many times, they are moody and easily upset."—(edited) Dr. Doris Rapp, MD.

Another cause of gas, bloating, diarrhea, and pain associated with irritable bowel is fructose intolerance. When fructose (added to everything these days) is not absorbed it passes into the lower intestines undigested, and is fermented by certain bacteria. This produces methane gas that then produces these symptoms. Supplementing with bifidobacterium can help to alleviate this gas build up and stop diarrhea. Use a supplement that supplies four billion or more count. Nevertheless, one should restrict the intake of fruit and of foods with added fructose. High fructose intake, particularly in the form of high-fructose corn syrup, causes a rise of both uric and lactic acid that creates insulin resistance at cell receptors (Syndrome X), eventually causing high blood pressure and diabetes. This same syndrome is created, over time, by any high carbohydrate intake, but high-fructose corn syrup is particularly nasty.

Aggressiveness and self-injury behavior can sometimes reduce rapidly as a result of anti-fungal treatment. Aggression has also been connected to both too much and too little magnesium. Usually, it is too little. Magnesium controls the breakdown and loss of serotonin in the synapse, and it is the best calcium channel blocker.

Research shows that it is the magnesium status that controls cell membrane potential and through this means controls uptake and release of many hormones, nutrients, and neurotransmitters. It is magnesium that controls the fate of potassium, sodium, and calcium in the cell. In the gut, however, it is calcium that is the 800-pound gorilla, and it will prevent absorption of magnesium, manganese, iron, and zinc. Unless there are sufficient anions such as lactates from milk or malates from apples (Apple Cider Vinegar), calcium also will combine with phosphate and both will be excreted. Clearly, these minerals should be taken at different times, yet they are often packaged together. Take a bit of apple-cider vinegar or milk with your calcium supplements. If magnesium is insufficient in the blood, calcium will enter the cell excessively causing spasms and cramps, and it will be deposited in the soft tissues (kidneys, arteries, joints, brain, etc.). In the heart, at least, potassium similarly controls the amount of calcium entering the heart cells. Thus, calcium, magnesium, and potassium play off one another to control the force, rate, and regularity of the heartbeat.

One with slow metabolism will tend to deposit calcium in soft tissues even when no milk products are used. Giving calcium will slow metabolism further. Potassium and calcium will be lost in the urine. Calcium is often

low because potassium is high, so giving calcium is a way of lowering potassium and slowing a "fast metabolism". This will often offer tremendous relief to one suffering insomnia, for such frequently have high potassium. Overwork and stress, mental rigidity (fanaticism), and foods like avocado and shrimp will raise calcium levels above normal for some people leading to overweight, fatigue, and depression even if not supplementing calcium. Supplementing calcium may excessively lower phosphorus (creating tooth decay), potassium, and magnesium. A supplement of molybdenum will strengthen tooth enamel, reducing decay. If you have chronic dry skin, you generally are a slow metabolizer and do not need extra calcium. One with beautiful skin may well be a fast metabolizer, and taking calcium will slow metabolism and help retain the beautiful skin. This skin test is not totally accurate, but very indicative. A serum calcium test is not a reliable indicator of calcium sufficiency. You can still have not enough in the bones or too much in tissues. It is important to note that magnesium may test normal in the serum, yet be depleted in the muscle cells, hence cramps and spasms.

Magnesium protects the cell from aluminum, mercury, lead, cadmium, beryllium, and nickel. Evidence is mounting that low levels of magnesium contribute to the heavy-metal deposition in the brain that precedes Parkinson's, Multiple Sclerosis, and Alzheimer's. It is probable that low, total-body magnesium contributes to heavy-metal toxicity in children, and it is a participant in the etiology of learning disorders.

In addition to allergy or opioid production, it has been found that milk and dairy can actually cause a microscopic blood loss in the intestine by a "reactive" inflammation of the bowel. This can lead to anemia. Curiously, a child that might go berserk on milk may not have a reaction to "processed" cheese. When the protein structure is changed, the food will not give as large an allergic reaction. "Unless a child has eczema where yolk or egg is triggering off a skin reaction, for some reason the immune pathway fired off by eggs doesn't seem to play a role in what we are talking about in the brain. I rarely have to worry about taking a child off of eggs, even though you may have this 'huge reaction' on the food screen"—Dr. Michael Goldberg. Recent information from Dr. Shaw relating to need of cholesterol in a subset of children would indicate the need for eggs in the diet.

We've mentioned PST and now the phenols, let's take a look at these enzymes that break down environmental and endogenous toxins: there are two forms of PST (11 members have been identified) that are specific for the sulfation of small phenols (PST-P) and monoamines (PST-M). Phenolic acids have been reported to have important biological and pharmacological properties and are beneficial to human health, but an excess is very neurotoxic. In the present study, human platelets were used as a model to investigate the influence of 13 phenolic acids on human PST activity, and to evaluate the relationship to their antioxidant activity. The results showed that chlorogenic acid, syringic acid, protocatechuic acid, vanillic acid (vanilla), sinapic acid, and caffeic acid (many fruits and vegetables - inhibits also 5-LO and leukotriene biosynthesis) significantly (p 0.05) inhibited the activities of both forms of PST by 21-30% at a concentration of 6.7 microM (perhaps best avoided). The activity of PST-P was enhanced (p 0.05) by p-hydroxybenzoic acid, gallic acid (tea), gentisic acid (gentian), o-coumaric acid, p-coumaric acid, and m-coumaric acid (coumaric is largely in perfumes) at a concentration of 6.7 microM, whereas the activity of PST-M was enhanced by gentisic acid, gallic acid, p-hydroxybenzoic acid, and ferulic acid (related to vanillin). The phenolic acids exhibited antioxidant activity as determined by the oxygen radical absorbance capacity (ORAC) assay and Trolox equivalent antioxidant capacity (TEAC) assay, especially gallic acid, p-hydroxybenzoic acid, gentisic acid, and coumaric acid, which had strong activity. The overall effect of phenolic acids tested on the activity of PST-P and PST-M was well correlated to their antioxidant activity of ORAC value ($r = 0.71$, p 0.01 and $r = 0.66$, p 0.01). These observations suggest that antioxidant phenolic acids might alter sulfate conjugation. End. Since PST children react very adversely to coumaric acid in perfumes, I suggest the "enhancement" spoken of is

not beneficial enhancement, but the efforts of the body to rid itself of these potentially poisonous substances.

Subsequent molecular-genetic experiments revealed the existence of three human PST genes, two of which, SULT1A1 and SULT1A2, encode proteins with "TS (thermal-stable) PST-like" activity. We recently reported common nucleotide polymorphisms for SULT1A1 that are associated with variations in platelet TS-PST activity and thermal stability. We also present new data on the inhibition of SULT1A enzymes by dietary chemicals, showing that compounds to which we are exposed regularly, such as epigallocatechin gallate and epicatechin gallate (from green tea, usually thought to be great as supplements) are extremely potent inhibitors of phenol sulfotransferases (K(i) in the nanomolar range for SULT1A1). We found that the mechanism of inhibition by these chemicals varied depending on the individual isoform involved, showing uncompetitive inhibition of SULT1A1 whereas with SULT1A2 and -1A3 they demonstrated mixed-type inhibition. Thus, genetic-environmental interactions may play an important role in modulating sulfotransferase activity and in determining individual response to chemicals metabolized by these important enzymes.

Sulfation is an intriguing pathway of thyroid hormone metabolism since it facilitates the degradation of the hormone by the type-1 deiodinase (D1). This study reports the preliminary characterization of iodothyronine sulfotransferase activities of human liver cytosol and recombinant rSULT1C1 and hSULT1A1 isoenzymes. All these enzyme preparations catalyzed the sulfation of - in decreasing order of efficiency - 3,3'-diiodothyronine (3,3'-T2), 3,3',5-triiodothyronine (T3), approximately 3,3',5'-triiodothyronine (rT3), and thyroxine (T4). Different phenol derivatives were found to be potent inhibitors of the sulfation of 3,3'-T2 by native and recombinant sulfotransferases, with pentachlorophenol and 2,4,6-tribromophenol being the most potent. In addition to deiodination, iodothyronines are metabolized by conjugation of the phenolic hydroxyl group with sulfate or glucuronic acid. Sulfation and glucuronidation are so-called Phase II detoxication reactions, the general purpose of which is to increase the water-solubility of the substrates and, thus, to facilitate their biliary and/or urinary clearance. However, iodothyronine sulfate levels are normally very low in plasma, bile, and urine, because these conjugates are rapidly degraded by D1 enzymes, suggesting that sulfate conjugation is a primary step leading to the irreversible inactivation of thyroid hormone. This would indicate that children with PST malfunction will have the thyroid hormones adversely affected.

There is evidence of immune suppression on exposure to testing doses of phenols (see PST). There may be a drop in T-suppressor cells or total T-cell numbers. An overabundance of B-cells was interpreted as a reflection of toxic image to the immune system. An increase in helper cells, antibody formation, and elevation of some immunoglobulins was also noted. Other findings on phenolic exposure have been depressed serotonin, elevated histamine and prostaglandins, abnormal complement, and immune-complex formation. Phenol is a known carcinogen with a special affinity for the brain. Dopamine, a neurotransmitter, and the amino acid tyramine (formed from tyrosine metabolism that produces dopamine) are phenolic compounds that are strongly vasodilative; however, they lower the pressure (in the gut) at which peristalsis begins; thus, peristalsis is increased in the intestine (tending to diarrhea) and distribution of blood is altered because of sensitizing smooth muscles to epinephrine, norepinephrine, and other physiological stimulants. (Low EPA levels [Omega-3 fatty acid] will also increase smooth muscle contraction leading to hypertension [High Blood Pressure], asthma, painful menstruation, and irritable bowel. Additionally, there may be depression, impulsive behavior, hostility, angry outbursts, and cynical ideas.) An important property of phenolic hydroxyl groups is their acidity, which is due to the propensity for the bond between the oxygen and hydrogen to break to form the corresponding negatively-charged phenoxide ion. This would cause systemic acidosis, it seems. Most natural antioxidants, such as Coenzyme Q10 and Vitamins C & E are phenolic in nature. Children may crave foods containing phenolic compounds or their derivatives. These compounds are also present in plastics, paper, and rubber, so you may see your child chewing these substances. It can contribute to the toxic overload in PST, or it can precipitate an allergic reaction. Hot cocoa

has two to three times more phenols in it than other foods or red wine! Do not give it to a PST child, that is, to a child lacking full Phase II liver function.

These alterations in normal body chemistry are largely due to a damaged, chronically-irritated gastrointestinal tract largely caused by vaccinations, heavy metals (particularly mercury), antibiotics (resulting Candida and bacterial overgrowth), chronic viral infections, and milk. While it is important to remove the allergens and to deal with the yeast, the single most effective, least expensive, way to treat the cause and not the secondary symptoms could be homeopathy. I know the principles of homeopathy offend reason and the good American Way, "more is better". With homeopathy, "less is more". There are forces we do not begin to comprehend working in this body, and homeopathy is working with one. Find a skilled homeopath, and ask him to clear the vaccine damage and resultant virus infections, and the heavy metals poisoning. You will be amazed at the simplicity and the relatively low cost, and immediate results, though there is some temporary regression with each course. This will restore the immune function to balance, and then other necessary, nutritional and behavioral interventions will be more effective. Until you have done this, other efforts will be very expensive and not fully effective.

One long ignored but remarkably effective, relatively inexpensive, system of overcoming many of the chronic infections that we have discussed to this point is Ultraviolet Blood Irradiation (UBI). Some Autistic children are responding well to it. Also known as photoluminescence, photopheresis, photodynamic therapy—UBI is a process of exposing a small amount of blood to ultraviolet light to stimulate the immune system to destroy all pathogens, whether viral, bacterial, fungal, or cancerous cells/tumors, and their toxins. UBI is time-tested—in use for over 75 years by physicians around the world. There are no known side effects, and the therapy creates a strong immune response. Additionally, there is significant elevation of blood oxygen levels, which in most cases remain optimized for over a month after therapy. Blood oxygen levels are perhaps the most important fundamental element in one's health. Viruses, bacteria, and cancerous cells cannot sustain themselves in a well-oxygenated environment. Not only are pathogens killed by UBI, but perhaps more importantly, biological toxins are cleared: tetanus, botulism, snake venom, bee stings, and bacterial and fungal toxins—are all rapidly cleared by UBI.

Around 1880, some clinics in England were using externally applied UV light with phenomenal success in treatment of disease. In 1928, one Emmitt K. Knott, a scientist in Seattle, ran some experiments on exposing the blood to UVC rays in the treatment of women with severe bacterial infections that were not responding to the sulfa preparations and were condemned to die. After one or two UBI exposures, the patient's symptoms completely subsided within 24 hours!

A doctor or nurse withdraws about 100-180 ml's of whole blood that enters a small, quartz-glass chamber that exposes the blood to the UV rays. As the syringe fills with blood, the irradiated blood is returned into the patient.

It was originally thought the germicidal properties of UVC—which are well understood in science—were responsible for the miraculous cures of infection. Closer inspection showed that is not all that is happening—we are talking photonic energy—a powerful thing indeed. It is thought that the irradiated portion—about 1/25th of one's blood—carries the primary UV rays into the untreated portion of the blood and that the secondary radiation is produced in this way. The effect is physical, then chemical, and finally biological.

In 1939, Dr. George Miley, MD, made a study of 97 blood irradiation treatments given to people suffering from various diseases. His observations:

1. A 58% increase in the venous oxygen content in ten minutes.
2. A 9% decrease in venous oxygen after a half hour.
3. A 50% increase in venous oxygen one hour to one month after treatment.

Dr. Miley—a practitioner of thousands of UBI treatments in the 1940's—made this comment about Emmitt Knott, "I think personally, that this is one of the greatest contributions to medicine ever made by a citizen of the United States." For in-depth discussion by one who has used this protocol, obtain "Into the Light" by William Campbell Douglass, MD.

Leaky Gut

In a test of 36 autistic children reported by Repligen Corporation, 75% had a greater than normal pancreatic response to Secretin infusion, especially among those with diarrhea (whose stool improved in consistency for several weeks afterward). These children are probably producing too little Secretin, and thus receptor sites have proliferated. Human Secretin receptor is a G-protein-coupled receptor that is functionally linked to the cAMP second messenger system by stimulation of adenylate cyclase (Ng et al, 1999). When given Secretin, there is overactivity of the pancreas. Intravenous Secretin causes a five-fold increase in the output of IGF-1 in pancreatic fluid. They also documented a pattern of intestinal inflammation (esophagitis, gastritis, and duodenitis that would greatly hinder absorption of nutrients) in the majority. The most frequent gastrointestinal complaints were chronic diarrhea, gaseousness, and abdominal discomfort and distention. Histologic examination in these 36 children revealed grade I or II reflux esophagitis in 25 (69.4%) with symptoms of wakefulness with irritability or crying, pressing of the lower abdomen, and diarrhea. Chronic gastritis was detected in 15, and chronic duodenitis in 24. Low intestinal carbohydrate digestive enzyme (amylase) activity was reported in 21 children (58.3%), although there was no abnormality found in pancreatic function. Thirty-nine percent were deficient of the enzyme Lactase, and thus had digestive problems with milk, with bloating, gaseousness, and a loose stool (these symptoms can be alleviated with a digestive enzyme supplement containing amylase and lactase). **None showed signs of Helicobacter Pylori infection, or of fungal or bacterial overgrowth even in the one-third with suspected fungal or bacterial overgrowth based on urine acid test results.**

Dr. Karoly Horvath reported low levels of disaccharide/glucoamylase enzymes, and suggests that carbohydrate malabsorption may be the cause of the gastrointestinal symptoms seen, *including* abdominal pain, gas, bloating, and chronic diarrhea (loose stools). He also found 14 of 21 children had low lactase activity. He documented reflux esophagitis in 69.4%, chronic inflammation of the gastric mucosa in 41.7%, and chronic duodenal inflammation in 66.7%. Further, a high carbohydrate (high insulin), low fat, high glycemic diets (and stress) promote inflammation because GLA is being driven toward arachidonic acid by the activating effect of insulin in overwhelming the inhibitory effect of EPA upon the Delta-5 Desaturase enzymes. High insulin levels also lower blood testosterone in men by 10%! Remove the child from his high-glycemic, high-carbohydrate diet and supplement a good digestive enzyme such as Kirkman's *EnzymAid*^{tm} or Mannatech's *GI-Zyme*^{R}.

A recently discovered inhibitor of Delta-5 desaturase is Sesame lignans. It also enhances production of DGLA. When combined with fish oil, DGLA levels rise dramatically. Life extension Foundation supplies Super Omega-3 with Sesame lignans. This would greatly reduce the need for Evening Primrose to supply GLA/DGLA. Sesame lignans also inhibit production of dangerous cytokines, such as TNF and IL-6, and suppress free radicals that increased DHA creates. Sesame lignans also enhance levels of vitamin E and DHA. These kids also desperately need a digestive enzyme supplement, but may first need Bromelain, an effective anti-inflammatory enzyme shown to reduce inflammation by 60%. Even more effective would be Vitalzym™ that supplies both anti-inflammatory and digestive activities.

Your doctor has probably forgotten a simple, inexpensive, urine test that he can make in office that uncovers toxic bacteria. Ask for a "urinary indican" test. Indican is created when harmful bacteria in the bowel ferment the essential amino acid tryptophan. If the indican test is positive, decrease intake of sugar and high glycemic carbohydrates because eating these things encourage overgrowth of many types of unfriendly critters, including

Candida. Supplement friendly flora to crowd out the nasties.

This inflamed gut (dubbed "Leaky Gut" because it has become porous allowing large, food particles of both partially digested protein [peptides] and undigested starch to pass unnaturally into the blood) produces a number of symptoms. Increased intestinal permeability (IP) may reflect damage to the microvilli, which can reduce levels of lactase, the enzyme needed to digest milk sugar, eventually triggering osmotic diarrhea. Once this disease process starts, small bowel mucosal damage, indicated by higher IP ratios, remains "an important factor" associated with increased acidosis, hypokalemia (lack of potassium), iron deficiency, dehydration, and parasitic infection.

Actually, the dehydration, often caused by excessive amounts of sugar in the form of wheat and other grains, bread, and any form of sugar including fruit juices, causes a breakdown of the mucosal surfaces leading to the leaky gut syndrome and all forms of allergies. Once dried out, there is no mucosal protection against the ever-present yeast, molds, bacteria, pollens, and various allergens. It is vital that you increase the child's intake of water in most instances. Drinking a glass of water 30 minutes before eating increases the mucosal film significantly.

Sucrose (table sugar) leaks into the blood, and this abnormal sugar in the blood stream causes a host of problems. Sugar increases the amounts of calcium, oxalate, uric acid, and glycosaminoglycans in the urine. Particles [especially from milk (casein) and grains (gluten/gliadin)] called peptides pass through the "Leaky Gut", and activate the immune system (Leukocytosis) creating many allergic symptoms, and also creating opioids in the brain that cause much of the "weird" behavior. Dermorphin, and other opioid-like peptides, can reduce stomach acid output (by inhibiting a zinc-bearing enzyme needed to make HCl), and change emptying time for the stomach, and therefore, hamper digestion. Undigested particles of undercooked grain starches pass into the blood and to the capillaries where they slow and clog blood circulation. Collateral circulation is likely enough to keep the organ functioning, but in the brain, neurons may be lost. Eating enzyme-deficient (cooked) foods also causes Leukocytosis (Paul Kautchakoff, MD). The immune system has to digest the foods! This is why digestive enzymes are so vital to break down these protein and starch particles before they reach the gut.

As mentioned, Shan, et al, found that gliadin is not broken down completely by pancreatic enzymes, but a proline-rich fragment (a large molecule) is left that still causes leaky gut and adversely affects the bowel in celiac patients. Because the fragment is rich in the amino acid proline, investigators reasoned that a peptidase (an enzyme that breaks down proteins) with the ability to digest proline-rich chains might be able to break down the gliadin fragment, rendering it harmless to celiac patients. They have now shown that this is the case in test tubes and in rats. Dipeptidyl peptidase IV (DPP-IV—found in milk) digests proline-rich peptides (www.kirkmanlabs.com).

This abstract shows the problem with casein is the same and responds to the same solution – DPP-IV!

Complementary action of dipeptidyl peptidase IV and aminopeptidase M in the digestion of ß-caseinA heymann e [PubMed] [Google Scholar], mentlein r [PubMed] [Google Scholar], Eberhard Heymanna1 and Rolf Mentleina1. Biochemisches Institut, Fachbereich Medizin, Universität Kiel, D-2300 Kiel, FRG

Abstract
Purified bovine ß-casein was digested in vitro with varying mixtures of purified proteinases and peptidases including trypsin, chymotrypsin, dipeptidyl peptidase IV (DP IV), aminopeptidase M and prolidase. In digestion mixtures without DP IV the yield of free amino acids was considerably lower than in the corresponding assays with this peptidase. Especially, the release of proline increases drastically from almost zero to the theoretical amount in the presence of DP IV. Quantitative results

indicated that the specificities of the two microvillar peptidases (aminopeptidase M and DP IV) optimally complemented each other. This effect elucidates the hitherto obscure physiological role of intestinal DP IV. A similar effect may also apply to other caseins and nutritional proteins. (Accepted Nov. 18, 1985)

Substance P is a known natural DPP-IV substrate [Journal of Pharmacology and Experimental Therapeutics 260 (1992) 1257]. That is, this enzyme acts upon Substance P (pain transmitter). Should it be deemed desirable, capsaicin also has been shown to reduce the levels of Substance P, probably by reducing the number of C-fibre nerves, or causing these nerves to be more tolerant. Additionally, Oral papain seems to protect against the toxic effect of gluten (Messer & Baume, 1976), however, it is important to eliminate gliaden from the diet where possible for it is a powerful Lectin. That's quite a commitment, no gliadin for life. Taking "Seacure", a white-fish protein product that is pre-digested will supply you with high-quality, digestable protein during the first aix-months of your gut healing. Other aids may be Hawthorne berry, folic acid, and vitamin B_{12}.

Dipeptidyl peptidase (DPP-IV) is a protein that has multiple functions in the body. It is known under different names depending on where it is found. When DPP-IV is on the surface of the T-cell (lymphocyte), it is called CD26, and supports immune function. When this enzyme is found on and imbedded on the epithelial brush-border, mucosal membrane of the intestinal tract lining it is known as DPP-IV. The importance of DPP-IV is that it has primary function in breaking down casein and side chain activity in breaking down gluten. Thus, the use of a DPP-IV containing enzyme will support the digestion of casein-containing milk products as well as the gliadin in gluten-containing grains.

Mothers are often perplexed when, having been on Gf/Cf for a period, they find high levels of peptides still present. When a person goes Gf/Cf the body takes the opportunity to dump these things in the blood/urine again. That is why we see them in the urine for some time afterwards. In celiac literature, it speaks of taking seven years to totally clear the system! **"Treatment of the latter (Candida) with conventional, synthetic, antifungal agents often causes impairment of liver detoxification functions, and a decrease in synthesis of phospho-sulfotransferase, an enzyme necessary to cleave food proteins, e.g., casein, into smaller easily absorbable peptides."**—Dr. Hugh Fudenberg, MD. Thus, fungicides exacerbate the opioid problem, and increase the potential for toxicity in PST kids. **Of utmost significance is the observation that those eating soy proteins or drinking soymilk may also have high peptide readings in their urine. Soy proteins are used extensively as emulsifiers, binders, and stabilizers in meat, poultry, snack foods, sausage, frozen spaghetti, and whipped toppings. Textured vegetable protein is soy-based, and many meat substitutes are soy-based. It has been found that those on soy may have high values of gliadorphin and casomorphin, presumably because of peptides from soy that are similar or identical to those in gluten or casein (Zhang XZ, Wang HY, Fu XQ, Wu XX, Xu GL. Bioactive small peptides from soybean protein. Anri NY, Acad Sci 1998 Dec 13, 864: 640-5. Additionally, hypoallergenic soy formulas contain very high levels of MSG. Never feed an infant soy formula. See www.truthinlabelingorg/formulacopy.html for further details.**

Additionally, those on SerenAid™ or EnzymAid™ may show high peptide values in the urine. This may be because these products are interfering with the test.

Are the symptoms being suffered symptoms of "autism", or of malnutrition, toxicity, and immune changes induced by that chronically inflamed, out of balance, gastrointestinal tract? Can nutritional intervention ameliorate these "autistic" symptoms?

Digestion 101

Digestion begins in the mouth. Here foods are to be chewed until totally fluid, thus mixing ptyalin and other enzymes necessary to digestion of starch with the food. No fluids should be taken during chewing. Furthermore, thorough mastication of food may nourish the gut by providing it with salivary Epidermal Growth Factor (EGF) that is healing to the epithelial lining of the gut. Purified Epidermal Growth Factor has been shown to heal ulceration of the small intestine.

The food then passes to the stomach where it is thoroughly mixed and "ground" down to smaller pieces, separated and held back as required for proper digestion. It may be held for an hour while starches continue to digest. Food ready for digestion passes to the lower stomach, the pyloric antrum, where most digestion takes place. This highly sensitive area of the stomach controls the acidity of the stomach's digestive juices. Secretions of the parietal cells into the stomach create the acid necessary to the breakdown and digestion of proteins and fiber. Acting as a thermostat, its G-cells secrete varying amounts of gastrin into the blood that signals the H2 cells of the upper stomach to produce more or less acid as needed. Histamine acts on the H2 receptors of the upper stomach's parietal cells empowering them to produce hydrochloric acid (HCl) when called for by gastrin. It's interesting to note that the acid is actually produced in the stomach by the mixing of chemicals secreted by these cells. Acetylcholine, released by the nerves, also affects the amount and timing of HCl production. Stress and emotions, then, also affect HCl production. Zinc, sodium, potassium, and chloride are required in optimal amounts for production of HCl. **If these things are not happening, your child may refuse meat, or will not digest it well, producing ammonia.** He may also suffer acid reflux damaging his esophagus (in 67.4%). These same cells also release "Intrinsic factor" necessary to utilization of vitamin B_{12}.

It's of interest to note that sodium bicarbonate/base is made as the stomach makes hydrochloric acid. This is carried by the blood stream to the salivary glands, the gall bladder system, glands in the pylorus (the part of the intestine the stomach is connected to), and the pancreas. These are the alkaline glands of the body and essentially, they neutralize the acid contents of the stomach. Should the saliva pH not be raised by one point while eating, I would take that as an indication of a lack of HCl production.

This dislike for meat, or a loss of taste, could indicate cellular distress and possibly cancer, or a lack of hydrochloric acid, or a copper or ammonia toxicity, or a zinc deficiency, for zinc controls the enzyme that makes HCl. Because there is a strong association between protein and zinc content in virtually all foods, insufficient protein intake, or emphasis on fish and fowl or vegetarianism, may often be the cause of zinc deficiency. The food additive tartrazine (Yellow dye #5) is found to act directly as a zinc-chelating agent, and it blocks vitamin B_6 by binding B_6 dependent enzymes as does insecticides, Theophylline (asthma drug), benzene, and hydrazine. Vitamin B_6 is vital to zinc and magnesium utilization. Zinc is an essential component of about 70 metalloenzymes (including dehydrogenases lactate, malate, alcohol, and glutamate), alkaline phosphatase, carbonic anhydrases, carboxypeptidase A and B, metallothionein, and DNA and RNA polymerases. Zinc is thus widely found in relatively high concentrations throughout the body. Zinc and magnesium both play a specific role in protein synthesis. A deficiency of these metallic nutrients will affect protein synthesis. A deficiency has far reaching consequences. Niacin is also involved in protein synthesis. It functions in conjunction with zinc as a coenzyme in DNA polymerase. Research by Hsu studied the effects of only one nutrient deficiency, zinc, on the levels of free amino acids in urine, plasma, and skin. When there was a zinc deficiency, there was an inability for the body to metabolize all of the available amino acids consumed—thus they were excreted into the urine as waste. Thus, the level of zinc in the body determines the overall ability of the cells to produce new protein for growth.

Studies show that a marginal zinc deficiency reduces serum testosterone levels by 50% in adults. This adversely affects muscle tone and strength as well as digestion and utilization. Acrodermatitis enterophatica is presently the

most well recognized, human, zinc-responsive syndrome attributable to an inherited defect of zinc absorption. However, there are also a variety of other conditions that have been found to respond to zinc therapy, such as idiopathic hypogeusia (loss of sense of smell from no known cause), improvement in wound healing, gastric ulcers, acne, rheumatoid arthritis, as well as dyslexia. Zinc controls the release of vitamin A from the liver. An inadequate zinc nutriture has been linked with a variety of immune deficiency disorders, including cancers in both animals and in humans. However, after treatment for thyroid dysfunction, normalization of zinc in red blood cells naturally occurs, lagging about 2 months behind normalization of plasma T4 and T3 levels (Yoshida 1996; Varga, 1994), hence its importance in determining duration of pre-existing thyroid disease. This is a clear sign that many cases of "zinc deficiency" are NOT caused by an actual nutritional lack of zinc, but by thyroid dysfunction. Incidentally, the symptoms of "zinc deficiency" are identical to the ones ascribed to hypothyroidism. Fluoride causes "zinc deficiency". Incidentally, one study showed that supplementing 20 mg of zinc increased the children's hand-eye coordination, the memory of abstract images, and their ability to remember a list of words.

Complex nitrogen (protein) metabolism appears to flourish in children with seizures, developmental delay, and Autism Spectrum Disorder (ASD) involving not only Nitric Oxide (NO), but nitrogen retention as a whole (described previously as purine autism by Mary Coleman). Kids presenting with suppression of carbon dioxide (CO_2) may shun nitrogen rich foods due to the formation of ammonia (an alkaline compound of nitrogen and hydrogen) leading to a state of hyperammonemia. Excitotoxic effects of ammonia are augmented by increased synthesis of nitric oxide (NO), which is associated with N-Methyl-D-Aspartate (NMDA—excitatory) receptor activation and/or increased synaptic transport of arginine. High levels of NO are a consequence of excitotoxin damage. Excess NO has been shown to inhibit sulfation of GAGs. The behavior associated with excess NO/ammonia production in the autist is maniacal laughter. Other symptoms reported by Dr. Amy Yasko include flapping tremors of extended arms, disorientation, brain fog, hyperactive reflexes, tremors of hands, paranoia, panic attacks, memory loss, hyperventilation (often with decreased CO_2), and Central Nervous System toxicity.

Hyperammonemia means that ammonia, instead of being discharged by the liver, is recirculated into the blood stream. It is apparently caused by a deficiency of four Amino Acids: Citrulline, Aspartic Acid, Threonine, and Arginine. Vegetarians are especially susceptible to Hyperammonemia because of the lack of essential, Medium-Chained Amino Acids (L-Leucine, L-Isoleucine, and L-Valine) that in turn cause a deficiency of those Amino Acids named above. A lack of biotin contributes to excess ammonia. Thus, a hyperammonemic state yields the spacy "brain fog" reaction, or in more severe instances may lead to seizures. Childhood episodes of high ammonia (hyperammonemia) may be brought on by viral illnesses, including chickenpox, overgrowth of clostridia bacteria in the gut, or even exhaustion. There is likely to be an ammonia smell to the urine. This can be misleading for ammonia can be endogenous, or bacteria in the bladder or in the diaper can form it! Protease digestive enzymes may relieve the burden. The condition is often misdiagnosed as Reye's syndrome.

Over breathing, expelling too much carbon dioxide through fast, shallow, or even fast, deep breathing is part of the primitive stress response built into every human body. If this natural fight-or-flight response becomes chronic, the lack of CO_2 causes much havoc. "Autistics (90% or more) have low $C0_2$ (alkaline condition); hyperactive children often have high CO_2 (acid condition). For high CO_2, give HCl before meals, but only if serum chloride is not elevated. One also may give apple cider vinegar (if tolerated) to lower CO_2, or phosphoric acid (Phosfood™)"—Patricia Kane. Curiously, apple cider vinegar is also said to alkalize, being converted to bicarbonate (a pH buffer).

Dr. Robert Fried found that hyperventilation (low CO_2, high alkalinity) precedes seizures and results in arterial constriction, including brain arteries, and spasms. This reduces blood flow and oxygen supply to the brain. This affects the brain's metabolism, therefore its function. Giving mineral carbonates often can control these seizures. This would raise CO_2 and acidify the system. Additionally, apnea is the absence of effective breathing for 20

seconds (15 in a preemie) and is associated with color changes (blue, gray, or dusky) and/o r **reduced muscle tone (turning "floppy").** In the infant, whether premature or not, breathing is exquisitely controlled primarily by the level of carbon dioxide in the blood, and to a lesser extent by oxygen levels. The method of children re-breathing their own air through "masking" used at The Institutes for the Achievement of Human Potential has often been helpful with these children as they raise their CO_2 and oxygen levels (and acidify the system). (Conversely, one Mom writes, "What we thought to be seizure behavior are periods of her blood pressure dropping suddenly and dangerously".) Fried concluded that the abnormal electrical activity picked up on EEGs is the result of seizures, not the cause, nor the seizure itself. CO_2 is the main regulator of Cerebral Blood Flow, so this impaired vasoreactivity (constriction) may reflect the brain dysfunction in the seizure focus and adjacent areas.

Understanding these complex relations can be daunting: In living systems an enzyme, carbonic anhydrase, speeds the interconversion of CO2 and carbonic acid. In aqueous solution, carbonate, bicarbonate, carbon dioxide, and carbonic acid exist together in a dynamic equilibrium. In strongly basic conditions, the carbonate ion predominates, while in weakly basic conditions, the bicarbonate ion is prevalent. In more acid conditions, aqueous carbon dioxide, CO2(aq), is the main form, which, with water, (H2O) is in equilibrium with carbonic acid - the equilibrium lies strongly towards carbon dioxide. Thus, sodium carbonate is basic, sodium bicarbonate is weakly basic, while carbon dioxide itself is a weak acid.

Snoring is often a precursor of serious upper airway disorders. "When persons with sleep apnea fall asleep, their tongue falls back into their throat, blocking their airway. As they struggle for breath, their blood pressure soars," Dr. Arthur Friedlander, who worked on the study, said further, "We believe that this rise in blood pressure damages the inner walls of the carotid arteries lining the sides of the neck. Cholesterol and calcium stick to the injury sites and amass into calcified plaques that block blood flow to the brain. The result is often a massive stroke. The calcium deposits are just the tip of the iceberg," he said. "The X-ray can't show the true size of the plaque, which is also made up of fat, platelets, and other soft tissue." **However, it is not these large plaques that cause the major problems.** Often, they don't exist. The major problem relates to unstable, smaller plaques that break apart and clog smaller vessels causing the problem. Researchers at Southampton (UK) found that supplying Omega-3 oils increased the stability of these plaques by 50% thus preventing sudden deaths by stroke and the likelihood of future heart attacks! The damage to the vessels can largely be prevented by an adequate intake of magnesium and the vitamin B_6 needed to utilize it. Several studies have shown that supplementing 500-700 mg magnesium per day can significantly reduce blood pressure. Estimates indicate that this could save at least half of those dying from heart attack and stroke!

When a person is suffering from sleep apnea, air cannot flow in or out of the nose or mouth. Oxygen is not taken in so carbon dioxide builds to dangerous levels in the blood. "It's like pressing a pillow over someone's face," Friedlander said.

Some symptoms caused by apnea are:

* Limb jerking, punching, and kicking during sleep
* Depression, reduction in motivation
* ADHD symptoms (hyperactivity)
* Morning headaches, bloodshot eyes
* Multiple trips to the bathroom during sleep time
* Heartburn (Acid Reflux)
* Waking up very tired (feeling exhausted) and thirsty
* Weight gain and love handles in men over 35
* Irritability
* Memory problems

* Poor ability to concentrate
* Poor motor skills
* Daytime fatigue
* Excessive sleepiness during waking hours

"By examining blood chemistries, the data that began to unfold was fascinating and clearly earmarked the acidosis (SIC, actually alkalosis) and hypoxic state. Seizures were often brought under control by examining the electrolytic disturbance, and matching them to the child's needs. Potassium bicarbonate, sodium bicarbonate, magnesium carbonate, and the like were used. **(These normally alkaline minerals release the carbonate raising carbonic-acid levels, acidifying the system and raising CO_2. CO_2 acts as an anticonvulsant, and also reduces glucose metabolites, which accumulate around the foci of convulsion. Blood flow is increased to the brain. Petit mals have been stopped using magnesium carbonate—WSL.)** Now, we began to understand why so many children responded to Buffered C (potassium bicarbonate, calcium carbonate, magnesium carbonate), and why others needed a more specific buffer (in some children for example niacin was grossly depleted, and they required niacin bicarbonate). (Calcium carbonate tends to constipate, and may be useful in controlling diarrhea, or when magnesium is tending to loose bowels, but it acidifies the system—WSL.) Buffers and butyrates attenuate (lessens the effects of) abnormal nitrogen metabolism (protein digestion), however, children with ASD are unique in their presentations, and as we examine nitrogen retention/NO (nitric oxide), electrolyte stability, catalysts, and lipid status to determine disturbances in metabolism, it requires that we act upon these aberrations in an integrative manner from a cellular perspective, not as singular interventions.... We found that mineral endings contained in many multiples were worthless (magnesium oxide—a laxative), or irritating to the CNS (aspartates, excess can be excitatory), or to the urea cycle (picolinates raise uric acid or BUN, and disturb the urea cycle), but the children responded beautifully to alkaline salts such as Buffered C, to the carbonates, and to digestive support, including duodenum (naturally containing Secretin and other components of the small intestine—1 teaspoon after meals. Obtain from www.krysalis.com —WSL.), and pancreas (available in porcine, bovine, or bovine derivatives—1 to 2 capsules after meals—WSL)"—Patricia Kane. There are three problems with the carbonate forms: 1) Like the other inorganic forms, it's the most poorly absorbed (only 5-10%); and 2) It overacidifies a system that is consuming a highly acidic diet; and 3) Unlike the other inorganic forms, calcium carbonate requires (and binds) the most stomach acids. That's why TUMS™ are sold.

Though most children with Autism may show low CO_2 and an alkaline pH, some may have high CO_2, low oxygen, and low pH. Further, while most people can tolerate a wide range of CO_2, others cannot, and a small excess can trigger anxiety and panic attacks. An adult serving of 200 mg 5-HTP (children 100 mg) may alleviate the anxiety and panic. Results should be apparent within two hours or less.

"I found...that many, many of these children are in negative nitrogen balance. Their BUN-to-creatinine ratios are very high"—Dr. Mary Megson. Low creatinine, BUN, and uric acid are markers of a lack of nitrogen. Nitrogen retention is dependent upon dietary consumption of nitrogen-rich foods (proteins), along with lipid consumption (fats), electrolyte stability, and mineral density and balance. Those with organic acidemias or aminoacidemias will often exhibit this same protein intolerance. Those with elevations of BUN are deficient in lipids and mineral base (check for dehydration).

Purines are key building blocks for the synthesis of DNA and RNA, and are involved in a variety of other cellular processes. "Purine autism" was first characterized in the 1970s by Mary Coleman who noted elevated levels of uric acid in the urine of some patients. Uric acid is the end product of purine metabolism, and is elevated in other diseases of purine metabolism such as Lesch-Nyhan Syndrome. Recent studies at UCSD suggest that some of the autistic patients with elevated urate levels also have evidence of abnormally high rates of intracellular purine synthesis further indicating that they have a purine metabolism defect. A few of these patients have been treated with dietary restrictions

of fatty proteins and an analog of uridine for several years, with improvements observed in cognitive performance and muscular function. Repligen Corp now holds the patent to uridine treatment for this condition.

High uric acid may indicate high homocysteine requiring vitamins B_6, B_{12}, folic acid, and possibly TMG. High homocysteine is also an indication of Hypothyroidism that inhibits B-vitamin absorption (Broda Barnes 1976, and Cleveland Clinic 1999). It is of interest to note that recent studies (University of North Carolina at Chapel Hill) show that even when folate and B-vitamins were adequate, a deficiency of choline substantially impaired the body's ability to regulate high homocysteine levels. When choline is ingested, some is converted to betaine, and betaine (TMG) regulates homocysteine by converting it back to Methionine. This would suggest that when MTHFR problems exist, adequate Choline or possibly TMG supplementation would provide a second pathway to improve methylation. In fact, the MTHFR deficient, having impaired availability of methyl groups from mTHF, utilize (and consequently deplete) choline and betaine (TMG) to maintain homocysteine remethylation. A lack of choline reduces acetylcholine and depresses cognitive function as well as unbalancing acetylcholine/dopamine ratios. Methylenetetrahydrofolate reductase (MTHFR) is a key gene in one-carbon metabolism and, indirectly, in all methylation reactions. Several laboratories have noted that the C667T polymorphism (Ala to Val), which reduces enzymatic activity, is inversely associated with occurrence of colorectal cancer and acute lymphocyte leukemia. Low intake of folate, vitamin B_{12}, vitamin B_6, or methionine was associated with increased risk for cancer among those with the MTHFR TT genotype. MTHFR variants are also implicated in Cardiovascular Disease (CVD). Additionally, in 78% of those supplementing folic acid, there was unmetabolized folic acid in their blood. In those low in vitamin B_{12}, but high in folic acid, there was a risk of cognitive impairment. Researchers concluded, "It might be better to use the metabolically active L-methylfolate (Metafolin^{TM}) instead of folic acid, and it might be best to always combine vitamin B_{12} (as methylcobalamin) with any type of folate supplementation."

Exciting new research has shown that almost every organ, every gland, and every immune cell in the body has vitamin D receptor sites. Clinical experience has shown activation of these receptor sites facilitates calcium utilization for maximum alkalinization. Vitamin D receptors are also a part of the MTHFR problems. Vitamin D is one of the major controllers of which gene it turned on or off. Get in the sun! If no sun, then supplement vitamin D_3.

Mothers with this MTHFR block will likely have high levels of SAH and homocysteine, while their kids will be low is SAMe, that is, undermethylated. Epigenetically, undermethylation turns unwanted genes on whereas, in those properly methylated, the genes will be turned off. So, if there is an active gene that is undesirable, turn it off!

Dr. Stephen Sinatra, MD, reports that an estimated 30% of Americans (40% of adults) have the genetic abnormality of MTHFR, and that this can cause too little homocysteine as well as too much! Medical studies have shown that the conversion of folic acid into L-Methylfolate is frequently disrupted not only by genetic factors, but also by age-related problems, medications, and metabolic obstacles. This is not just a heart disease problem, but families having this genetic fault will suffer a multitude of variations of disease as a result. People who have GERD or asthma, or are sensitive to red wines (headache) often have low homocysteine. The homocysteine normal range should be 7-10 umol/L. A lesser level will tend to produce excess sulfites, sulfates, and ammonia. Individualls with low homocysteine typically have high sulfate in the urine. You can check this with a dipstick "Sulfate Test" from Holistic Health International (www. Holisticheal.com for $55.00. Use L-methylfolate rather than folic acid.

Do the Iodine Test and support the thyroid as outlined herein. Copper deficient rats also showed high uric acid, higher sugar levels, and weakened immune systems. The amount of urea excreted depends on hydration of the patient. If dehydrated (and most of our kids are), then low tubular flow in the kidneys will allow more urinary filtrate so more urea is absorbed leading to a higher serum level. Additionally,

elevated uric acid, white blood count, and CPK enzymes in a patient's lab work may indicate yeast-induced psychosis, but not all patients reacting to yeast will be suffering from an overgrowth large enough to show up in lab tests. The amino acid ornithine is an effective supplement for removing uric acid as is celery seed. A pleasurable way is to eat a bowl of cherries every day! It doesn't matter the type. An adult needs about 22 cherries a day. Don't like cherries? Try a bowl of strawberries.

"When we blocked or lowered uric acid, we were able to largely prevent or reverse features of metabolic syndrome," Dr. Richard Johnson, professor of nephrology and chief of nephrology, hypertension, and transplantation at the university's College of Medicine, said in a prepared statement. "We were able to significantly reduce weight gain, we were able to significantly reduce the rise in the triglycerides in the blood, the [rats'] insulin resistance was less, and the blood pressure fell." High amounts of urea in the blood indicate poor cardiac output, leading to weakened kidney function.

Dr. Ted Page reported a more puzzling form with low uric acid and a high amount of an enzyme, nucleotidase, in the cells of skin samples. Children with a high level of heavy metals have a low amount of uric acid. URIC ACID LOW? This is always seen in people with CHRONIC INFECTIONS, including lyme. A uric acid reading of less than 3.0 is an indicator for heavy metal toxicity. This probably means that child has impaired ability to produce purines that are converted to uric acid in the body, so the low uric acid may indicate an inability to release purine. Additionally, those with deep suppression of uric acid may have difficulty with sulfation (sulfite to sulfate) in the conversion of xanthine (excess of which is highly inflammatory, especially to blood vessels) to uric acid, a molybdenum dependent step. A supplement of moly may help, but in particular, avoid homogenized milk that is high in xanthine – Dr. Stephen Sinatra, MD.

Purine is needed for energy production, and adequate protein is needed for muscle and growth. There is a school of thought that tells us we ought not to eat much protein, as it is "hard on the kidneys". Except for the instances we have discussed, unhealthy swelling or dropsy that accompanies so many diseases (especially those of heart or kidneys) may well be an indication of too little protein intake. A kidney-diseased patient should take more protein, not less, in order to replace the nitrogen being lost through the kidneys. Each should eat the amount of protein indicated by his metabolic type.

Purine is involved with all energy reactions in the body. This is another reason why toxic metals can cause muscle weakness because they are inhibiting energy production by the body. This abnormality may indicate we have another therapeutic treatment for autism, through the supplementation of purine (eat dark meats). Treatment with pyrimidine nucleotides or nucleosides has resulted in a marked improvement in symptoms. The sugar, Ribose was also therapeutically beneficial, but to a lesser degree. Avoid copper if uric acid is significantly suppressed (BodyBio Corp. note).

High uracil readings with normal or slightly elevated thymine may indicate a lack of folic acid needed to convert uracil to thymine. A deficiency of molybdenum would likely be associated with abnormally low levels of uric acid in the blood and high sulfate in the urine. Supplementation of sulfur in any form will tend to deplete moly. When BUN, Creatinine, and Uric acid are low, there is a need for organic poultry and seafood, particularly for the fatty ones. Eat dark meat not white, fatty fish, not dry. Additionally, inhibition of guanase activity could reduce the availability of endogenous xanthine, but would also reduce uric acid formation. A supplement of xanthine may help in this instance. As previously stated, the amount of urea excreted depends on hydration of the patient, if over-hydration occurs there will be high tubular flow rate in the kidneys and less urate is reabsorbed; so, serum level will be low.

Through its conversion into carbonic acid, carbon dioxide is the most vital player in the maintaining of the body's acid-base balance (actually buffering movement in pH). Lowering carbon dioxide in the lungs by

hyperventilation shifts the body's pH towards alkalinity, which slows the rate of activity of all body ferments, enzymes, and vitamins. Another major cause of alkalosis is the glutathione deficiency that is pervasive in Autism and Chronic Fatigue Syndrome. Low glutathione causes an elevation in citrate, which in turn lowers a substance (2,3 DPG) that controls the release of oxygen from hemoglobin. Our blood can be full of oxygen, but without enough of this substance it cannot break free and get into the cells. This causes oxygen deprivation in the tissues (hypoxia) that makes the body switch over to anaerobic metabolism, which can be painful. This shift in the rate of metabolic-regulator activity disturbs the normal flow of metabolic processes and leads to the death of the cell. **The lowering of carbon dioxide in the nerve cells heightens the threshold of its excitability, alerting all branches of the nervous system and rendering it extraordinarily sensitive to outside stimuli. This hypersensitivity to light, sound, touch, taste, smell, heat, or cold leads to irritability, sleeplessness, stress problems, unfounded anxiety, fears, allergic reactions, and inordinate stress.** Concurrent with this, the breathing center in the brain is further stimulated causing a further loss of carbon dioxide with increased alkalinity. A vicious cycle has commenced. The detrimental influence of the rapid, deep breathing on the organism is a direct result of the creation of a carbon-dioxide deficit. It is clear that a deepening of the breathing does not necessarily mean an increase in oxygen uptake. On the contrary, it can mean a decrease in oxygenation, which leads to hypoxia, an alkaline imbalance, and cell spasming. "You are hyperventilating if breathing is predominantly thoracic (chest); if little use is made of the diaphragm (abdominal movement is minimal); if breathing is punctuated by frequent sighs; if sighing has an effortless quality with a marked forward and upward movement of the sternum but little lateral expansion."—Dr. Robert Fried.

Those with migrating nerve or joint pain, insomnia, or morning stiffness that improves as you move around may well be one of the rare individuals who is too alkaline. Obtain a pH test strip for measuring urine and measure both urine and saliva pH (do saliva between and during meals). A saliva pH (between meals) of more than 7.5 would pinpoint your problem. Lower your systemic (saliva) pH to 6.5 to 7.0 for relief of these and many other symptoms (Dr. David Williams, MD, Newsletter). Those too acid (below 6.5) will suffer a wide range of other symptoms that can be corrected by raising the saliva pH. Addition of digestive enzymes, vitamin D_3, and eating a couple of Brazil nuts each day (or 200 mcg of selenium supplement) will banish many other pains.

Details of this testing are found in my electronic book "Self-help to Good Health", (50 Chapters, over 1000 Pages, $29.95 US) in the Chapter "Digestion and Utilization". Saliva pH when not eating should be 6.5 to 7.0. While eating, it should rise one full number, 7.5 to 8.0. **An excessively acid condition would likely signal a too high CO_2 or an intake of too many carbonated minerals.** The lungs are not getting the carbon dioxide out and the needed oxygen in. The opposite would be true for an excessively alkaline condition—there is too little CO_2, or too little glutathione, and the cells will be starving for oxygen. Electrolyte levels, particularly of calcium (or perhaps more accurately, of vitamins D and K to utilize the calcium), also control the pH. Some think the best time for checking urine pH is mid morning and late afternoon before the evening meal. Others prefer the second urine of the morning. A word of warning: in using sodium bicarbonate excessively, potassium can be excreted producing a potassium deficiency that can cause heart palpitations. Use of too much carbonate can cause the system to become overly acid. Dr. Carl Reich considers these saliva pH values taken between meals to mean: 4.5-6.0 you have a disease, 6.0-6.5 you are developing a disease, 6.5-7.4 you are in a healthy range (The Calcium Factor by Robert R. Barefoot and Carl J. Reich, M. D). Buffers tend to stabilize the pH by acting chemically to resist changes in pH. The most important of these compounds in the blood are bicarbonates, albumin, globulin, and hemoglobin (gives off hydrogen ions).

If suffering hyperammonemia, or over alkalinity of any cause, calm the child's breathing in whatever manner you can in order to raise CO_2 levels, and use these carbonate buffers to restore CO_2 and body acidity. One quick way to restore acidity is to drink a teaspoon of raw, unfiltered, apple-cider vinegar (diluted in water) every hour or so until desired

acidity is restored. Deep breathing can be used consciously, and perhaps unconsciously, to make more alkaline an already acid system. As Dr. Fried states, the over breathing may be "the body's best adjustment to its present needs." If the acidity were that of excess lactic acid, consciously hyperventilating would likely make the condition worse.

Use these methods also to stop severe allergic reactions. The average asthmatic, for example, over-breathes 3-5 times the recommended amount, sometimes more. If you think someone's having an allergic reaction, and you don't have those bicarbonate buffers, try half a teaspoon or a teaspoon of baking soda in a half-glass of water. Sometimes, that will stop a reaction within 10 to 15 minutes. Three commercial, bicarbonate products AlkaAid™, Alka-Seltzer Gold™, and AlkaLime™ can be used. This is very effective, not only in stopping reactions, but if you take it before you eat a food to which you are sensitive, you can sometimes prevent a reaction. If you're going to dinner, and you're not quite sure what they're going to serve, you certainly should try to take that in advance. **Supporting the thyroid will increase carbon dioxide production.**

Remember, taking a high amount of potassium may be most valuable, but it tends to deplete vitamin B_{12}, as does high amounts of vitamin C, and using sodium bicarbonate excessively can excrete potassium producing a potassium deficiency that can cause heart palpitations and reduce HCl production. Conversely, drinking a large glass of orange juice every day (for potassium), as advocated by the American Cancer Society, may eventually drain all your magnesium making you very ill. Under no circumstances take more than 4 ounces of juice (adults)! Many have found bee pollen, or perhaps more so, honeycomb, from local honey farms to be highly effective in relieving environmental allergy. Start with very small amounts, and slowly increase amounts until the allergy is overcome.

Butyrate (butyric acid) will aid in removal of ammonia and is essential to the health and function of the large intestines. Though there are food sources (butter and parsnips), it is mostly produced by beneficial bacteria. Highly-fermentable fibers like resistant starch, oat bran, and pectin are transformed by colonic bacteria into short-chain fatty acids including butyrate. One study found that resistant starch consistently produces more butyrate than other types of dietary fiber. Fermented Kombucha "tea" includes butyric acid as a result of the fermentation. It supports the integrity of colonic mucosa by acting as primary fuel for the colonic epithelium. Several studies have reported a correlation between a low level of stool butyrate and a higher incidence of colon cancer, and one animal study supplying a very high level of butyrate eliminated early-stage colon cancer. Butyrate is a natural histone deacetylase inhibitor, and thus has anticancer activity. **Butyrate has been shown to modulate local electrolyte flux, thereby mediating diarrhea. High amounts reduce inflammation and cut DNA damage in half. Sodium butyrate (NaB) increased lifespan in experimental animals.** Colonic bacteria normally produce it, if there is plenty of fiber, but when these bacteria are disrupted, this supplement will support colon health as you rebuild colon flora. Evidence of adequacy will be a formed and floating stool.

ButyrEn™ (butyric acid) by Allergy Research Group/Nutricology, Inc (800-782-4274) is a short-chain, fatty-acid, dietary supplement, an enteric-coated formulation of calcium and magnesium salts of butyric acid. Ecological Formulas (800) 654-4432 supplies a fluid butyrate. Alpha ketoglutarate clears ammonia, and butyrate clears ammonia, spores, and nitrogen. Butyrate and another short-chain fatty acid, caprylic acid, are frequently used as anti-Candida agents. Liver and gallbladder congestion are major issues in states of toxicity. To insure that your gallbladder bile flow is functional add magnesium taurate or L-taurine, glycine, and butyric acid. **The oral use of butyrate, a short 4-carbon-chain-fatty acid, is of striking benefit (Fusunyan et al 1998, Segain et al 1983, Yin et al 2001) in mobilizing renegade fats, lowering TNF(a), sequestering ammonia, and clearing biotoxins.** An increased amount of niacinamide will be helpful for it aids in release of toxins stored in fats. Sugar, caffeine, alcohol, and drugs deplete niacin. Vitamins E, C, selenium, CoQ10, phosphatidylcholine, and low dose Alpha Lipoic Acid all support the liver. Nevertheless, "Though butyrate works, arginine, ornithine, magnesium, and manganese are far superior and proper in the detoxification of ammonia" —Mark Schauss of Carbonbased Labs.

As indicated, the undigested protein turns into ammonia and goes to the brain. Kane recommends that one hour after every meal, when the body is supposed to be producing its own bicarbonate, the carbonate buffers be given (carbonates give off CO_2 when neutralizing hydrochloric acid), along with a big glass of carbonated (CO_2) Seltzer water (this load of CO_2 will acidify the system, but it will also convert the carbonates to bicarbonates that are alkaline—WSL). I feel this is too soon for it will stop protein digestion and defeat the purpose of intervention. Studies of stomach content have shown that for up to an hour after eating, the stomach produces no acid, but digests carbohydrate. Though dumping takes place in small lots over time, it seems to me that 2 1/2 or 3 hours after eating would coincide with dumping acid chyme, and serve the purpose better. A child with these problems will consume mostly carbohydrates. All those carbs cause high glucose which produces more insulin than is healthful, and that interferes with fatty acid metabolism and protein utilization, and produces insulin resistant cells, tending to overweight and diabetes. Overweight children with high levels of insulin in their blood are also likely to have high levels of homocysteine, a substance that appears to raise the risk of heart disease, stroke, and birth defects, as well as possibly other adverse effects as well. In addition, these children and adolescents appear to have lower levels of folate, a vitamin that can lower homocysteine levels. These children may have high albumin—which is the substance that transports toxins out of the body. High albumin means high levels of toxins are presently being transported.

"Albumin binds organic acids and neutralizes their toxic effect to some extent. A low serum albumin is a significant risk factor that results in a more serious clinical episode in patients with organic acidemias. The administration of Valproic acid (Depakene™), or salicylates, should be carefully evaluated in cases of suspected organic acidemias, since these drugs also bind to albumin and diminish the protective effect of albumin in neutralizing toxic organic acids. Swedish developmental biologist Rodier has found that Valproic acid, a common anti-seizure drug known to induce autism, causes brain damage in rodents, and precisely in the places expected, based on what's known about autism. Anytime you are taking Valproic Acid, you must supplement L-carnitine (Carnitor™) and folic acid to avoid the deadly consequences of their deficiency. It may be wise not to supplement more than one milligram of folic acid without your doctor's advice for it may reduce the drug's effectiveness and induce seizures. Indicative of the possible harm from Valpoic Acid is this: folic acid is already lacking in the alcoholic, those with chronic disease, the anorexic, the premature infant, the elderly, the pregnant, and in those suffering hyperthyroidism, neoplasia, hemolytic (chemical poisoning) anemias, and psoriasis! Eat your greens! Adding an oil dressing raises folate intake ten fold, but negligible amounts were absorbed without any fat! The study leader said, "A substantially greater absorption of carotenoids was also observed when salads were consumed with full-fat than with reduced-fat salad dressing." Including avocadoes was equally as effective as oil (8.5-13 times more nutrients absorbed!).

"Lactic acid may be elevated in a wide range of conditions including the pyruvate dehydrogenase, pyruvate carboxylase, 6 diphosphatase, and phosphenol-pyruvate carboxykinase, and dihydrolipoyl dehydrogenase deficiencies, glycogen storage disease type I, fructose 1, and respiratory chain deficiencies"—Wm. Shaw. At least the pyruvate dehydrogenase is dependent on vitamin B_1 that may be lacking. Additionally, vigorous exercise, bacterial overgrowth of intestines, shock, anemia, and an absence of sufficient oxygen will elevate lactic acid. Excess lactic acid will eventually result in the death of the cell. A possible link of metal toxicity to chronic fatigue is via metal binding to the sulfhydryl-containing antioxidant, lipoic acid, making lipoic acid unavailable for its vital role in the energy-producing tricarboxylic acid (citric acid, Krebs) cycle. A deficiency of lipoic acid results in reduced muscle mass, brain atrophy, failure to thrive, and increased lactic acid accumulation. An enzyme complex that contains lipoic acid, niacin, and thiamine breaks down the pyruvate. If pyruvate were high, I would supplement these nutrients. Intracellular levels of glutathione increased as much as 50% with administration of lipoic acid.

When the mitochondrial respiratory chain (Krebs or citric acid cycle) is blocked, metabolites that are normally processed by its enzymes may build up in the cells and cause problems. When glutathione levels

are compromised, the mitochondrial respiratory chain is a vulnerable target and cell death ensues. Both L-carnitine and acetyl-L-carnitine can by-pass the defect in Complex I that is seen in Parkinson's and Huntington's diseases. Richard Kelley from Kennedy Krieger in his presentation at Mitochondria Interest Group Minisymposium in March of 2000 stated, "When identified below the age of two years, affected children often respond to therapy designed to augment Complex I activity (supplement carnitine, niacin, and or NADH—ENADA™—WSL). We propose that, like the basal ganglia, areas of the brain important in language development and personal, social interaction are especially vulnerable in the first two years to injury mediated by defects of mitochondrial energy metabolism, and that early and careful evaluation of autistic children for these more subtle mitochondrial disturbances may rescue them from more severe brain injury." He also pointed out, "Although we find a variety of autistic phenotypes to have associated mitochondrial abnormalities, the most common is nonspecific PDD, typically a form that manifests language and cognitive regression or stagnation during the second year." ENADA™, riboflavin, niacin, thiamine, alpha lipoic acid, carnitine, CoQ10, and vitamin K all improve mitochondrial energy production. Additionally, IV glutathione and Hyperbaric oxygen is restoring function to those with Parkinson's!

While we are considering cognitive stagnation, be aware that rats and kids without adequate stimulation (impoverished mentally), that is, few toys, little interplay with parents, such as playing with and reading to them, or withdrawal that is typical of an autistic child, will suffer cognitive stagnation and memory impairment such as seen in old age. Like muscles, neurons that are not used stagnate. A brain that is receiving regular, high levels of stimulation grows more neurons. This is why ABA (Canadian IBI) works so well. Nevertheless, cognitive stimulation will be minimally effective without supplying missing biochemicals as suggested herein. The mentally impoverished rats supplemented with a precursor to phosphatidylcholine (CDP-choline) retained more normal memory and cognitive functions according to MIT researchers. Other researchers report that "healthy" elderly adults showed a four-fold increase in growth hormone, and an increase in brain levels of key neurotransmitters acetylcholine, dopamine, norepinephrine, and serotonin. CDP Choline – Cytidine Diphosphate Choline is an active lipotrope of choline that restores brain levels of Phosphatidylserine, Phosphatidylcholine and Sphingomyelin that are crucial to the function of neurons and the myelin sheath that protects them.

Aluminum interferes with the citric acid cycle (inhibits alpha-ketoglutarate and results in toxic levels of ammonia), and thereby reduces energy production from foods. This has been shown to influence mood and energy levels. High aluminum levels were found to be related to encephalopathies and dementia. Recent studies suggest that aluminum contributes to neurological disorders such as Alzheimer's disease, Parkinson's disease, senile and presenile dementia, clumsiness of movements, staggering when walking, and inability to pronounce words properly. Early symptoms may include fatigue, headache, and symptoms of phosphate depletion. Aluminum, as obtained from antacids, can bind pepsin and weaken protein digestion. It also has astringent qualities, and thus can dry the tissues and mucous linings and contribute to constipation. Regular use of aluminum-containing deodorants may contribute to the clogging of underarm lymphatics and then to breast problems such as cystic disease. The effect of aluminum in contributing to Alzheimer's is offset by adequate magnesium that is universally lacking in the American diet. Further, it is theorized that supplementing 500 mg magnesium per day would cut heart disease by 50%!

Acute aluminum poisoning has been associated with constipation, colicky pain, anorexia, nausea and gastrointestinal irritation, skin problems, and lack of energy. Slower and longer-term increases in body aluminum may create muscle twitching, numbness, paralysis, and fatty degeneration of the liver and kidneys. It is worse with reduced renal function. Aluminum may reduce the absorption of selenium and phosphorus from the gastrointestinal tract. The loss of bone matrix from aluminum toxicity can lead to osteomalacia, a softening of the bone. Skin rashes have occurred with local irritation from aluminum antiperspirants. To detoxify aluminum take a two or three teaspoons of apple cider vinegar (malic acid—

also used in the mitochondria) each day. This can be as salad dressing or drank with the morning glass of water. Taken before meals it enhances digestion. Also supplement selenium, magnesium, melatonin, and silica (silicon, now found increasingly as filler in supplements).

Dr. Paul Bragg, ND, Ph.D., brought 3 "mentally retarded" children into his home and gave them two teaspoons of pure, Apple Cider Vinegar with a heaping teaspoon of raw honey and a potassium rich diet. After 3 weeks they became more mentally alert, and in one year they were able to join school again with children of their own age! Similar results were had with mentally retarded adults and with senile adults. This may be served two or three times a day.

Pyruvate is a chemical derived from glucose that's normally shipped into the mitochondria. A mitochondrion is a bean-shaped organelle that resides in the cytoplasm of every cell. These vary in number from 200 of these tiny "boilers" to 10,000 per cell (expanding in number to meet the need)! One of the more unsung heroes of cellular life, the mitochondria use Pyruvate and fatty-acid metabolism and electron transport to provide energy for cells. Researchers studying this enterprising organelle have discovered that in 95 percent of the cases of stroke, Alzheimer's disease, and ALS there are elevated levels of free radicals and crashed mitochondria.

Pyruvate is processed further so that the respiratory chain can harvest its potential energy. However, when the respiratory chain (electron transport) is blocked, pyruvate accumulates outside the mitochondria, and when too much pyruvate has accumulated, the cells start to convert it to lactic acid. "Many patients with mitochondrial disease have lactic acidosis—lactate in the blood," neuroscientist Eric Schon of Columbia University in New York says. "And there's decent evidence that the lactate isn't just a sign of faulty mitochondria, but that the lactate itself is bad—especially in the brain, but probably also in the muscle. If this is true, then holding that lactate down would help the patient." There is a frequent association of lactic acidosis and carnitine deficiency in autistic patients, which suggests excessive nitric oxide production in mitochondria (Lombard, 1998; Chugani et al, 1999). *Sport* by Mannatech™ can aid in removing excess lactic acid, whether in sports, or in autism; however, supplementing small amounts of alpha lipoic acid (several times a day), NADH, and CoQ10 may enable the mitochondria to use the pyruvate. Children with inborn errors of pyruvate metabolism showed symptomatic improvement with a supplement of Alpha Lipoic Acid. A deficiency of carnitine decreases the activity of Cytochrome c oxidase (Complex IV), NADH dehydrogenase (Complex I), and succinate dehydrogenase that regulate three of the five steps in the process by which cells oxidize food to energy in the mitochondria. Supplementing acetyl-L-carnitine restores the function of the antioxidant enzyme cytochrome c oxidase to optimal levels.

Additionally, tartaric and citramalic acids, often elevated in autistic children and in sufferers of fibromyalgia, apparently as a byproduct of yeast overgrowth, can interfere with mitochondrial function. These acids are analogs of malic acid and as such, they inhibit the enzyme, fumarase, that is important in the production of malic acid needed in the Krebs Cycle in its production of energy. The proper function of the Krebs Cycle depends on a continuing supply of malic acid. The very toxic Tartaric and the Citramalic acids block the availability of malic acid in the mitochondria. Supplementing with malic acid (pure Apple Cider Vinegar and/or magnesium malate) brought favorable improvement in the disorder, fibromyalgia. Enquire at your healthfood store. A tasty, chewable magnesium, 200 mg (malate, citrate, and gluconate chelate), is available through your doctor from Anabolic Labs at (800) 445-6849 reference number 370015.

Cellular energy production itself produces free radicals that can damage cell structures, including the mitochondria, and ultimately lead to various diseases if the body's natural antioxidant capacity is inadequate. Acetyl L-carnitine and Alpha Lipoic Acid are both endogenous (naturally present in the body) antioxidants that have been shown to restore mitochondrial function and reduce free radical damage. (Hagen TM et al., 1998; Lyckesfeldt J et al., 1998) Together with NADH and coenzyme Q10, they work to maintain the function of the mitochondria. Elevated levels of free radicals from immune activation produced by dietary intake of food

substances identified as pathogens (allergens) in the autist contribute significantly to the production of toxic and neurotoxic substances. Mitochondria are vulnerable to a wide array of endogenous and exogenous factors that appear to be linked by excessive nitric oxide production. Strategies to augment mitochondrial function, either by decreasing production of endogenous toxic metabolites, reducing nitric oxide production, or stimulating mitochondrial enzyme activity may be beneficial in the treatment of autism. To accomplish the strategies to augment the mitochondrial function requires that the dietary pathogens be identified and eliminated, the nitrogen containing amino acids be regulated, and the metabolism be functioning at optimal levels with healed mucosal linings and the recognized essential nutrients present and available.

The volume of hydrochloric acid needed for digestion may be as important as its strength (acidity). It must register a pH of 3 or below for pepsinogen to be converted to pepsin—needed to dissolve proteins into polypeptides in the first step of reducing protein to amino acids that the body can use. In today's crazy world, even children do not produce enough HCl to digest their foods properly! It seems that autistic children in particular have a preponderant number who are lacking HCl. One test identified 52% lacking.

Conditions associated with the depressed secretion of hydrochloric acid include infancy, aging, elevated levels of prostaglandin E2, cannabis use, billiard disease, allergies, autoimmune phenomenon, disorders in calcium metabolism, Vitiligo, and the signs and symptoms associated with fat-soluble vitamin deficiencies (A, E, D, K, Fas). Fatigue, vague epigastric distresses after meals, reflux, chronic excessive intestinal gas, constipation, belching, abdominal distention, coated tongue, nausea, vomiting, morning diarrhea, and frequent appearance of undigested food in stools all signal that HCl secretion may be impaired.

Chyme leaves the stomach in small dumps. When the chyme leaving the stomach is sufficiently acid, the duodenum triggers the secretion into the blood of Secretin from S-cells in the small intestine walls. **HCl is the only known stimulus of Secretin. Secretin is also formed in the portions of the intestines that lie beyond the duodenum, and the humoral effect of Secretin is exerted not only on the pancreas but also on the intestinal glands and the liver (in augmenting the secretion of bile).** Zinc appears to influence the bioavailability of Secretin as well as the availability of HCl. The amount of Secretin released is dependent on the volume and pH of the chyme. This release of Secretin does three things immediately. It signals the stomach to: 1) shut down HCl production (indicating that infusions should not be administered immediately after a meal, and that signs of an acid stomach after the stomach is empty may be due to a lack of Secretin output), 2) to release bicarbonate of soda in precisely the right amounts to neutralize the acid, and 3) to release pancreatic enzymes to continue the digestion of the food. The Secretin passes throughout the system, even into the brain, where it affects many body functions. Slowed emptying time of the stomach, reduced gastrointestinal symptoms, and—in many—dramatic improvements in behavior, as manifested in improved eye contact, alertness, and expansion of expressive language, are documented in many of those receiving infusions of Secretin.

Secondarily, Secretin generates a signal to the gallbladder to send down appropriate amounts of bile to aid the digestion of the sensed amount of fat present. The body has many "backup" or secondary systems to function under varied conditions. When fat and protein enter the duodenum, apparently even in the absence of sufficient acid to trigger Secretin production, cholecystokinin (CCK) is secreted from the walls of the duodenum, which signals both the pancreas and the gallbladder to do their thing. That is why we can exist without HCl, though not well, for HCl/pepsin has not broken down the protein in the stomach, and vitamin B_{12} is not being assimilated. Similarly, if food is not thoroughly chewed, some carbohydrate digestion will still take place in the small intestine due to the pancreatic enzyme Amylase (that is often deficient in Autism).

Vitamin B_{12} is essential for myelinogenesis in the developing central nervous system, a process that is not complete until around the age of 10 years. B_{12} deficiency may, therefore, be a contributory factor in the

developmental regression. The primary sources of vitamin B_{12}, which is essential for brain development, are animal products like meat, dairy products, and eggs. Since Vegan mothers eat little or no animal products, too little vitamin B_{12} is transmitted to their children through breast milk, according to Dr. Maria Elena Jefferds. Similarly, children who refuse meat, dairy, and eggs, or who lack HCl will lack this vital vitamin. Curiously, blood levels of vitamin B_{12} may appear normal, yet the brain will be lacking. This can cause severe mental deterioration. Many find methylcobalamin shots more effective than oral or sublingual, and this is benefiting those with autism.

As with Secretin, CCK does many things throughout the body. This peptide is found in neurons of the peripheral nervous system, including those in the gut, and in the brain, but little in the spinal cord. The highest concentrations are found in the cerebral cortex, hippocampus, thalamus, amygdala, and hypothalamus. There are two receptors identified: CCKA found abundantly in the pancreatic acinar cells, and CCKB, that functions also as gastrin receptors. That is the predominant form found in the brain where CCK produces satiety. Both Secretin and CCK have a direct gut/brain connection. It would appear that gastrin, a hormone produced by the G-cells of the lower stomach, but secreted not into the stomach but into the blood stream, may have widespread effects also as it uses CCKB receptors.

"Many forms of CCK are active but the octapeptide form of CCK, which is a chain of eight amino acids, is able to promote the same degree of signal at the CCKB receptor regardless of whether sulfate has attached to it or not. On the other hand, the CCKA receptor is a thousand times more responsive to sulfated octapeptide than it is to the octapeptide's unsulfated form. In a condition of low sulfate (PST—poor sulfoxidation), CCK's maturation might be affected, and the delivery of its signal at the CCKA receptor would be unreliable. When one looks at the function of the CCKA receptor, the possible relevance to autism begins to become clear. Though it is clear there are some regions where the CCKA receptor does not regulate the production of the neurotransmitter serotonin, it clearly does have effects in the hypothalamus, and it is also clear that CCK has very powerful effects on serotonin in other regions where the receptor has not been differentiated. It may consequently have effects on serotonin's metabolite, melatonin, in the pineal gland. (Serotonin, through its effect on CCKB, produces satiety—WSL.) The CCKA receptor powerfully regulates another neurotransmitter, dopamine, and also intrinsic factor, a substance in the digestive system that allows the body to absorb vitamin B_{12}. When B_{12} is lacking, it will result in elevations in methylmalonic acid in the urine, which was found to be consistently elevated in the children in Wakefield's recent study...The CCKA receptor also governs the release of and regulates the release of the hormone oxytocin, dubbed the 'social hormone'. CCK also helps to regulate another hormone: motilin"—Susan Owens. "Thus, a lack of sulfation will greatly diminish available pancreatic enzymes necessary to digestion, and adversely affect all these neurotransmitter functions (see the information on sulfation deficit, and PST below). Opioid peptides inhibit oxytocin release, and thereby promote the preferential secretion of vasopressin when it is of functional importance to maintain homeostasis during dehydration and hemorrhage. Both neuromodulators and neurohormones coexist in the same neuron"—Susan Owens.

The significance of this is seen in a recent study: patients who inhaled the hormone oxytocin paid more attention to expressions when looking at pictures of faces and were more likely to understand social cues in a game simulation, the researchers said in the journal Proceedings of the National Academy of Sciences. Angela Sirigu of the Center of Cognitive Neuroscience in Lyon, who led the study, said the hormone has a therapeutic potential in adults as well as in children with autism. While it would be nice to have an oxytocin "puffer", it seems more productive to work with improving CCK and the sulfation aspects.

CCK is dependent upon an adequate supply of the amino acid phenylalanine. Secretin and other hormones are also dependent upon adequate amino acid substrates. "Available pools of these sulfhydryl amino acids can be depleted by the metal-induced, high turnover of glutathione (GSH). Persistent candidiasis/dysbiosis associated with mercury

(Hg) burden can compromise the absorption of aromatic amino acids such as phenylalanine, tyrosine, and tryptophan, which are precursors to dopamine/norepinephrine and serotonin, respectively" (Quig, unpublished). **Due to poor digestion, and the poor eating habits of these children, amino acid concentrates often must be supplemented.** Lewis Laboratories' Brewer's yeast, or desiccated liver, or pure amino acid supplements must be supplied. Seazyme™, a specially predigested concentrate of white fish, is a good way to go since it is absorbed by those too weak to digest regular protein.

When supplementing pure amino acids, do not take phenylalanine, tyrosine, and tryptophan together as they compete. Be aware that elevations of phenylalanine and dopamine (produced by phenylalanine and tyrosine) have been associated with several known behavioral disorders including schizophrenia and seizures as well as headaches. Do not drink diet drinks with their high phenylalanine and aspartate content. Additionally, be aware that dopamine and norepinephrine, produced by metabolism of phenylalanine in the brain, play an important role in controlling the release of several pituitary hormones (vasopressin, prolactin, oxytocin, luteinizing hormone, growth hormone, and thyroid stimulating hormone). **Supplementing phenylalanine or tyrosine prevents reduction of norepinephrine levels that is induced by stress. These amino acids are themselves depleted by stress.** Many clinical studies, and a large body of anecdotal evidence, indicate that tyrosine may prove to be a vital substance in alleviating depression and the irritating symptoms of premenstrual syndrome. It also controls familial tremors. Tyrosine is vitally important because it is a precursor to Thyroxin (Triiodo tyrosine), dopamine, adrenaline, and noradrenaline. Thyroxin (T4) is, of course, a primary thyroid hormone, a lack of which leads to a series of conditions including excess weight gain, cold hands and feet, and decreased basal metabolism. The catecholamines adrenaline and noradrenaline are critical. Science magazine reports that tyrosine lowers blood pressure by increasing norepinephrine metabolites that, through a feedback, shuts down an overreactive sympathetic nervous system (as does magnesium and glycine).

Further, remember that magnesium raises the threshold for seizures, greatly reducing the chance of seizures and of migraine headaches. Throughout this paper, I have stressed the great need for magnesium supplementation. This need is all the more evident when we realize that a USDA survey found only 25% of us receive even the pitifully inadequate RDA amounts, while 39% received less than 70% of RDA! Furthermore, we know that stress (and you and your kid are stressed to the max) greatly increases magnesium excretion, as does many medications and many chronic diseases such as heart failure, lung diseases, MS, diabetes, and other neurodegenerative diseases.

When treated with oxytocin, which neutralizes the effects of stress, within one week, autistic children become much more relaxed. Within the next week, the child will start to remember social events. Oxytocin controls the memory of social events, and autistic kids can't remember social interactions that they had only hours before. Oxytocin is also instrumental in the ability to read facial expressions. Autistic children can't do this. It can also help reduce stimming, which typically disappears when oxytocin levels are restored. They show better eye contact and better language expression. The protocol for using oxytocin is quite complex. – Dr. Jorge Flechas, MD. Unless Dr. Flechas has trained your doctor, a negative response to oxytocin may result from inappropriate administration. Nevertheless, it is better to restore the body's ability to naturally excrete oxytocin as discussed above.

If the fat is not digested because of insufficient bile or a lack of the pancreatic enzyme lipase, or there is a deficiency of lipotrophic agents (primarily vitamin B-complex) there will develop a fatty-acid deficiency affecting the amino acid balance, and a deficiency of the fat soluble vitamins A, D, E, and K contributing to many of the "autistic" symptoms, and causing heart problems in adults. The already dysfunctional immune system will be further compromised. Vitamin E deficiency can be seen in people unable to absorb fat properly. Such conditions include pancreatitis (inflammation of the pancreas), cystic fibrosis, and biliary diseases (illnesses of the gallbladder and biliary ducts). Symptoms of vitamin E deficiency include muscle weakness, loss of muscle mass, abnormal eye movements, impaired vision, and an unsteady gait. Eventually, kidney and liver function may be compromised. Other vitamin E deficiency symptoms:

fatigue, severe menstrual cramps, menopausal hot flashes, depression, sweating, fear, nervousness, difficulty becoming pregnant, lack of sex drive, low sperm count, dry skin, dry scalp, split ends of hair, wounds that fail to heal cleanly, breathlessness, stabbing pains around the heart after exercise (Angina), and swelling of feet, legs, and ankles after sitting. In addition, severe vitamin E deficiency can be associated with serial miscarriages and premature delivery in pregnant women.

Parents using over-the-counter CCK, as an oral dietary supplement for their children with autism or PDD, have reported beneficial effects similar to those of Secretin. High doses suppress the appetite leading to the product being marketed as a weight-loss treatment under the name Bodyonics®. CCK is available from GNC stores (800) 797-8828. For use in children, 1/8 to ¼ of a 100 mg capsule of the CCK product is taken following each meal exactly one hour after the first bite of food. The dosing and the timing of administration are critical, and it should only be used under a physician's supervision. Over dosage has caused panic attacks, nausea, uric acid and appetite suppression. When given at the beginning of the meal, pancreatic enzyme secretion begins before the food reaches the small intestine and may cause rectal burning. Being a beef extract, it can cause allergic reactions for those sensitive to beef—Biological Treatments for Autism and PDD by Wm. Shaw.

Scientific studies show that gingerol, one of the primary pungent principles of ginger, helps counter liver toxicity by increasing bile secretion and enhancing Phase I liver enzymes. Ginger has potent anti-microbial and anti-oxidant (food preservative) qualities as well. A recent study, furthering ginger's reputation as a stomachic, shows that acetone and methanol extracts of ginger strongly inhibits gastric ulceration. Several studies published in the last two decades have confirmed the traditional claims for use as an anti-vomiting or anti-motion sickness agent. Additionally, it prevents dangerous blood clotting and reduces inflammation. It can be taken as a tasty tea, or in capsules. It also produces nitric oxide, so those with low smooth muscle tone may not wish to use it.

If the stool floats, is light tan or gray in color, bulky, shiny, and foul smelling, then fat is not being digested and a supplement of magnesium taurate or L-taurine and L-glycine, and possibly ginger are needed. If these do not correct the problem soon, then a supplement of ox bile or of bile salts is needed. I'll say more on that later. It is of interest to note that lipase is present in good amounts in raw meat, but not at all in cooked meat, and cooking destroys all enzymes found in raw food. To compensate for our cooked-food diet, we must use a digestive enzyme supplement. I recommend Kirkman's EnZym-Complete™ or Metagenic's SpectraZyme™, or Hn-Zyme Prime™/Peptizyde AFP™ by Houston, Inc, or Mannatech's GI-Zyme™. Houston's AFP has no fruit-source enzymes that are troublesome for some children. Houston also has a product called No-fenol™ that seems helpful in breaking down fiber and complex carbohydrates of plants. This should release more nutrients and diminish food for Yeast and other pathogens.

Felsenfeld, et al, found pancreatic enzymes useful in restoring proper intestinal flora and in the nutritional management of gastrointestinal bacterial overgrowth problems which come from increases in bacteria such as Clostridia, Bacteroides, Pseudomonceae, and the Enterobacteriaceae, such as E. Coli and Klebsiella. Many of these organisms can be recognized as those bacteria involved in protein putrefaction and the so-called toxic bowel syndrome. Bowel flora mass depends on high intakes of starch, therefore, the "London Ankylosing Spondylitis (AS) diet", consisting of a low intake of starch (no bread, cakes, potatoes, and pasta) has been used in the treatment of AS patients at the Middlesex Hospital with relative success since 1982. AS is adjudged to be caused by or to be aggravated by Klebsiella. It is of interest to note that most diseased patients have elevated levels of specific antibodies to Klebsiella microorganisms. The general theory is proposed that HIGH STARCH eaters may develop two types of diseases, depending on their HLA-status: Those that are HLA-B27 POSITIVE will develop AS and those that are HLA-B27 NEGATIVE will develop Crohn's disease. They will definitely develop insulin resistance and probably diabetes! In one study, use of azeotropically (a type of distillation) processed pancreatin hastened the

return of the altered intestinal flora to their pre-infection levels and restored gastrointestinal ecology. Additionally, vitamin B_{12}, folic acid, and zinc were better absorbed and utilized.

Pancreatic function was significantly reduced in patients with hypothyroidism compared with healthy subjects. Treatment with thyroxin restored the pancreatic function to normal. In two additional hypothyroid patients studied by means of duodenal intubation, pancreatic secretion of both bicarbonate and enzymes was found to be significantly decreased. It was concluded that the thyroid gland plays an essential role in maintaining the functional integrity of the exocrine pancreas in humans (Gullo et al, 1991). Hypothyroidism is also associated with anorexia, anxiety, fears, and aggressiveness in the young. Constipation and low HCl are also frequent problems. Sometimes the reduced ability to concentrate and short-term memory loss of hypothyroidism looks like attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD). A new study published in the July issue of the American Journal of Gastroenterology by Dr. Vincenzo Toscano and colleagues at the Universita La Sapienza in Rome indicates that adolescent patients with celiac disease have elevated levels of anti-thyroid and anti-pancreatic autoantibodies.

Infants born to women with underactive thyroid were at increased risk of cardiac problems even if the mothers were on medication. (Synthroid^{R} medication does not correct the nutrient lack, the excess fluoride or copper, or the mercury and lead poisoning that induced the hypothyroidism!) There was increased risk of other problems, mostly intellectual or developmental, in children as a result of hypothyroid (underactive thyroid) pregnancies. Moms with hypothyroidism were more likely than those with hyperthyroidism to have babies with defects. Do the Iodine and Morning Temperature Test for both you and your children and support the thyroid function as outlined later. A simple urine test for iodine being excreted would be even better. The median concentration (of a deficient population) is 145 mcg/L. Unless you test well above that figure, supplement iodine. Fifteen percent are likely to have less than 50 mcg/L! I, Willis, had Zero! An ultra-conservative figure of 500 mcg/L has been set as "excessive" iodine. Ideal amounts would be well above that (Orthoiodo supplementation: Iodine Sufficiency of the Whole Human Body by Guy E. Abraham, MD, et al., The Original Internist, Dec 2002. Commonly difficult problems for which iodine therapy has been called a panacea are fibrocystic breasts, polycystic ovary syndrome, hypo- and hyperthyroid (with or without goiter), brain fog, constipation, obesity, diabetes (resolving problems without insulin), hypertension (high blood pressure), and some heart problems, notably, irreversible arrhythmias like atrial fibrillations. The iodine/iodide loading test is much more accurate than the skin test, and it is now available from two laboratories:

FFP Laboratories, 80 Doctors Dr., Suite 3, Hendersonville, NC 28292, Phone: 887-900-5556 / Fax: 828-684-3253

Doctor's Data Inc, 3755 Illinois Avenue, St. Charles, IL 60174, Phone: 800-323-2784 / Fax: 630-587-7860

It was shown in an in vivo experiment that treatment of rats with thyroid hormone increased hypothalamic oxytocin (OT) mRNA levels, the pituitary OT content, as well as OT levels in blood. The results reveal thyroid hormone as a physiological regulator of OT gene expression, which stimulates OT promoter activity directly through interaction with a thyroid hormone-response element in the OT gene. (Adan et al, 1992) Thyroid hormones affect oxytocin gene expression in hypothalamic neurons (Dellovade et al, 1999).

Leslie Brothers of the California Institute of Technology found that when connections to and from the amygdala and the cortex were severed, monkeys in the wild lost all sense of how to respond emotionally to other monkeys, and isolated themselves, even as ASD children often do. Other researchers observed that there was a remarkable, family resemblance between social bonding and narcotic addiction—from the initial attachment-dependence phase to the eventual tolerance-withdrawal phases. It became clear that when animals were given very tiny doses of opiates, they were not distressed by social isolation, and they became comparatively unsocial (even though they could exhibit increases in certain social activities such as rough-and-tumble play). When given an opiate antagonist, such as naltrexone, to block opiate receptors, they were more disturbed by social isolation, and they

became more eager for gentle and friendly social contact. A double blind study using naltrexone produced significant reduction in autistic symptomology among the 56% most responsive to opioid effects. The behavioral improvements (increased endorphin levels) were accompanied by alterations in the distribution of the major lymphocyte subsets, with a significant increase in the T-helper-inducers and a significant reduction of the T-cytotoxic-suppressors and a normalization of the CD4/CD8 ratio (boosting immune function).

Low dose naltrexone (LDN) is becoming popular with DAN! Doctors. This enhancing of the immune system function may be a negative effect for those with an "Autoimmune" condition where T-cells are already overactive and Suppressor cells underactive. Additionally, LDN acts upon receptor sites throughout the body, not just in the brain. What are the long-term effects? It also comes with a long list of side effects that the child cannot express, though the low dose may lessen the frequency and severity of those. In my humble opinion, LDN should not take the place of gluten/casein free diet. Nevertheless, for you Mom's, Dad's, and Grandparents, this may be of value. Dr. Julian Whitker, MD has found LDN to be a tremendous benefit to two lymphoderma patients (cancer patients whose lymph nodes had been removed), greatly reducing swelling and pain (Health and Healing Newlsetter, July 2007) and Dr. Burton Berkson, MD, and others, have used it successfully on many other cancers. It is being used with good results for MS, rheumatoid arthritis, lupus, Crohn's disease and other autoimmune disorders, and AIDS. See other information under the Section "Mercury Poisoned", and visit www.lowdosenaltrexone.org.

Clinical signs that may attend high urinary opiates are aphasia or poor language development; constipation or constipation mixed with wet stools; strong growth and gain or excess weight for stature; marked perseveration and rigidity; and marked lack of social connectedness. Opioid peptides are known to adversely affect neuronal development in the central nervous system, to affect perception, sleep, pain, cognition, and immune function, and to create perseverative behaviors.

Other studies have found that mercury causes increased levels of the CD8 T-cytotoxic-suppressors. It's not a far step to imagine that these opiate effects on social behavior might reflect something that is happening in childhood disorders such as autism. "When we focused on the data, it was clear that only the animals given opiates became unsocial with less pain sensitive (dysautonomia)", researchers said. Thus, it seemed more compelling to suggest that some kids with autism might also have too much opioid activity in their brain. This was especially attractive since there were experimental drugs, such as naltrexone, that could reduce such brain activities. Still, some of the kids, perhaps the insecure/anxious ones, may have too little opioid activity.

"The digestive actions (of motilin—WSL) can be suppressed...when there is a high level of histamine from an allergic reaction or from an immune attack against parasites, and...when there are low levels of serotonin in the gut. Lowered gut levels of serotonin might occur if bacteria were squandering available tryptophan in order to produce the precursor to indolyl acryloyl glycine (IAG). IAG is very often extremely elevated in urinary profiles of those with autism. (It usually returns to normal when the lactobacillus acidophilus is restored to the gut—Wm. Shaw). Motilin also appears to be very influenced by opiates. This regulatory influence could have significance in a syndrome in which excess opiates from dietary sources (gluten and casein) have been frequently described; and in which inflammation is frequently seen, because inflammation would induce the expression of endogenous opiates, such as interferon-alpha. These influences upon motilin's digestive activity may account for the variable digestive difficulties that are commonly described in autism"—Susan Owens.

Motilin is reported to be elevated in the plasma of some autistics. "Motilin has similar effects to morphine on the reflex involved with urination (and may cause difficulty in potty training—WSL). Acute elevations in plasma motilin seem to follow on the heels of immune activation in the gut and in other GAG-rich areas such as the lungs. It could become elevated in plasma due to a regulatory effect of low bicarbonate released from the pancreas. This could happen if Secretin levels were unusually low, or when CCK is not fully sulfated. Since Secretin seems to

stimulate the release of sulfated glucosaminoglycans (GAGs) from some epithelial tissue, this interplay of intestinal hormones may furnish more reasons why Secretin has recently been found beneficial to those with autism. Motilin is also an important neurotransmitter found in abundance in the areas of the brain suspected of having problems in autism. It is a major neurotransmitter in Purkinje cells in the cerebellum, where the most conspicuous problems in brain morphology in autism have been described"—Susan Owens.

Colostrum is very high in motilin (that may promote diarrhea), and may be helpful in the above respects as well as in its antibacterial properties. Colostrum is, however, at least in mother's milk, high in casein, so those on casein-free diets should verify there is none in the commercial colostrum of cow's milk. In one independent testing of several brands, only Kirkman Lab's Colostrum Gold™ was casein free. Casein is often hidden in dextrose, maltose, modified food starch, caramel color, barley malt syrup, calcium caseinate, etc. As to potty training, one Mom reports that AIT enabled her son to know when he needed to go.

What are GAGs? They are molecules of long, unbranched polysaccharides (mucopolysaccharides) containing a repeating disaccharide unit. The disaccharide units contain either of two modified sugars—N-acetylgalactosamine (GalNAc), or N-acetylglucosamine (GlcNAc), and an uronic acid such as glucuronate or iduronate. GalNAc and GlcNAc are two of eight known to be necessary polysaccharides. They are lacking in the diet and should be supplemented. GAGs are extremely vital to your health and immune function, and require vital sulfate and adequate manganese to be properly formed. IGF-1 increases the incorporation of sulfate in glycosaminoglycans. IGF-1 is known to be low in zinc deficiency seriously affecting the vital sulfation of GAGS. A study published in the March 31, 2004 issue of the European Journal of Clinical Nutrition DHEA (the "youth hormone") is also directly related to magnesium deficiency. Magnesium Oil can deliver all of the magnesium you need to restore DHEA levels and to help you look and feel younger. Recent tests show that there are cellular receptors specific to DHEA. In addition, DHEA significantly increased the expression of endothelial nitric oxide synthase, the enzyme that catalyzes the conversion of arginine to nitric oxide in the endothelial cells of the blood vessels, thus aiding in the vasodilation and lowered blood pressure. It appears that arginine and DHEA should be taken together. Arginine must also be taken in time release or be taken 4 times a day, one serving being at bedtime. Otherwise, NO production will be sporadic, and HGH is formed during sleep. Cortisol is the antagonist of DHEA (and vice versa), so, those under high stress must supplement DHEA. DHEA (the "youth hormone") is also directly related to magnesium deficiency. Magnesium Oil can deliver all of the magnesium you need to restore DHEA levels and to help you look and feel younger. Recent tests show that there are cellular receptors specific to DHEA. In addition, DHEA significantly increased the expression of endothelial nitric oxide synthase, the enzyme that catalyzes the conversion of arginine to nitric oxide in the endothelial cells of the blood vessels, thus aiding in the vasodilation and lowered blood pressure. It appears that arginine and DHEA should be taken together. Arginine must also be taken in time release or be taken 4 times a day, one serving being at bedtime. Otherwise, NO production will be sporadic, and HGH is formed during sleep. Cortisol is the antagonist of DHEA (and vice versa), so, those under high stress must supplement DHEA. reports that high intakes of skimmed milk, but not meat, increase serum IGF-I in eight-year-old boys. Use care here for excess IGF-I is a key factor in the growth and proliferation of every human cancer.

The specific GAGs of physiological significance are hyaluronic acid, dermatan sulfate, chondroitin sulfate, heparin, heparan sulfate, and keratan sulfate. Excitotoxic effects of ammonia are augmented by increased synthesis of nitric oxide (NO), which is associated with N-Methyl-D-Aspartate (NMDA-excitatory) receptor activation and/or increased synaptic transport of arginine. High levels of NO are a consequence of excitotoxin damage. Excess NO has been shown to inhibit sulfation of GAGs.

The pancreas secretes many enzymes, including amylase (starch digesting) lipase (fat digesting), protease (protein digesting) lactase (milk digesting), and peptidase. The peptidases will breakdown the peptides of milk and gluten that, if undigested, may pass through a damaged "Leaky Gut", and become responsible for many of the problems

seen in the autistic. Mercury, however, inhibits the peptidase—dipeptidyl peptidase IV—that cleaves, among other substances, casomorphin during the digestive process (Puschel et al, 1982). Mercury, then, is a major contributor to the opioid problem. Curiously, gelatin in that favorite of kids, Jell-O™, is now said to inhibit this enzyme, and should be eliminated from the diet. The enzyme is dependent on zinc that is universally lacking in these kids, so a zinc supplement would help. Candida, antibiotics, vaccines, and pesticides all deactivate DPP-IV—Dr. Wm. Shaw. **Of 36 vaccinees, 10 were demonstrated to be allergic to gelatin**—Allergic Reactions to Measles-Mumps-Rubella Vaccinations, by Anna Marie Patja, MD, Soli Makinen-Kilujen, Ph.D., Irja Davidkin, Ph.D., Mikko Paunio, MD, Ph.D., and Heikki Peltola, MD, Ph.D. The allergic response these opioid-forming peptides cause makes the gut all the more permeable. One study of delinquent boys (Schauss, 1980) found that they drank an average of 64 ounces of milk daily! This is an allergic addiction. The control group of non-delinquent boys drank less than half that amount. Milk doesn't always "do the body good". Beta-casomorphine-7 is a morphine-like compound that results in neural dysfunction, as well as being a direct histamine releaser in humans and inducing skin reactions. **Additionally, milk increases the bioavailability of Mercury.**

The rapid turnover of the epithelial cells of the gut (3 to 6 days) demands high nutritional levels, especially of the sulfates, that are not being adequately supplied. A low level dysfunction called "dysbiosis" develops within the gut. Ordinarily unvirulent organisms (yeasts, fungi, and bacteria) begin to alter the metabolic and immune responses of the body. The immune system may react to and destroy normal gut flora. Contributing to this may be a low-grade, measles infection in the gut from vaccines, and chronic infection from common pathogens such as Epstein-Barr virus (EBV), Cytomegalovirus (CMV), and/or Human Herpes Virus 6 (HHV-6). The liver is overburdened, creating a flood of free radicals that damage the liver and create toxic bile that can damage the pancreas. Restoring the beneficial bacteria that line the intestinal tract may help to prevent the body's immune system from causing inflammation in the gut. Researchers found that these bacteria are actually able to control the immune system of the host. Additionally, these viruses can be controlled by taking massive doses of vitamin C and A for several days, in conjunction with exercise. Chromium, manganese, selenium, and zinc will benefit.

I have spoken of the value of vitamin C, but when dealing with viruses these snips should be noted: "Vitamin C response when taken by mouth is not predictable. Wright and Lilienfeld (1936 19) reported that the scorbutic state could develop even though the patient was taking large doses of vitamin C by mouth. In the opinion of Musser (1945 20) poor absorption and equally poor storage are cardinal factors in leading to vitamin C deficiencies. It was our privilege to observe this mechanism in one of our daughters several years ago. She had contracted chickenpox. Vitamin C was started on this child when the macules first put in their appearance. In spite of the fact that she was given 24 grams every 24 hours, there was no interruption in the progress of the disease. Itching was intense. One gram administered intravenously stopped the itch within 30 minutes, and she went on to peaceful sleep for the next eight hours. Although feeling fine, a second injection was given at this time, following which there were no new macules, and recovery was fast and uneventful. In the past few years, we have noted that in chicken-pox when massive injections (of vitamin C) are employed there [are] no repeating waves of macules, and the usual seven to nine days required for crusting is reduced to less than twenty-four hours. Large doses parenterally are effective when oral administration fails (Youmans 1945 3)."

"In this experiment it was found that 1000 mg vitamin C every four hours, by mouth, would modify the (viral) attack. Smaller doses allowed the disease to progress. When 1000 mg was given every two hours, all evidence of the infection cleared in 48 hours. If the vitamin was then discontinued for a similar period (48 hours), the above syndrome returned. We observed this pattern for thirty days at which time the vitamin C was given 1000 mg every 2 hours around the clock for four days. This time the picture cleared and did not return. These little girls did not develop the measles rash during the above experiment and although exposed many times since, still maintain this "immunity." Late cases were given the vitamin by needle. The results proved to be even more dramatic. Given by injection the same complete control of the measles syndrome was in evidence in 24- and 36-hour periods,

depending entirely on the amount employed and the frequency of the administration. Aborting of these cases before the development of the rash apparently gives no interference to the development of immunity. Recent progress on the rapidity of growth (development) of the virus bodies by means of the electronic microscope makes intelligent the failure experienced by earlier workers when employing vitamin C on the virus organism (or bodies). Unless the virus is completely destroyed, as demonstrated in the experiments with the measles virus, the infection will again manifest itself after a short incubation period. Small, single daily doses do not even modify the course of the infection."

Shenk and his colleagues have shown that a COX-2 Inhibitor can stop CMV from replicating in infected cells. The drug does this by blocking production of cyclooxygenase-2, an enzyme better known as COX-2. Normally, COX-2 helps to manufacture the pro-inflammatory prostaglandin E2 (PgE2), an eicosanoid that triggers fever and inflammation. Some viruses apparently commandeer PgE2 to help them multiply. Shenk showed that fibroblasts (from human foreskins) infected with CMV made 50 times more PgE2 than normal. The cells stopped making PgE2 altogether, however, as soon as they were exposed to the COX-2 Inhibitor. Virus production by the cells dropped 100-fold! This should be effective against all lipid-enveloped viruses. Additionally, this from another researcher: "We found that the inhibition of COX antagonizes Vesicular Stomatitis Virus (VSV) propagation both in vitro and in vivo. In addition, aspirin and Celecoxib (COX Inhibitor) both prevented the disruption of the blood brain barrier in VSV-infected mice. **In vitro experiments showed that the effect of COX inhibition was at least partially mediated by increased production of Nitric Oxide (NO), a molecule known to inhibit VSV replication**—Chen N, Warner JL, Reiss CS, Department of Biology, New York University.

Actually, PgE2 suppresses the immune system by inhibiting the activation of NK cells. Another group of "bad" eicosanoids, **lipoxins**, inhibit the action of NK cells as well. This is vital new information, but we don't need these drugs with all of their side effects (Vioxx™ was just removed from the market - Sept 2004 - for causing heart problems!) to accomplish the reduction of Prostaglandin E2. Balancing fatty acid production will do this, and arginine and other nutrients will increase NO. A supplement of Bromelain also greatly reduces PgE2. See the Section "Managing Fatty Acids" following. Additionally, vitamin A, monolaurin, and lactoferrin inhibit the growth of CMV.

It has been observed that those children whose autism appears at or around the time of birth may have a problem with casein and show diarrhea, eczema, and ear infection from an early age. These have 10 times normal IAG and high peptides; whereas those who show regression into autism at about two years of age following MMR and introduction to a wheat-based diet, have particular difficulties with gluten. These would likely not have high IAG, but do have high peptides. Both gluten and casein may need to be removed, but this may give priority in beginning the program. Wheat gluten is 43% glutamate, the milk casein is 23% glutamate, and gelatin protein is 12% glutamate. Soymilk has a high content of glutamate, and additional glutamate is often added in form of hydrolyzed vegetable protein. Glutamate is an excitotoxin under many circumstances.

A test devised by Susan Bryson of York University in Toronto gives an early measure of autism. She measures a child's ability to shift focus from one stimulus to another. First, one light is turned on, and then as a second light is turned on and the first is shut off. All children will shift their focus from the first to the second light. In the second part of the test, the first light is left on as the second is turned on. Normal children will disengage from the first to the second light, but autistic children cannot make that shift. In contrast, a severely retarded 6-month-old can refocus its gaze with no problem.

It is worthy of note that over 80% of the children with acute otitis media improve without antibiotic therapy within a week. That compares with 93% recovery during the first week with antibiotic treatment, according to a

study released by the Agency for Healthcare Research and Quality (AHRQ). "Watchful waiting" is suggested as preferred treatment. This will prevent the damage to the gut, Candida overgrowth, and if made accepted practice, it will greatly reduce bacterial resistance to antibiotics. Strachah of Britain found that 1/3 of cases of otitis media could be attributed to second-hand cigarette smoke. **Cantekin found that recurrence after antibiotics was 2 to 6 times greater than for those not using antibiotics!** Van Buchem proved that the results of treatment and no treatment were virtually the same! **Left to heal itself, the immune system will be the stronger.** Otitis is often a clinical sign of vitamin A deficiency in children and antibiotics should never be used until vitamin A supplementation has had a chance to restore the immune function according to Dr. Richard A. Kunin, MD. To enable the body to throw off the infection quickly, supplement vitamin A (cod-liver oil) and use Echinacea extract in juice three times a day. It is totally nontoxic, but do not use if allergic to daisies. Put a drop of garlic and mullein oil in the ear also (but not if there is an ear tube in). If you must use antibiotic, request injections to avoid killing gut bacteria. Failing that, take one of the natural antifungal listed herein, and take yogurt or a probiotic supplement. Homeopathy offers an alternative to antibiotics. In one German study, after one year, 70.7% treated with homeopathy had no relapses compared to 56.5% treated with antibiotics.

Recurring ear infections or inflammation produces fluid buildup in the inner ear. A magnesium deficiency has been found to result in fluid retention, even after the infection is controlled or eliminated. Fluid retention in the inner ear is a sign of increased magnesium need in children. Do not use antihistamines to "dry up" the ears for that has been shown to triple the time it took to drain the ear.

One way to temporarily address that undigested peptide/leaky gut problem is to remove the casein or gluten, and the allergens from the diet. I urge you to undertake that as early as possible (See www.Gf/Cfdiet.com). Food sensitivities that express themselves in severe symptoms, such as would be the case for autism, rarely are limited only to a relative few food categories, such as gluten and casein. I strongly encourage you to determine the full extent of relief and improvement your child can achieve through dietary intervention. It is essential to avoid not only gluten and casein containing foods, but every other problem food in your child's diet. If the immune system is triggered by an allergen, the body is affected for a minimum of a week to ten days (or longer). So it's necessary to be particularly strict at the start of the treatment, when the goal is to "cool down" the immune system. It has been shown that these opioids permanently increase the permeability of the blood-brain barrier opening the brain to heavy metal poisoning and other toxic damage. Antibodies to gluten of the IgA type have been observed to lead to cerebellar degeneration. Some have been puzzled at seeing these antibodies while on the Gf/Cf diet. Dr. Shattock found that it could take at least a year before the peptides of gluten and casein would no longer be excreted in the urine.

The cerebellum (the part of the brain responsible for coordination) and in particular the Purkinje cells (output neurons of the cerebellum) appear to be most susceptible to damage in patients with gluten ataxia, but other areas of the brain are not spared. "We were interested to determine the mechanism by which Purkinje cells are damaged in gluten ataxia," commented Hadjivassiliou. Study results show that patients with gluten ataxia have antibodies against Purkinje cells and also that antibodies against gluten (antigliadin antibodies) cross-react with Purkinje cells.

It is especially important to have the child gluten-casein free during the teen years when his brain is being pruned of one-third of brain cells and synapses in the maturing of the brain. The opioids hinder this vital phase of development. In instituting a casein-free diet, one must supplement calcium (500 mg) and 1200 IU of vitamin D. Testing has found 2/3 of these children receiving less than the RDI of calcium.

Only about half of all Americans get the RDI of vitamin D, E, folic acid, and calcium, yet anticonvulsants lower levels of vitamins B_6, D, and E, calcium, manganese, zinc, copper, folic acid, and carnitine! Valproic

acid, in particular, depletes carnitine, alpha-ketoglutarate, and folic acid, and interferes with the conversion of vitamin B_6 to P5P. Additionally, a high amount of vitamin A interferes with vitamin D absorption, creating a calcium problem. Don't reduce vitamin A; but increase vitamin D that is woefully inadequate in the American scene.

Folic acid deficiency can be caused by use of Depakote™, Tegretol™, aspirin, Pepcid®, methotrexate, Dilantin™, Zantac®, oral contraceptives, and 21 other commonly used drugs. Folic acid deficiency symptoms include: harm to DNA that causes abnormal cellular development, especially in those with the most rapid rates of turnover (red cells, leukocytes, and epithelial cells of the stomach and gut, vagina, and uterine cervix). There will be birth defects (Spina Bifida, cleft lip and palate, small head, and possibly Down's), cervical dysplasia, elevated homocysteine, headache, fatigue, hair loss, memory loss, anorexia, insomnia, diarrhea, nausea, and increased infections. Folic acid is necessary for the production of red blood cells, thus a deficiency can result in anemia leading to tiredness, weakness, diarrhea, and weight loss. Recently, low folic acid levels have been linked to depression (up to 38%), especially in the elderly, and to poorer antidepressant response to selective serotonin reuptake inhibitors. Additionally, data from the famous Nurses' Health Study, conducted at the Harvard Medical School, show that long-term supplementation with folic acid reduces the risk of colon cancer in women by an astounding 75%. Folate deficiency may cause darkening of the skin and mucous membranes, particularly at the dorsal surfaces of the fingers, toes, and creases of palms and soles. Distribution typically is patchy. Fortunately, the hyperpigmentation gradually should resolve after weeks or months of folate treatment. **A modest temperature elevation (<102°F) is common in patients who are folate deficient, despite the absence of any infection.** Although the underlying mechanism is obscure, the temperature typically falls within 24-48 hours of folate treatment and returns to normal within a few days. An interesting thing about temperature is that many with subclinical Hypothyroidism run temperatures as low as 95 degrees Fahrenheit. An infectious fever in these might be represented by a normal 98.6! (Those with such low temperature will likely not become pregnant.) Nevertheless, supplementation of the general public with large amounts of folic acid will potentially harm many who are undermethylated (more than 50% of ASD children) according to Dr. Wm. Walsh. These should beware of prepared breakfast cereal that gives as much as 400 mcg in a 1-cup serving. If there is a question about supplementing folate, ask the Lab for a "Neutrophilic Hypersegmentation Index". If they do not have such to offer, have them draw blood and send it to Meridian Valley Labs, www.meridianvalleylab.com . The cost is only $35.00 US. The expected reading is Zero percent. Should it be more, even 95%, you must take 5 mg a day of folate until a Zero reading is achieved. This will take about 6 months. This formulation is available from www.tahoma-clinic.com.

Epilepsy often ceases when the child is placed on a gluten-casein free diet! Additionally, remove him from all allergens. Supplements of copper, magnesium, vitamin B_1, B_6, niacin, vitamin E, selenium, Evening Primrose Oil, GABA, Taurine, and melatonin have been shown to be helpful in ameliorating epilepsy. Evening Primrose Oil has few side effects. It may cause an occasional headache, nausea if taken on an empty stomach, and diarrhea, if taken in high doses. Patients with Temporal Lobe Epilepsy probably should not use Evening Primrose 0il. One should note that a frequent cause of seizures is parasites, usually worms. **One must always supplement vitamin B_6 when supplementing high amounts of niacin to avoid raising homocysteine levels.** A supplement of Dimethylglycine (DMG) has benefited many undermethylated children.

Clinical studies showed that children using anti-epileptic medication had reduced plasma levels of vitamin E; so doctors at the University of Toronto tested vitamin E on 24 children with epilepsy whose seizures could not be controlled by medication. The frequency of seizures was reduced by more than 60 percent in 10 of 12 children taking vitamin E supplements. (They took 400 IU per day for three months in addition to their regular medication – larger amounts would likely be more effective.) It should be noted that several studies show that alpha-tocopherol levels increase significantly when supplementing d-alpha-tocopherol, but gamma-tocopherol levels decrease significantly. It is the gamma tocopherol fraction that has been shown to be the critical factor in suppressing free radicals. Further, according to Dr. Marcus Laux, it neutralizes excess nitric oxides that cause inflammation.

Gamma-tocopherol (the major form of vitamin E in American food, in contrast to alpha-tocopherol, which is the major form of vitamin E in supplement pills) blocks cyclo-oxygenase and reduces proinflammatory PGE2 & LTB4 formation [FASEB JOURNAL 17:816-822 (2003)]. This is why it is important to buy the mixed-tocopherols. Increasing incidence of allergies and seasonal asthmas has been attributed to increased levels of LTB4 caused by excessively high, dietary omega-6 intake relative to omega-3.

Vitamin E (mixed tocopherols) is a boon in helping prevent heart disease as it improves blood flow and angiogenesis is enhanced. Muscles function on 40% less oxygen! However, Japanese researchers, led by Kiyotaka Nakagawa from Tohoku University, looked at the ability of tocotrienols to prevent angiogenesis, associated with tumor growth, rheumatoid arthritis, and diabetic retinopathy. In vivo tests, using the mouse dorsal air sac (DAS) assay dietary supplementation of 10 mg tocotrienol-rich oil per day (equivalent to 4.4 mg tocotrienol per day), suppressed angiogenesis by 44%, compared to controls; and in the chick embryo chorioallantoic membrane (CAM) assay, tocotrienol was found to inhibit new blood vessel formation while simultaneously increasing the area containing no blood vessels by 36% to 50%.

For additional helps for seizures, see Dr. Donna Andrew's website at www.andrewsreiter.com. She has epilepsy. However, she has not had a seizure in 25+ years. She taught her brain not to go into convulsions. This woman has dedicated her life to teaching others how to be seizure-free.

Have you been aware of food-related problems in your child? This would include, but would not be limited to, food allergies such as food-related asthma or rashes, food intolerance, food addictions, food sensitivities, food aversions such as being a very picky eater, or experiencing moderate to severe dietary limitations that are self-imposed. If your answer is 'yes' to one or more of these questions, then food allergies, intolerances, or sensitivities are more likely to be an underlying cause of the autism-related symptoms and seizures in your child. **However, avoiding the foods that trigger your child's symptoms is a very difficult, expensive stopgap unless the improved condition it brings is used to heal the digestion and the inflamed, leaky gut.**

When the duodenum or upper intestine is damaged, as in celiac disease, Secretin production may be diminished or lacking. That may require administering Secretin even when adequate HCl is present, as well as going on a gluten-free diet, at least until the damaged gut is healed. I think that frequent transdermal application is more natural if Secretin is to be used. This would avoid the trauma of infusion, and the possibility of seizures following infusion that has been reported in rare instances. To administer Secretin without first testing for pancreatic enzymes in the stool would be counterproductive. "We have been measuring pancreatic enzymes in the stool for 8 years: chymotrypsin directly and amylase and lipase indirectly. About 15% of autistic spectrum patients were deficient therein; they were given capsules containing these 3 enzymes, plus 2 additional ones (bromelain and papain) in a neutral solution. This group improved initially and continued to do so as normal enzyme levels were attained."—Dr. Hugh Fudenberg, MD. Repligen has found that 25% to 30% had abnormal values of chymotrypsin. Kids with low levels did not respond to Secretin infusion. Bromelain is also said to "digest" the outer shell around a developing tumor, allowing the immune cells to attack and destroy it. It stops the inflammatory prostaglandins (PgE2) without affecting the anti-inflammatory ones, thus lowers inflammation by 60% in a very short time. Remarkably, this gives it antiviral properties against CMV. Additionally, it reduces blood clotting and blood pressure, blocks development of varicose veins, reduces sinus problems, and bruises and sprains heal in 1/3 the usual time. It aids absorption of large molecule substances like glucosamine sulfate, recommended elsewhere.

"Autism" is of unknown cause, and most doctors will tell you there is no effective treatment, however**, this failure of digestion, whether from HCl or Secretin deficiency, or a damaged gut causes most of their mental and physical symptoms! These symptoms of malnutrition can be ameliorated by nutritional intervention.** As the nutritional status is improved, the immune function will be able to deal with the pathogens, especially if given the

benefit of Ambrotose AO™ and Phyt•Aloe® by Mannatech™ in modulating and strengthening the immune function. See the statistics of malabsorption and other biochemical malfunction at end of this paper. Clinical studies are available on request.

Recent reports indicate that 84% of autistics have elevated oxalic acid. Sugar increases the amounts of calcium, oxalate, uric acid, and glycosaminoglycans in the urine. This report suggests another source: Oxalate accumulation from citrate by Aspergillus niger. I. Biosynthesis of oxalate from its ultimate precursor. Müller HM. Oxalates trap heavy metals in tissues and bone and contribute to forming kidney stones. The sharp crystals may damage joints, blood vessels, lungs, and possibly the brain. Thirty-six percent of autistic children had urinary values of oxalate higher than 90 mmol/mol creatinine consistent with a diagnosis of genetic hyperoxaluria. However, other organic acids associated with genetic diseases of oxalate metabolism were missing. This indicates that oxalate is high due to external sources, such as yeast/fungal overgrowth and excess sugar intake, which is likely the main cause of elevated oxalate in the urine of ASD children. An interesting symptom is a craving for salt. Salt supports the adrenals, suggesting a need to support the adrenals as suggested elsewhere in this paper.

Oxalate degradation by the anaerobic bacterium Oxalobacter formigenes is important for human health, helping to prevent hyperoxaluria and disorders such as the development of kidney stones by 70% (J Am Soc Nephrol 08;19:1197-1203)! Oxalate-degrading activity cannot be detected in the gut flora of some individuals, possibly because Oxalobacter is susceptible to commonly used antimicrobials. Observations confirm a direct association between antibiotic consumption and absence of O. formigenes. Absence of intestinal O. formigenes could represent a pathogenic factor in calcium-oxalate urolithiasis when antibiotics are prescribed generously. A single oral ingestion of O. formigenes by adult volunteers was, for the first time, shown to result in (i) reduced urinary oxalate excretion following administration of an oxalate load, (ii) the recovery of oxalate-degrading activity in feces, and (iii) prolonged retention of colonization.

Recently, a low oxalate diet was hailed as the new thing in autism. Researcher, Susan Owens, discovered that a low-oxalate diet markedly reduced symptoms of children with autism. The Low Oxalate Diet (LOD) was developed by the Vulvar Pain Foundation (VPF) to ameliorate the vulvar pain that was found by Dr. Clive Solomons to be linked to the presence of oxalates. Dr. Solomons discovered the role of oxalates in triggering pain, and made the assumption that the major source of oxalates was dietary. Over time, the VPF developed a diet low in oxalates, with the goal of reducing body stores of oxalates and, therefore, reducing pain. Dr. Solomons found, however, that, if the diet is very low in oxalates, the dieter would begin to produce oxalates endogenously (from within). Nevertheless, the VPF's diet has been presented as a solution to some of the behavioral and health problems plaguing children with autism.

The diet recommends adding 1000 mg calcium citrate a day to bind oxalates in the gut. Much, but not all, of the oxalic acid in plants is already bound to calcium; thereby, making it insoluble. (Oxalic acid binds to cations, including calcium, zinc, sodium, potassium, and magnesium and may induce a deficiency of these vital nutrients.) Supplementing calcium citrate has a down side for citrate mineral forms are contraindicated in those of loose bowel for they are laxative. Calcium also "bulldozes" other minerals, such as zinc, indicating it is best to take zinc on an empty stomach as suggested elsewhere in this paper. Supplementing this amount of calcium without balancing it with magnesium and potassium, and possibly sodium, would be contraindicated. The calcium should be taken in no more than 500 mg servings. When vitamin C is used by the body, oxalate is produced. Therefore, if the physician has recommended reducing vitamin C supplements while on the LOD, this is not a good idea.

Adding sodium bicarbonate to a person on a high protein diet (that is known to acidify urine and sometimes lead to hypercalciuria - high level of calcium in urine) has been shown to greatly reduce calcium urinary excretion. The effect has been observed with 5.5 g of bicarbonate supplement received daily for two weeks. A recent study

presented in the review of literature highlights that a bicarbonate-rich mineral water could be useful in the prevention of the recurrence of calcium oxalate and uric acid renal stones. Bicarbonates are best given 2.5- to 3-hours after eating. Ensuring adequate intake of vitamins D and K would facilitate proper disposition of calcium.

In my opinion, adding the Low Oxalate Diet (LOD) (to a gluten/casein/allergenic-restricted diet) is a poor method of addressing the problem of calcium-oxalate (CaOx) crystals. The things to eliminate are sugar (including the fructose of fruit juices and foods with high-fructose corn syrup) and excess salt, both of which increase oxalate in the urine. The LOD uses dietary manipulation and supplements of calcium and other citrate minerals to dissolve CaOx stones. Degradation of calcium-oxalate crystals results in the release of calcium, and because the child undoubtedly has low values of vitamins D and K and magnesium; unless these are supplemented, the calcium influx is unmanaged and causes additional damage to the nervous system. Additionally, magnesium can help dissolve calcium-phosphate kidney stones, and magnesium prevents the formation of calcium-oxalate kidney stones as they are associated with Mg deficiency. Harvard researchers found that taking magnesium and vitamin B_6 can reduce calcium oxalate stone formation dramatically. The avoidance of oxalate/vitamin K-containing vegetables means that the child's stores of vitamin K and other valuable nutrients will be depleted. Vitamin K appears to be capable of chelating the calcium from calcium-oxalate crystals, thus dissolving them and opening up the kidney tubules as another avenue for disposal of soluble oxalate. The kidneys accumulate large amounts of vitamin K_2 and secrete vitamin K-dependent proteins that inhibit the formation of calcium salts. Patients with kidney stones secrete this protein in its inactive form, which is between four and twenty times less effective than its active form at inhibiting the growth of calcium oxalate crystals, suggesting that vitamin K_2 deficiency is a major cause of kidney stones.

A deficiency of vitamin B_6 (and all these kids lack B_6) will cause the human liver to manufacture oxalic acid. It is also a cofactor in an enzyme that degrades oxalate and has been shown to reduce oxalate production. I believe it is probable that the liver is also producing oxalic acid in response to a vitamin K deficiency. If this is true, then reducing dietary intake of oxalates will not solve the problem of endogenous production, but it could, in fact increase oxalate production (as Dr. Solomons discovered) since a low-oxalate diet excludes dietary sources of vitamin K (that prevents hardening of the arteries and strengthens bones), such as leafy greens. If a child is unable to regulate calcium due to a deficiency of vitamins D and K and magnesium, that child may display signs of glutamate toxicity and uncontrolled neuronal firing that manifest as the cluster of behavioral disorders called autism.

This influx of unmanaged calcium into circulation and then into the nervous system is, I believe, the reason that so many autistic children are exhibiting adverse responses to the LOD, including seizures, behavioral regression, hyperactivity, and depression. These symptoms do not indicate that oxalates have moved from storage into circulation for transport to the disposal sites (termed "oxalate dumping" on the TLO listserve), but rather reflect the deleterious effects of an influx of unmanaged calcium into the nervous system. This is why supplementing calcium citrate as recommended in the LOD is contraindicated. Some of the autistic children on the LOD begin to experience heavy nosebleeds, which could reflect an exacerbation of an existing vitamin K deficiency since on the LOD; vitamin K-containing vegetables have been removed. Nosebleed also suggests a loss of vitamin C known as scurvy.

Of interest is a study recently that shows that folates (prevents high homocysteine levels that contribute to heart problems), carotenoids (vitamin A source), and flavonoids (all from leafy greens) are not efficiently digested and utilized unless eaten with a source of high fat such as a full-fat, salad dressing. Apple cider vinegar and olive oil is recommended. It is not the fat, but the triggering of bile release that enhances absorption of these vital nutrients. Ensure that the liver is producing adequate bile. Is the stool showing adequate bile (medium brown color)? If not, the undigested fats will bind calcium reducing its ability to bind oxalates or to be absorbed into the blood stream.

Another means of disposal of oxalic acid is across the intestinal lumen into the GI tract, where intestinal bacteria

degrade the acid. Aerobic degradation of oxalates leads to the formation of carbonate ions, which will react with calcium released during the consumption of calcium oxalate by bacteria. The transformation of oxalate into carbonates results in a pH-increase that allows calcium-carbonate precipitation (sic - formation). Studies on the oxalate-carbonate cycle show this production of calcium carbonate by oxalate-degrading bacteria. This would exacerbate an already alkaline child's problems. However, oxalate-degrading bacteria, which includes Oxalobactor formigines and various forms of lactic-acid bacteria (that produce vitamins K and B-complex for us) are easily destroyed by antibiotics so the intestinal flora of most autistic children probably does not include these types of "good" bacteria. Additionally, dysbiosis, wherein acidophilus and bifidus bacteria are destroyed, will rob the body of its major source of vitamin K and B-complex. Therefore, if kidney-tubule efficiency is reduced due to the presence of CaOx crystals, and the intestines don't contain the types of bacteria that can degrade oxalates, the autistic child will have difficulty disposing of the oxalic acid via either urine or stool, so it will remain in the body to form mineral crystals – unless enough vitamin B_6 and magnesium are being supplied.

To eliminate vegetables from the diet that is already restricted would do more harm than good. There has to be a better way. Supplementing potassium and magnesium citrate capsules (citrus juices don't work), with vitamin B_6 and other supplements, will dissolve and prevent CaOx kidney stones. This would probably be preventive of other mischief oxalates are thought to cause. Remember that citrates are laxative.

So, first, aggressively address dysbiosis by eliminating sugar, including fruit juices known to feed Candida and increase oxalates in the urine. (Pure lemon juice is good.) Limit your intake of salt (unless there is a craving for it indicating a need for adrenal support, addressed elsewhere in this paper) and refined carbohydrates, increase fiber intake, and supplement needed nutrients, such as vitamins B_6 (100 to 300 mg), D (2000 to 4000 IU), and K (to reduce endogenous production of oxalic acid), with 3000 mg vitamin C, 500 mg magnesium, and 1000 mg potassium citrate (to dissolve CaOx crystals), chondroitin sulfate (to prevent CaOx crystals), 10,000 IU vitamin A (adults), and increase water intake. N-acetylcysteine is a new therapy for calcium oxalate urolithiasis. I suggest Jarrow's N-A-C Sustain, a time-released formula that takes account of the short half-life of NAC. If the stool is light-colored, supplement taurine to increase bile production and the digestion of fats and greens. Supplement a high-count probiotic (Lactobacillus acidophilus, Bifidobacterium lactis, and O. formigines to break down oxalates in the gut). Eliminate use of omega-6 cooking oils and foods high in inflammatory arachidonic acid (grain-fed animals and farmed tilapia and salmon) and take evening primrose oil and cod-liver oil to prevent inflammatory prostaglandins and reduce oxalate problems. Supplement vitamin E, selenium, and arginine shown to reduce oxalate problems. Supplementing magnesium orally may contribute to more uptake of oxalates from the intestines; so, transdermal creams, baths or footbaths of Epsom salts, baking soda, and sea salt will supply these vital nutrients needed to dissolve these stones and crystals and, thus, accelerate the process of draining oxalic acid from the body. Oxalic acid shares the same cellular transporters as sulfur, bicarbonate, and chloride; when the circulatory levels of these three substances are increased, they are more available for transportation into cells to replace the oxalic acid. This will bring more oxalic acid into circulation.

Vitamin K appears to be able to chelate the calcium from the CaOx salts, leaving behind oxalic acid that can be filtered through the kidneys or secreted across the intestinal membrane for disposal. If the child's GI tract contains oxalate-degrading bacteria, the concentration of oxalates inside the GI tract will remain less than the concentration in the body, signaling the body to continue secreting oxalates across the intestinal membrane. Magnesium closes the calcium channels and will assist in controlling neuronal firing. The sulfate, bicarbonate, and chloride can all exchange with the oxalic acid inside cells, allowing the oxalic acid to leave the cell and be disposed of. The Specific Carbohydrate Diet (SCD) will address the obvious imbalances in GI flora that have led to this situation, which include the absences of both O. formigenes and vitamin K-producing bacteria. Children experiencing setbacks on the Specific Carbohydrate Diet, especially those consuming yogurt, may actually be manifesting the effects of a release of calcium (that is reabsorbed) from calcium/oxalate crystals. The lactic acid bacteria, L.

acidophilus and S. thermophilus, the classic yogurt-making bacteria used in the SCD, have been found to degrade oxalates effectively.

Serotonin Connection

Serotonin (5-HT) content of blood platelets is variously reported to be excessive in 30% to 50% of autistic due to an errant peptide or to a variant gene (note that those with more than one autistic offspring are apt to fall into this category). It may be that a serotonin transporter is trying to reduce an excess of serotonin from the blood (caused by a sluggish Phase II, liver enzyme system not clearing the spent hormone). This high platelet level of serotonin is surprising in view of the limited protein intake of most autistic, apparently they are not being cleared by the PST pathway.. McBride and colleagues recently presented results of a study that confirmed the importance of controlling for race and ethnicity in studies of platelet 5-HT. African-American and Hispanic-American subjects had higher levels of platelet serotonin when compared to Caucasian-American subjects. Interestingly, subjects with autism, who had a sibling with autism, had higher platelet, 5-HT levels than subjects without a sibling with autism. Platelet 5-HT levels have been demonstrated to be stable after the age of nine years, supporting the hypothesis that platelet 5-HT levels are under genetic regulation.

In platelets, thimerosal (mercury) causes aggregation, increase of arachidonic acid metabolism, and exocytotic release of serotonin. These platelets release substances, primarily serotonin and prostaglandins, causing the blood vessels to spasm. The herb feverfew contains a chemical (parthenolide) that inhibits the release of serotonin from platelets facilitating a more regular blood flow, which is said to be a benefit in migraine. One study, however, shows it to be toxic to the liver and to peripheral mononuclear blood cells (immune cells) and to inhibit Phase I liver enzymes. Additionally, it contains salicylates that are contraindicated in PST (Salicylates suppress P-form phenol-sulfotransferase). The Phase I liver detox pathway (cytochrome p450 liver enzymes—there is said to be 40 variants, each with a different capacity to metabolize drugs and chemicals) is the only way a baby has to deal with endotoxins from the gut. The Phase I system is one of several shut down temporarily by DPT and other vaccines, and suppressed by mercury. With these toxins (and those of Candida) being given off when the liver is impaired, they can have severe consequences, including SIDS. Pharmacological evidence suggests more than 50% of the patients with autism may have an abnormality in serotonergic neurotransmission; however, no consistent patterns of behavior or of symptoms have been identified that relate to this high-platelet level of serotonin.

Nevertheless, Dr. Robert Reisinger, DMV, describes the final mechanism of death in infants who have temporary liver dysfunction, and E. Coli in the gut: "One bottle of formula is enough to change a baby's gut dramatically, and it takes two weeks of breast feeding to return the gut to normal. How can this happen? E. Coli is the main culprit. This bacterium is putrefactive and protein loving. The protein content of human breast milk is lower than in any other mammal, and the protein content of formula or any other milk supplement has a direct influence on the numbers of E. Coli in the gut often raising it to 1000 times higher levels. Not only does the acid gut and very low protein content of breast milk provide a more hostile environment for E. Coli, but breast milk also contains neutralizing factors against E. Coli. When E. Coli is elevated, absorption into the bloodstream over hours of time of small amounts of bacterial endotoxin not detoxified by a temporarily dysfunctional reticulo-endothelial system results in removal of blood platelets and fibrinogen from the circulating blood. The result is release of relatively large amounts of serotonin from platelets into the blood plasma (in some experiments the increase of plasma serotonin is almost 100-fold). This serotonin shock can cause such serious vasoconstriction as to cause sudden heart failure. Serotonin initiates, in some cases, the coronary chemoreflex (Becold-Jarisch reflex) in which there is inhibition of sympathetic outflow and increased activity of the cardiac (efferent) vagus, leading to profound bradycardia, hypotentions, and cardiovascular collapse. The complex pathogenesis of endotoxemia depending on time and dosages, also involves release of norepinephrine, epinephrine, corticosteroids, etc. However, if death occurs early in the course of this syndrome, it is due primarily to serotonin effect. Serotonin is associated with deep sleep and in certain circumstances strongly inhibits

respiratory movements. Endotoxin also has a more direct effect on cellular respiration, since it interferes with oxidative metabolism of mitochondria in vitro as well as in vivo... Between three and six hours, vascular capillary permeability has become more substantial, and varying amounts of edema and hemorrhage by diapedesis (passage of blood cells through the capillary walls) are apparent. After six to eight hours or more, fibrin-platelet clots have formed, and disseminated intravascular coagulation (DIC) is present in lungs, kidneys, and other organs and tissues."

"For nonautistic children, serotonin synthesis capacity (of the brain) was more than 200% of adult values until the age of 5 years and then declined toward adult values. Serotonin synthesis capacity values declined at an earlier age in girls than in boys. In autistic children, serotonin synthesis capacity increased gradually between the ages of 2 years and 15 years to values 1.5 times adult normal values and showed no sex difference."—Developmental Changes in Brain Serotonin Synthesis Capacity in Autistic and Nonautistic Children. Chugani DC, Muzik O, Behen M, Rothermel R, Janisse JJ, Lee J, Chugani HT, Department of Pediatrics, Children's Hospital of Michigan, Detroit 48201, USA.

This imbalance in allocation of available serotonin, a tryptophan deficiency, a vitamin B_6 deficiency, a magnesium deficiency, or a deficiency of the enzyme tryptophan hydroxylase, or some combination, leaves a deficit for the brain. Evidence of serotonin deficiency in autism comes from a pharmacological study using tryptophan depletion. Tryptophan depletion leads to reduced serotonin synthesis, release, and neurotransmission. McDougle and colleagues found exacerbation of behaviors such as whirling, flapping, pacing, stomping, banging and hitting self, rocking, toe walking, and anxiety in more than 50% of the adults with autism after tryptophan depletion. Deficiencies in the brain chemical transmitter serotonin have been identified as a potential cause of suicide. There is evidence showing that aggressive dyscontrol—be it violence, rage, impulsivity, or disinhibition—is often linked to disturbances in serotonin metabolism. This study is consistent with the finding of decreased ratio of serum tryptophan to large neutral amino acids in idiopathic infantile autism relative to controls, which would lead to a lower basal level of serotonin synthesis, vulnerability to tryptophan depletion, and response to pharmacological manipulations that increase 5-HT neurotransmission. Vitamin C has also been shown to significantly reduce autistic behavior such as rocking, spinning, and hand flapping, In fact, a university study of autistic children utilizing 8 g/70 kg body weight of oral vitamin C, in 2 or 3 divided doses, showed over 10 weeks that total scores on the Ritvo-Freeman scale, which rates social, affective, sensory, and language behaviors, improved in the group going from placebo to vitamin C and worsening in the group going from vitamin C to placebo.

Drugs that inhibit transport of serotonin: the tricyclic antidepressants, and the Selective Serotonin Reuptake Inhibitors (SSRI), and Monoamine Oxidase Inhibitors (MAOI) that hold more serotonin in the synapse between brain cells longer may greatly reduce the above symptoms. Normally, the enzyme MAO removes some serotonin from the synapse while a major part is sucked back into the neuron that created it (reuptake). In the autistic with the above behaviors, there needs to be more serotonin available in the synapse. That can best be ensured by increasing the supply in the neuron—naturally—by increasing the precursor it needs to make serotonin. This is accomplished by supplementing 5-HTP, and/or by conserving it from destruction in the synapse by supplementing magnesium and vitamin B_6. Folic acid is added to the regimen since requirements increase with pyridoxine-magnesium therapy and males with fragile X syndrome (a subgroup of autism) benefit specifically from folate supplementation. **Vitamin B_6 may not be responsive if folic acid is depleted**, so it should probably always be accompanied by folic acid, and vitamin B_{12}.

The tendency for some teens to become violent or suicidal using SSRIs has been tested in rats (van der Stelt, Psychopharmacology 172:137-44(2004). When we realize that SSRIs do not create serotonin, but merely hold it in the synapse longer (or in the blood), leading to increased destruction of the limited supply, we can understand the outcome of the tests. The ones who responded adversely were the ones most depleted in tryptophan! SSRIs depleted available serotonin to dangerous levels quickly. One of the results of taking SSRIs

you will not learn about from the drug dispensers is the increased risk of serioul bleeding due to the platelets being deprived of needed amounts of serotonin without which they cannot aggregate and control bleeding (Dec. 2009. Clinical Gastroenterology and Heptology). Rats fed tryptophan along with the SSRIs did not have the dangerous depletion but showed increased extracellular serotonin.

Nevertheless, with these children who accumulate serotonin in platelets, and who cannot sulfate it to get it out of the body (PST child), giving 5-HTP may surprisingly produce opposite than expected responses. To avoid this, Dr. Jerry Kartzinel has observed good results by using transdermal tryptophan from Coastal Compounding Pharmacy, Mr. Tyrus Smith, (912) 354-5188. If you are experiencing the above symptoms indicative of tryptophan depletion, I urge you to give this cream a try. Applying it after a warm bath is most effective for blood is to the skin to absorb the tryptophan and moist skin absorbs better too. Be sure you are supplementing vitamin B_6 and niacin or the tryptophan may be used to create niacin instead, and vitamin B_6 is needed in all tryptophan metabolism. For some, eating high tryptophan foods, like a large serving of turkey, for breakfast may accomplish the same results. Best results are had taking tryptophan away from other proteins with a bit of carbohydrate (a turkey sandwich).

Another nutrient, inositol, has been used in the treatment of obsessive-compulsive disorder as well as the compulsive behaviors demonstrated by some autistic children. Doses vary from 1-6 grams, three times daily. Tryptophan is prescribed in orthomolecular therapy in cases of insomnia, depression, and obsessive-compulsive disorders. Based on studies done in animals, some digestive enzymes may also have an effect on neurotransmitter levels, especially dopamine.

Serotonin is found in many foods we eat such as grape, avocado, tomato, orange, plum, pineapple, banana, and spinach. Eating carbohydrates with tryptophan supplements or protein meals increases conversion of tryptophan to serotonin by stimulating the pancreas to secrete insulin. Insulin increases the relative concentration of tryptophan in the blood by causing the body tissues to soak up competing amino acids from the blood so the tryptophan has less competition in transferring from blood to brain.

Tryptophan is the precursor to serotonin, tryptamine, melatonin, and indolamine, all neurotransmitters. Dehydration seems to cause a severe depletion of brain tryptophan. Tryptophan is the natural brain regulator for salt absorption in the body. This lack of tryptophan and its neurotransmitter products will establish lower than normal salt reserves. This will lead to a higher sugar content in the blood in an effort to balance osmotic forces. If blood sugar is to come down, a slight increase in salt intake will be necessary. In Type I diabetes, there may be severe salt shortage, leaving the brain no alternative but to raise the level of sugar even more to compensate. One of the most effective ways to raise tryptophan, serotonin, and endorphin levels in the brain is exercise. Another is the adequate intake of pure water. Tryptophan and water are essential to homeostasis, the balanced function of all body systems. Taking 10 to 15 mg lithium orotate twice a day will enhance serotonin, dopamine, and norepinephrine production. Nevertheless, lithium is concentrated in the thyroid and can inhibit iodine uptake. This is why it is important to monitor both the levels of iodine and lithium on essential mineral tests and supplement lithium only as needed for low values that may occur as a result of detoxification and excretion of mercury--Dr. Amy Yasko. A correction of tryptophan levels will bring many dividends in good health, feelings of well-being, and relief of depression.

Foods that supply tryptophan: dairy products, turkey, banana, and nuts. Selling tryptophan for human consumption has been illegal in the United States without a prescription; however, it is available over-the-counter again, and it is legal for use with animals. You can buy pure pharmaceutical grade tryptophan without prescription from BIOS Biochemicals 8987-309 E. Tanque Verde, No 340, Tucson, AZ 85749-9399 (Phone 520–326–7610) if you cannot find it locally. Do not inquire about usage, or mention human use. Tryptophan can increase both the effectiveness and the toxicity of certain antidepressant drugs, including Prozac™ and monoamine oxidase inhibitors (MAOI).

Mix them only if so directed by your doctor. Additionally, taking Prozac with as little as 500 mcg of folate substantially improves patient response to the antidepressant (Drs. Coppen and Bailey, Surrey, England).

Tryptophan, a well-known antidepressant, is a precursor of niacin and serotonin and can prevent and cure pellagra (being a source for formation of niacin). A deficiency of serotonin, from a lack of tryptophan, is related to sleep disorders, bloating, and constipation. Increasing serotonin usually increases peristalsis and decreases bleeding, but a lack is related to skin inflammation, depression, insomnia, and alcoholism. It cannot be utilized without adequate vitamin B_6 and magnesium. To enhance serotonin production, take tryptophan (apart from meals, but with a bit of carbohydrate) and supplement niacin to prevent its being diverted down that pathway. The toxic effects of indole (tryptophan) are mainly in the large intestine causing bloating and constipation. One eight-month-old breast-fed infant had a bowel movement once a week. Neutralization of indole (by NAET) led to daily bowel movements.

For those on anti-seizure medications, it should be noted that behavioral side effects of the barbiturate-related agents, phenobarbital and phenytoin (Dilantin™), may include irritability and depression as well as aggressive behaviors such as biting, pinching, and kicking. Additionally, Harrison's book, "The Principles of Internal Medicine", notes that the drug Phenytoin is documented to cause aplastic anemia, and has been observed to cause lymphatic conditions. The book observes that although the disease regressed in most cases when the patient stopped taking the drug, a significant fraction proceeded to develop Hodgkin's Disease, that is, cancer of the lymphatic system. Aplastic anemia victims have also been observed to have a much higher than normal risk of developing Hodgkin's Disease.

The anxiety produced by a lack of serotonin creates another problem. When the environment is not perceived as "safe", the nervous system will function adaptively to facilitate fight-flight behaviors. Fear and stress tend to produce illness, but fear, stress, and illness result in a retraction of the voluntary "social engagement system", leading to compromised social abilities. Depressing this neural system has several behavioral consequences including flat effect, aprosody (can't pay attention), difficulty in phoneme recognition, articulation problems, hypersensitivity to sounds, and behavioral state regulation issues. Stress also has observable effects on intestinal micro biota. Release of ACTH from fear and anger leads to increased jejunal E. Coli, loss of bacteria and Lactobacillus from fecal samples, and increased levels of the pathogenic Bacteroides fragilis. Although these symptoms are nonspecific regarding differential psychiatric or behavioral diagnosis, many children with developmental disorders share them. The high-level stresses these children suffer must be countered by a variety of antioxidants (Vitamins C, E, selenium, melatonin) to avoid systemic damage. The excess cortisol stress produces should be countered by supplementing 100 to 200 mcg of chromium, 400 mg magnesium, 50 mg pantothenic acid, and 500 mg vitamin C, and by various relaxation techniques, including a good back rub. It is reported that high, stress-induced levels of cortisol were present in one-third, and that the hippocampus (involved in memory) was 14% smaller than normal!

The development of the hippocampus and the supply of neurotransmitters are peculiarly vulnerable in the newborn and require adequate supplies of thiamin and pantothenic acid, in particular. If these coenzymes have been deficient, an imbalance of lactate to pyruvic acid will often persist (Winick, 1976). When pantothenic acid is low, the adrenals produce insufficient steroids (Beau et al, 1955; Notwosky, 1968).

Secretin was shown to inhibit anxiety in a well-recognized animal model of fear and anxiety. This study was published in Psychopharmacology (online, October 29, 2003). This study provides evidence that Secretin modulates the activity of the amygdala, part of a neural network implicated in the acquisition and expression of emotional and social behaviors, including fear and anxiety. It is of interest to note that in one whose amygdala was removed, he became completely uninterested in people, preferring to sit in isolation. Without an amygdala, he lost all recognition of feelings, as well as any feeling about feeling. Without an amygdala, life is stripped of

personal meaning. All passions depend upon it. Without one, there is a lack of fear or rage, there is no urge to compete or cooperate, and no sense of their place in the social order. Emotion is severely blunted or absent. These brain areas are affected by imbalances of neurotransmitters that are in turn affected by blood flow and by what one eats or assimilates, or how it is metabolized.

Marked disturbances of uptake of deuterated phenylalanine and tryptophan from intestine into blood were found in a portion of autistic patients (group A). In another group of the patients, a remarkable decrease in turnover of tyrosine in blood was found (group B)....These findings might suggest that the supply of tyrosine (from phenylalanine metabolism) and free tryptophan to the brain (in group A), or supply of tyrosine to the brain (group B) might be decreased. We postulated that in some of autistic patients there might exist decreases in synthesis of catecholamine or serotonin. Based on the hypothesis, **we started a new treatment with L-DOPA and 5-HTP in small doses, and found significant effects in some patients. However, in some, the amino acids caused marked aggravation of the symptoms**—Naruse H; Hayashi T; Takesada M; Nakane A; Yamazaki K; Source: No To Hattatsu, 1989 Mar, 21:2, 181-9. The amino acids Phenylalanine and Tyrosine are precursors to L-dopa, norepinephrine, and epinephrine. One Mom reported significant increase in cognitive awareness and speech after supplementing Phenylalanine. One hundred to 500 mg on an empty stomach before bedtime would be a good choice. Do not exceed 1000 mg. Yet, studies in Australia revealed that high levels of tyrosine were present in many hyperactive children (dietary tyrosine is found in a variety of food products, including yeast extracts, cheese, coffee, citrus fruits, chocolate, and cream).

Dr. Felix Sulman began his research on those who suffer from high serotonin levels because of their inability to metabolize serotonin. He found that serotonin is a stress neuro-hormone leading even rabbits, the most docile of creatures, to be aggressive. He coined the term "Serotonin Irritation Syndrome." **He found that those who were unable to metabolize serotonin (PST kids) would have the levels increase.** This, in turn, increases noradrenaline. They "were in effect being poisoned by the serotonin produced by their own bodies." These suffered from migraines, hot flashes, irritability, sleeplessness, pains around the heart, difficulty in breathing, a worsening of bronchial complaints, and irrational tension and anxiety, with horrifying nightmares. "It also caused his volunteers to sleep badly—that is, always on the edge of consciousness so that they were not properly rested—and to wake after only a few hours of sleep." He found it caused pregnant women to abort—October 1977: Slater, et al, Inhibition of REM Sleep by Fluoxetine, a Specific Inhibitor of Serotonin Uptake, October 1977, at p. 385. Children so often get coughs and colds, yet using a cough or cold medication with dextromethorphan could cause the serotonin syndrome, a very serious and potentially fatal adverse reaction. This being the case, neither Prozac-type SSRIs nor 5-HTP should be used by PST kids. Additionally, when animals were severely deprived of zinc, levels of brain catecholamines increased, that is, elevation of noradrenaline occurred consistently, dopamine increased irregularly, and serotonin relatively, when compared to controls. Experimental zinc deficiency in humans leads reversibly to reduced sperm count combined with reduced serum testosterone.

More to the point, 95% of serotonin is found in the gut! It is here we are able to see exactly what happens when SSRIs are used. When Prozac™ is given, stimulation of nerve cells becomes larger in amplitude, and longer in duration, and 8 to 10 times as many cells are activated, thus SSRIs are very likely to cause nausea, vomiting, and diarrhea. Continued use of SSRIs cause some serotonin receptors to desensitize and fail to respond anymore, while others simply become less sensitive. As desensitization sets in, cells stop responding and constipation follows. These are not "side effects" as usually suggested, but the direct effects of holding serotonin on the nerve cell receptors too long (preventing reuptake). Similar effects occur in the brain, **glutathione increases sensitivity to dopamine and to serotonin.**

Inositol Therapy can help in two ways: it can sensitize the receptors, or it can replace the SSRIs! Rahman and Neuman reported that exogenous inositol reverses the desensitization of serotonin receptors (Rahman, 1993). Increased membrane phosphatidylinositol could enhance effects of synaptic serotonin as do SSRIs (Fux, 1996).

Inositol has been proven as beneficial as SSRIs in the treatment of OCD, depression, and panic disorder in double blind placebo controlled studies (Benjamin, 1995; Fux, 1996). Doses vary from 1-6 grams, three times daily. Some OCD cases are induced by fatigue related to the neurotransmitter dopamine (excess dopamine); others are induced by cognitive impairment related to acetylcholine deficiency; and still others are based on anxiety associated with GABA imbalance. Additionally, OCD has been related to an excess of Cortisol. No wonder, when one considers the stress these Kids are under. Supplementing at least 200 mcg of chromium has been shown to reduce Cortisol levels as much as 47%. Lyme disease may manifest with OCD. All these can be measured with specific blood tests. Successful treatment, and the avoidance of unnecessary drug complications, depends on accurate diagnosis. Progesterone is the primary hormone that, when deficient, can exacerbate OCD. Progesterone, Growth Hormone, Serotonin, and Pregnenolone should all be measured, and replacement therapy using bio-identical formulations that duplicate the body's natural hormones, not synthetics, should be used. Tryptophan (1-2 grams daily) or 5-HTP should be used to promote Serotonin. Additional supplements that play a role in support include melatonin (300 mcg-1 mg daily, five days a week); Kava Kava (60 mg spray, 1-3 times daily); St. John's Wort (300 mg, 3-times daily); vitamin B_6 (50 mg, three times daily); niacinamide (500 mg, 2 times daily); fish oil (1-2 grams daily); and magnesium (500 mg 1-2 times daily).

A mother reports: I was in our new naturopath's office who matter-of-factly said, "When I see chronic OCD, I usually find a chronic Strep infection". Sure enough, a blood test confirmed it---in spite of the fact that he had absolutely NO symptoms of acute strep, nor had he for several years. It took over a year of naturopathic treatments to get rid of it (but we were fighting many other lyme related infections at the same time).

Inositol hexaphosphates (IP-6) is another form of inositol sometimes recommended for boosting the Natural Killer Cell count and or chelating excess iron, but it and pentaphosphates are the phytate forms that interfere with zinc absorption, whereas the lower phosphates have little or no effect. Iron can have a negative effect on zinc absorption, if given together in a supplement, whereas no effect is observed when the same amounts are present in a meal as fortificants. Cadmium, which is increasing in the environment, also inhibits zinc absorption. IP-6 and iron should not be taken with zinc supplements other than what might be in a multiple.

Taken between meals so it will not bind to minerals in the digestive tract, phytic acid (IP-6) is readily absorbed into the bloodstream where it acts as a potent mineral chelator. Phytic acid is said to bind to any free iron or other minerals (even heavy metals such as mercury, lead, and cadmium) in the blood, which are then eliminated through the kidneys. Phytic acid removes only excess or unbound minerals, not mineral ions already attached to proteins. Phytic acid supplements should not be taken during pregnancy since the developing fetus requires minerals for proper development. A three-month course of phytic acid should achieve adequate iron chelation, and prolonged daily supplementation may lead to iron-deficiency anemia. Anemic individuals who take phytic acid as a food supplement are likely to feel weak shortly after consumption, whereas iron-overloaded individuals are likely to feel increased energy.

Due to the possible negative effect of 5-HTP in PST kids, I suggest use of Dimethylglycine (DMG), or Trimethylglycine (TMG) that are methylated forms of the amino acid glycine, in particular, for the undermethylated kids. This will tend to enhance SAMe production, supplying more serotonin and enhancing sensitivity of serotonin receptors. SAM also is said to increase the antioxidant glutathione and phosphatidylcholine, a brain nutrient that makes cell membranes throughout your body more flexible. Improvements similar to those from 5-HTP have been reported, often within hours. Each child responds at a different level of intake, usually 1 to 4, 125 mg tablets of DMG, daily; so begin with one and slowly increase the amount. One to four DMG is the equivalent of one to two TMG 500 mg.

This is essentially a backup pathway, and is meant to complement the folate route for remethylation rather than supplant it. It does not interfere with the folate route"—David H. Swenson Ph.D. Use of folic acid may be contraindicated in certain undermethylated. In other words, methionine can be formed from homocysteine using methyl groups from N5-methyltetrahydrofolate (MTHF), or in certain undermethylated who are folate sensitive, using methyl groups from betaine (TMG) that are derived from choline. Similarly, MTHF can be formed from one-carbon units derived from serine or from the methyl groups of choline via dimethyglycine (DMG), and choline can be synthesized de novo using methyl groups derived from methionine (via S-adenosylmethionine). The use of TMG solves the problem of folate blockage (excess) in certain undermethylated; however, this would tend to deplete choline and TMG (sic). With TMG, one needs not add folate, and the amount of B_{12}, P5P, and serine needed to normalize homocysteine would be reduced. Nevertheless, to effect the conversion in those who are cystathionine Beta-synthase deficient (Down's in particular)), one must supplement vitamins B_6 and B_{12} even when supplementing TMG/DMG. Some supplement folinic acid hoping to bypass this block, but much bearing that label is 5-formal folate and will not bypass the mutation. Only Folapro™ is guaranteed to be the 5-methyl THF needed to bypass the folate block. Use of the active form L-methylfolate (Metafolin™ - 800 mcg) may give superior results. Supplementing folic acid excessively may cause breakthrough seizures by altering drug serum concentrations, so check with your doctor on this. It is also reported that large amounts of synthetic folate, or lesser amounts for some undermethylated, can cause abdominal distension, flatulence (gas/wind), irritability, loss of cognition, loss of appetite, nausea, over-activity, sleep disturbance, and vivid dreams (nightmares). Is your child experiencing nightmares?

Dr. Walsh adds: "Most autistics are very undermethylated and have little 'traffic' in the SAM cycle, with generally low levels at each point along the way: Methionine, SAMe, SAH, Homocysteine, etc. These same persons also exhibit elevated levels of folates. There is little homocysteine available to convert back to methionine. Supplements of folic acid and B_{12} will rob the cystathionine pathway of needed chemicals for production of cysteine, glutathione, and sulfur chemistry in general. This is not a good way to help an undermethylated person. Far better would be to simply introduce additional methyl groups. My favorite way is supplements of methionine (increasing protein intake may be better- WSL). On the other hand, if you give folic acid to a histadelic (undermethylated, high histamine) patient, severe worsening can be expected. I believe the obvious benefits exhibited by many autistics after methyl B_{12} (supplementation) derive from correction of severe B_{12} deficiency rather from helping methylation." Elsewhere, Dr. Walsh indicates that some few undermethylated do need folic acid. Use care in supplementing it in one who is undermethylated. One of those benefits of vitamin B_{12} may be elimination of stutter, a side effect of DTP, and probably related to myelin damage! One may need to use care in supplementing DMG/TMG also as it is said to potentially increase cholesterol levels.

As regards supplementing Methionine (and other single amino acids) as suggested, these recent findings must be considered. Normal rats were made to behave differently just by injecting them with a specific amino acid. The change to their behavior was permanent. The amino acid altered the way certain genes were expressed. Methionine, the supplement used to stress these healthy rats, is widely available in capsule form - and the molecules are small enough to get into the brain via the bloodstream.

Two years ago, researchers led by Randy Jirtle of Duke University Medical Center, showed that the activity of a mouse's genes can be influenced by food supplements eaten by its mother just prior to, or during, very early pregnancy (New Scientist, 9 August 2003, p 14). Then, last year, Moshe Szyf, Michael Meaney, and colleagues at McGill University, showed that mothers could influence the way a rat's genes are expressed after it has been born. If a rat is not licked, groomed, and nursed enough by its mother, chemical tags known as methyl groups are added to the DNA of a particular gene. Years ago, this same phenomenon was observed in unwanted babies who were allowed to lie alone in a crib, being given only needed food. They

died from want of handling and caressing.

The affected gene codes for the glucocorticoid receptor gene are expressed in the hippocampus of the brain. The gene helps mediate the animal's response to stress, and in poorly raised rats, the methylation damped down the gene's activity. Such pups produced higher levels of stress hormones and were less confident in exploring new environments. The effect lasted for life (Nature Neuroscience, vol 7, p 847). Now, the team has shown that a food supplement can have the same effect on well-reared rats at 90 days old - well into adulthood. The researchers injected L-methionine, a common amino acid and food supplement, into the brains of well-reared rats. The amino acid methylated the glucocorticoid gene, and the animals' behavior changed. "They were almost exactly like the poorly raised group," says Szyf.

The effect of TMG and of vitamins B_6, B_{12}, and folate is to reduce homocysteine (which sometimes builds excessively due to a cystathionine beta-synthase, serine, magnesium, zinc, and/or vitamin B_6 deficiency that prevents transulfuration to cysteine and taurine), while controlling cysteine production, where overproduction can be toxic. Additionally, TMG works in parallel with folic acid, vitamins B_6 and B_{12}, and methionine to form S-adenosylmethionine (SAM) that donates methyl molecules that are vital to proper liver function and cellular replication. Methyl groups are essential both for proper nerve transmission, and for the formation and maintenance of the myelin sheath that covers and protects nerve cells. Supplements of SAMe are available, but it is relatively unstable, breaks down into cysteine, and is somewhat costly. For most, it is best to supplement TMG and the B-vitamins allowing the body to form SAMe. The exception would be that supplementing SAM will give a more rapid response where that is desirable. Methyl Caps™ by VRP supplies TMG and these vitamins in a tasteless form that can be taken with food or water: www.vrp.com or (800) 877-2447. If purchasing SAMe, buy tablets with enteric coating that supply vitamins B_6, B_{12}, and folic acid, unless your child is undermethylated. Life Extension Foundation will supply quality SAMe (www.lef.org). Actually, you can buy it at less than member prices from www.iherb.com. Doses above 400 mg can cause dry mouth, gastric problems, and restlessness. The significance of enhancing SAMe production is accented by the realization that SAMe levels decline with age and drop dramatically with depression and with neurological disorders such as Alzheimer's, Parkinson's, and dementia due to HIV complications.

A new study published this abstract that introduces some considerations that are touched upon below. We will pick up the methylation thread immediately after:

Creatine and Creatine Deficiency Syndromes: Biochemical and Clinical Aspects.
Nasrallah F, Feki M, Kaabachi N. Department of Biochemistry, Rabta Hospital, Tunis, Tunisia.

Creatine deficiency syndromes, which have only recently been described, represent a group of inborn errors of creatine synthesis (l-arginine-glycine amidinotransferase deficiency and guanidinoacetate methyltransferase deficiency) and transport (creatine transporter deficiency). Patients with creatine deficiency syndromes present with mental retardation, expressive speech and language delay, and epilepsy. Patients with guaneidinoacetate methyltransferase deficiency or creatine transporter deficiency may exhibit autistic behavior. The common denominator of these disorders is the depletion of the brain creatine pool, as demonstrated by in vivo proton magnetic resonance spectroscopy. For diagnosis, laboratory investigations start with analysis of guanidinoacetate, creatine, and creatinine in plasma and urine. Based on these findings, enzyme assays or DNA mutation analysis may be performed. **The creatine deficiency syndromes are underdiagnosed, so the possibility should be considered in all children affected by unexplained mental retardation, seizures, and speech delay. Guanidinoacetate methyltransferase deficiency and arginine-glycine amidinotransferase deficiency are treatable by oral creatine supplementation, but patients with creatine transporter**

deficiency do not respond to this type of treatment.

What is methylation? Your body's chief mechanism for cellular housekeeping is methylation, a crucial, chemical reaction that converts inorganic to organic forms. When methylation is inefficient and sluggish, compounds may build to toxic levels. This is one of the most challenging areas of cancer research. One significant toxic build up is the element antimony; another is homocysteine, a metabolite in the pathway from methionine to sulfate, both normally detoxified by methylation. Elevated homocysteine harms arteries, impairs circulation, damages cellular DNA, and contributes to atherosclerosis, heart disease, cancer, depression, memory impairment, Alzheimer's, and many other conditions. This negative effect on DNA may lead to the cellular replication called cancer. The ability for these cancer cells to normalize is an exciting area of cancer research. Only a few things are known to provoke it, including vitamin A derivatives, hormones, vitamin D_3, and emodin (found in grape vines and other plants). **Both acetylation and methylation have the ability to control the activation and deactivation of genes.** You must have homocysteine levels checked, treated, and rechecked for not all respond to the typical low-dose regimen. The readings must be brought below seven mmol/L.

Nevertheless, Dr. Walsh made this statement about some very undermethylated individuls: "We have studied the biochemistry of more than 20,000 patients since 1989. If an adult has a history of self-motivation, perfectionism, OCD tendencies, and overachievement in early grades….. this usually means they will exhibit high blood histamine, high basophils, and undermethylation. We have studied captains of industry, sports stars, eminent scientists, etc., and most of them are undermethylated. Nearly all dedicated long-distance runners are undermethylated. Most autistics appear to have a genetic or acquired weakness in combating oxidative stress, such as that produced by toxic metals, viruses, injuries, etc. Out-of-control oxidative stress screws up the SAM one-carbon methylation cycle resulting in undermethylation, and low levels of glutathione, metallothionein, cysteine, etc. An interesting difference is that most autistic undermethylators are low in folates, whereas non-ASD undermethylators are usually overloaded in folates. Giving folic acid and B_{12} to an undermethylated patient with depression or psychosis usually leads to disaster. Giving folic acid and methyl B_{12} to an ASD patient usually results in good progress."

Methionine needs to be resynthesized in the cell because it is converted to SAMe that is the general methyl donor that makes, among other things, some neurotransmitters and some cell membrane components. SAMe is the substance that methylates regions of genes to shut off their expression, and it is critical for controlling gene expression. In order for homocysteine to be recycled to methionine and to SAMe for reuse, and for antimony to be excreted, there must be adequate amounts of folic acid and vitamins B_6 and $B_{12,}$ and possibly DMG/TMG. Suggested are: Vitamins B_{12} (100 mcg per pound), folate (10 mcg per pound), and TMG (10-20 mg per pound). Spread these through the day. They may be energizing so you may want to give them in the earlier part of the day. Detoxification is costly to the body's resources, requiring large amounts of vitamins B_6, B_{12}, C, folic acid, methionine, betaine (TMG), taurine, glycine, cysteine, and lecithin. Mercury decreases zinc and methionine availability, depresses rates of methylation, and increases free radicals. Inhibitors of methylation block pancreatic secretion. Disruption of the SAMe cycle by excess cystathionine beta synthetase and methyl-tetra-hydrofolate (a metabolite of folic acid) (genetically induced in Down's) results in an increased cysteine pool, and decreased methyl groups available for DNA methylation and for the normal formation of NADH. TMG and DMG (forms of the amino acid glycine) are methyl donors aiding in this methylation.

Glycine (the second component of magnesium glycinate) chelates mercury from the body. Glycine is a non-essential amino acid, but for people with mercury poisoning, it is essential to supplement it. Glycine is also particularly beneficial for people with too much serotonin influence, and because it enhances bile production

and contributes to glutathione production, it is a valuable supplement. Glycine forms creatine when combined with arginine and methionine. Additionally, it readily converts to serine, a lack of which often disrupts the sulfation pathway. For those lacking HCl, glycine enhances secretion of this vital digestive aid. In the CNS, glycine is a major inhibitory neurotransmitter acting primarily in the brainstem and spinal cord. This action may be responsible for anecdotal reports of positive effects in autistic children taking large doses of DMG or TMG. Magnesium glycinate in large amounts (around 1000 mg/day) causes light-headedness, loss of coordination, dizziness, and blurred vision. If these side effects from glycine (from the glycinate in magnesium glycinate) occur, reduce dosage or discontinue use of magnesium glycinate.

The diet is another factor that influences the methylation cycle. Large quantities of methionine from food (meat for instance) result in high levels of SAM. High levels of SAM down regulate MTHFR and MS (methioninsyntase) even if their activity is already reduced. This results in, more or less, a block of the remethylation of homocysteine, which accumulates even though the transulfuration pathway into cysteine is up-regulated. When SAM is depleted, MTHFR and MS are again up-regulated. A vitamin B_{12} deficiency gives the same result. (Maybe that's why one common symptom of B_{12} deficiency is aversion to meat?)—Dr. Christina Bolander-Gouaille of Sweden.

There is a MTHFR mutation that is present in up to 50% of the population. MTHFR polymorphisms appear to be implicated in neurological and neuropathological disorders. Although MTHFR deficiency is associated with various disorders, a recent study reported that betaine supplementation alleviated progressive neurological symptoms and normalized the blood levels of methionine and SAM. The significance of this may be seen in *MTHFR* knockout mice, which have impaired availability of methyl groups from mTHF. They utilize (and consequently deplete) choline and betaine so as to maintain homocysteine remethylation. There is no evidence that nitrous oxide is unsafe for carriers of this mutation, However, in children with developmental delay or altered homocysteine metabolism (particularly Down's), methionine levels should be determined before using nitrous oxide-containing anesthesia.

Folate-dependent remethylation of homocysteine to methionine is observed in all tissues, but an alternate remethylation pathway in liver and kidney is carried out by betaine homocysteine methyltransferase (BHMT), which utilizes betaine (TMG) as the methyl donor. When folate-dependent remethylation is disrupted, the alternate pathway may be particularly important. Large doses of oral betaine are the mainstay of therapy for patients with homocystinuria due to severely compromised MTHFR activity, **although betaine can also lower homocysteine in healthy subjects. The betaine effect can be monitored by measurement of plasma homocysteine concentrations**.

DMG's greatest benefit has received little publicity. Studies show it can have a dramatic effect on the immune system. A study at the University of South Carolina showed that when the immune system was challenged with a vaccine, those taking DMG had 400% more antibody production than controls. Before administering any vaccines, you may want to discuss the benefit this could be with your doctor. Additionally, the lymphocytes' T-cell response was increased—J. Infect Dis 81:143(1):101-104. It has been shown to increase interferon levels indicating possible antiviral activity. **Since many autistic kids have elevated T-cell activity indicative of autoimmunity, this may be contraindicated for them**—another thing to discuss with your doctor, and to have him monitor. A probably cause for this autoimmune condition is that yeast infection can decrease the percentage of natural suppressor cells in tissue fluids and blood—dropping from about 15 percent to as little as 1 percent. When the Candida infection is successfully treated, the percentage of these suppressors rises toward normal, and the symptoms tend to clear.

There is a newly available substance that works in this same circuit with DMG/TMG, S-adenosylmethionine (SAM) that, additionally, helps neurotransmitters bind to receptor sites. This makes the neurotransmitters more active. It is also said to increase serotonin levels. This would seem safer than trying to control usage of serotonin or other neurotransmitters by use of SSRIs. It has been proven more effective than the tricyclic

antidepressants, helping the severely depressed who did not respond to other antidepressants, and it is without the significant side effects of those drugs, though therapeutic intake may include a dry mouth, agitation, and gastrointestinal problems. It is faster acting with no withdrawal period. I would urge its use, possibly along with small amounts of 5-HTP, to control the above listed "autistic" behaviors.

It should be possible, then, to reduce these behaviors by increasing serotonin production naturally, rather than by use of transport inhibitors (SSRIs) (that typically deplete the already reduced supply still further, loads the system with fluoride that inhibits the thyroid, and inhibits Phase I liver enzyme function). If one determines that the child may respond to more serotonin in the synapse, the best way to meet the need is by supplementing magnesium and vitamin B_6, the natural conservers of serotonin, and TMG or SAMe, and if necessary, small amounts of 5-Hydroxy-Tryptophan (5-HTP), a metabolite of tryptophan that easily translates into increased serotonin and melatonin. It is of interest to note that Michael Murray, ND, says that only 3% of oral tryptophan is converted to serotonin, but 70% of 5-HTP is converted, so keep the servings small (30 to 50 or up to 100 mg on an empty stomach before bedtime). 5-HTP, TMG, and SAMe are available at any health food store.

To ensure proper conversion of tryptophan to serotonin, supplement vitamin B_6, folic acid, niacin, and magnesium. A good choice would be Super Nu Thera™, by Kirkman Laboratories. It is specifically formulated to help autistic children. They presently have one without vitamin A, so you can use fish-liver oil as your source of cis vitamin A. Some have had difficulty in getting their child to take Super Nu Thera because of a "not so great" taste. One "trick" that has worked for some is to place 1/8 - 1/4 teaspoon of plain ascorbic acid (vitamin C) into water with the Super Nu Thera™. The taste and look are almost like orange juice.

Some are fearful of the higher amounts of vitamin B_6 and magnesium in SNT. Dr. Bernard Rimland says that every child is different, but he has found the average amount of vitamin B_6 that is beneficial is around eight mg per pound of body weight per day. The French found virtually the same, 17mg/kg/day. That is 500 mg per 60-pound child. Dr. Rimland's adult child has taken 1000 mg for longer than twelve years. He suggests starting with 1/4 the target amount and increasing slowly over a 10-14 day period. The amount of magnesium necessary with the vitamin B_6 is 3-4 mg per pound of body weight. That would be up to 240 mg for that 60-pound child. He further states that in thirty years he has heard of only four cases of autistic children suffering neuropathy. He adds that if no benefit is seen in six weeks, stop giving the high amounts. It is imperative that these higher amounts of vitamin B_6 and magnesium be taken with the underpinning of a good multivitamin/mineral supplement to avoid induced deficiencies that probably account for every reported case of neuropathy. High amounts could induce a vitamin B_2 deficiency otherwise. Vitamins B_6 and B_1 sit on opposite ends of a teeter-totter, with B_1 adding CO_2 to molecules, and B_6 removing CO_2. One of the switch points into the Krebs cycle is made up of two enzymes that run in opposite directions. One is dependent on B_1, the other on B_6. All B-vitamins are closely linked, and so must be supplemented together. In general, the B-vitamins move little bits of things around, with B_5 moving fatty acids, B_3 moving electrons and protons, B_{12} moving methyl radicals. One study found that people who took higher amounts of B_6 live an average of eight years longer than those in the control group. Dr Julian Whitaker, MD, reports success in restoring nerve function using alpha lipoic acid. He recommends the time-release formula.

Additionally, tests show a marked difference in how autistic children metabolize these nutrients. After giving 500 mg of vitamin B_6 orally to healthy children, the nutrient reached its maximum level in 2-hours and returned to base level in 8-hours. Thus, the half-life was about 4-hours. In the autistic child, these figures are 5-hours and 15-hours! In other words, the enzyme, aminotransferase, reaches maximum activity in 2-hours in healthy children, but in the autistic child it took 2.5 times as long! This clearly shows why a higher dose of vitamin B_6 is required in autistic children.

According to Bruce N. Ames, professor of molecular and cell biology at UC Berkeley, high doses of some vitamins could play a big role in the treatment of disease and perhaps slow the effects of aging. Ames lists more than 50 genetic

diseases successfully treated with high doses of vitamins, most of them inborn metabolic diseases caused by defective enzymes. (The American Journal of Clinical Nutrition, April 2002). There may be many more diseases that can be treated with high-dose vitamins, particularly the eight B-vitamins like niacin, thiamine, and pyridoxine. Similar results with "genetic" diseases are being seen from supplementing glyconutrients.

Ames argues that the key to the effectiveness of high-dose vitamin therapy lies in the fact that vitamins are converted to co-enzymes, which team up with enzymes to perform some essential metabolic functions. Many diseases result from genetic mutations that reduce the ability of an enzyme to bind to its co-enzyme, thereby reducing the rate at which the enzyme catalyses a molecular reaction. Saturating the body with high doses of the appropriate vitamin increases co-enzyme levels to overcome the binding defect and boost the reaction rate towards normal.

In four different double-blind experiments on 60 autistic children, scientists found that large doses of B_6 (up to 1,000 mg daily) coupled with magnesium (up to 500 mg daily) provided relief from many of the symptoms of autism. Neither B_6 nor magnesium alone is effective—Martineau J. et al Biological Psychiatry, vol 20 p. 467 1985. Therapeutic doses start at 200 times the RDA for children age 1-4 (200-500 mg pyridoxine or 25-50 mg pyridoxal 5 phosphate) and no toxic effects are known at this dosage. Parents in some cases report hyperactivity, which is countered with additional magnesium at up to 4-mg/kg body weight. Magnesium as well as taurine plays a significant role in seizure control. Some use taurine for ASD children at up to 1000 mg/day. Excess taurine can harm zinc-deficient persons since it suppresses absorption of zinc at the exterior wall of the intestines—Bill Walsh Email.

Some 42% don't convert vitamin B_6 to its necessary metabolite pyridoxal 5`-phosphate (P5P) (This conversion of vitamin B_6 to its active forms requires zinc, magnesium, riboflavin [vitamin B_2], and Alpha-ketoglutarate, so taking some of the coenzyme form of the vitamin may increase effectiveness—WSL.) We measured B_6 levels in children with autism, and found them to be well above normal (55 vs. 33). We also found that several enzymes related to B_6, including pyridoxal kinase, are dramatically less active than normal. Thus, the inability to convert B_6 to P5P leads to elevated levels of B_6, but a functional need for high amounts of it—Jim Adams, affiliation: professor, chemical and materials engineering, Arizona State University.

Many report that they cannot tolerate B-vitamins. Often, this seems connected to Candida overgrowth, but magnesium is an essential cofactor in the conversion of thiamine and other B-vitamins into their active forms. There have been reports of thiamine deficiency aggravated by magnesium depletion with refractory response to thiamine until magnesium was given. The deficiency of vitamin B_1 has also been reported as a cause of epileptic seizures. It seems plausible that magnesium depletion could provoke Wernicke's encephalopathy, possible by suboptimum thiamine phosphorylation. Vitamin B_6, too, is only phosphorylated into its coenzyme (P5P) in the presence of magnesium.

One Mom wrote, "Previously, I could not tolerate anything but a low dose of plain B_6. I think this was because I was very low on alpha-ketoglutaric acid needed to convert B_6 to P5P. (Alpha-ketoglutaric acid is destroyed by Candida yeast.) When I first started on alpha-ketoglutaric acid combined with a very low dose B_6, I was told to take it in the morning because it may disturb sleep. Indeed, it sort-of made me jittery. I was told this would end in about two weeks. It did. It was just an adjustment period while my body's enzymes were starting to work again. When I gave my daughter P5P, I gave it in the morning. After two weeks of 150 mg of P5P, my daughter could fall asleep at night (she weighed about 120 pounds at the time. She is not autistic, but her sleep problem was severe). Afterward, I just gave her 50 mg of P5P once or twice a week. This has been enough to keep the benefits."

Zinc is required for the conversion of pyridoxine to P5P as is magnesium, vitamin B_2, and alpha-ketoglutarate. Too much B_6 without B_2 can deplete the body of B_2 possibly leading to Cheilosis—swollen, cracked, bright red lips, a

common symptom of B_2 deficiency. Vitamin B_2 is necessary for cellular growth and acts with vitamin A in helping maintain the health of mucous membranes and the integrity of epithelial tissue. Vitamin B_2 is needed in glutathione production, in mitochondrial function for energy, and in the pathway that converts homocysteine to methionine and SAMe. A shortage of vitamin B_2 would hamper production of cysteine, glutathione, glutathione peroxidase, taurine, and the sulfate needed to detoxify Phase II toxins (PST). Vitamin B_2 is probably the most commonly deficient vitamin in America. It is needed for vitamin B_6 to function, and is depleted by high intake of vitamin B_6. Deficiency symptoms are: sensitive, easily-fatigued eyes; blurred vision; itching-bloodshot eyes; dizziness; inflammation of mouth; sore tongue; vivid red lips; dermatitis; itching nose; cracks in the corners of the mouth, and rash on the cheeks. Vitamin B_2 is an antioxidant that aids in utilizing oxygen. It lowers body pH. It aids in carbohydrate and fat metabolism. Radiation destroys 8% of B_2 in foods. Remember, these nutrients (Zinc, magnesium, a-ketoglutarate, and vitamins B_2 and B_6) are necessary to normalize the metabolism of, and to conserve the neurotransmitters serotonin, melatonin, and dopamine. Foods rich in riboflavin include: Lean meats, eggs, legumes, nuts, and green leafy vegetables. Because riboflavin is destroyed by exposure to light, foods with riboflavin should not be stored in glass containers. Benefits reported are, variously, improved use of words, improved sleep, decrease in hyperactivity and irritability, better attention span, increased interest in learning, and reduced self-injurious or aggressive behavior.

Studies show that when darkness is maintained, melatonin production is 3 times higher than daytime, but maintaining a bright, night lamp or TV in the bedroom prevents that increased melatonin production. For the pineal gland to function it must have distinct light/dark cycles. When you put the child to bed, make sure the room is dark, and do not turn on the light during the night for melatonin production tends to stop. People are highly individualistic in this, but high amounts of vitamin B_{12} can cause melatonin production to drop more dramatically in response to light at night, and it will take longer to recover once the light is turned off. How long must you be exposed to bright light at night before your melatonin production is inhibited? As little as five minutes, according to a 1989 study. Additionally, electromagnetic forces from a clock or other electrical machine in the bedroom will deplete this powerful antioxidant that protects the whole body. It is by this mechanism that a loss of melatonin to EMF is thought to increase the risk of breast cancer. Testing shows that supplementing additional antioxidants, as with Ambrotose AO™, protects the body against EMF radiation damage. To increase melatonin, take a hot bath. To solve a stubborn sleep problem, tape a kidney bean to the inside of the right wrist, three finger widths above the crease of your wrist. Yeah, ask your Chinese Medicine doctor why.

Many studies have shown that attention deficit and/or hyperactivity disorders in children are linked to changes in the levels of thyroid hormone in the blood, and that irritability and aggressive behavior are linked to thyroid hormone levels and hypothyroidism. Make the iodine/morning temperature tests and support the thyroid if indicated. Hyperactivity is a common symptom of magnesium deficiency. Magnesium supplements are recommended for treatment of hyperness in many conditions besides the treatment of ASD. A magnesium deficiency depletes vitamin B_1, so this should be added when supplementing magnesium. Other supplements known to help with the hyperness are calcium, zinc, folic acid, chromium, and iodine. Dr. Lynn Wecker and his colleagues at Louisiana State Medical Centre observed that the autistic population had significantly lower levels of calcium, magnesium, copper, manganese, and chromium, and higher levels of lithium as compared to sex and age-matched controls. Bill Shaw and Jim Adams found low levels of iodine, lithium, and potassium. Lithium is said to be always low in a child extremely mercury poisoned (Medline). It is also typically low in mothers of autistic children, indicating again that most mothers of autistic children have undiagnosed thyroid and adrenal gland insufficiency or antibodies thereto. Shaw suggests this may be from the Mothers drinking distilled or Reverse Osmosis filtered (bottled) water that has had all vital trace minerals removed. Nevertheless, copper is frequently high to toxic levels. He further states that he hs found low lithium in hair samples from patients with schizophrenia. Lithium is needed to transport folate and vitamin B_{12} into the brain and a lack may be the reason such high doses of these vitamins are needed by some autistics. Shaw informs us that the typical lab studies on lithium are applicable only in monitoring high doses of lithium drugs. They are useless in measuring the very low

levels of lithium associated with nutritional needs (suggested to be 14.5 mcg/kg). It is of interest to note that iodine hooks up to the double bond in fats, and if a patient were iodine deficient and added a lot of fat to the diet without supplementing iodine, they would run out of iodine, hence, deep depression. Conversely, the fat person needs a lot of iodine! **Adequate iodine will chelate mercury, arsenic, and other heavy metals.**

Additionally, in a placebo-controlled study on prisoners with a history of impulsive/aggressive behavior, the group taking low amounts of lithium (10-15 mg twice a day) had a significant reduction in aggressive behavior and infractions involving violence. It is helpful also to raise white-blood-cell count and to protect against loss of white cells in chemotherapy,, radiation,and heavy metal detoxification with DMSA/DMPS. Lithium also tends to normalize thyroid function, particularly in Grave's Disease, but can compete with iodine in the thyroid. Researchers at Wayne State University (Detroit) found that high dose lithium has the ability to both protect and renew brain cells (3% increase in gray matter in four weeks)! In Ischemic stroke (loss of blood flow), death of brain cells was reduced by 56%! Further, anticonvulsant medications cause abnormal levels of brain-cell death, but lithium significantly protects against this type of cell death. Researchers concluded that lithium should be administered with any type mood-altering drugs, and that would extend to caffeine, alcohol, marijuana, or other "recreational" drugs. Additionally, lithium is said to chelate aluminum. It aids in removing excess uric acid as well. Combined with zinc, it has proven helpful in anorexia, enabling needed weight gain. Lithium and selenium have antiviral properties. Lithium has been successful in increasing white blood cell numbers (using 5-10 mg twice a day). Studies of lithium have also shown it to have profound immunoregulatory effects in animals and humans. In a study of the effect of lithium on ex vivo cytokine production, Rapaport and Manji (2001) found a decrease in the levels of proinflammatory cytokines IL-2 and interferon-gamma and an increase in the anti-inflammatory cytokines IL-4 and IL-10. In a study of healthy human subjects, lithium had major immunoregulatory effects, including increases in both proinflammatory and negative immunoregulatory cytokines or proteins when stimulated by lipopolysaccaride and phytohemaglutinin (Maes et al., 1999). I suggest Lithium Orotate (5 mg) from www.life-enhancement.com; others have di-calcium phosphate. Lithium at 30 mg day for adult diabetics reduced blood sugar levels after meals an average of 30-35%. Similar results were seen in fasting sugar levels (Hu M. Et al, 1997).

Mercury causes decreased lithium levels, which is a factor in neurological diseases such as depression and Alzheimer's. Chung and colleagues found that lithium protects brain cells against the excitotoxic effects of excess glutamate and calcium (that kill brain cells). **Additionally, low levels of lithium cause abnormal brain-cell balance and neurological disturbances related to lowered levels of neurotransmitters dopamine, serotonin, and norepinephrine.** It has been helpful in reducing cravings for alcohol, and will improve sleep of alcoholics and their relatives. Lithium also is important in vitamin B_{12} transport and distribution, and studies have found low lithium levels common in learning disabled children (adding lithium increased learning 10%), incarcerated violent criminals, and people with heart disease. Lithium supplementation has been found to be an effective treatment adjunct in conditions such as bipolar depression, autism, and schizophrenia where mania or extreme hyperactivity is seen. Lithium may block production of fatty acids, so take some EPO in conjunction with it. Dr. Jonathan Wright has found that taking fatty acids with lithium offsets any toxicity, even in pharmaceutical doses. Interestingly, Lithium Orotate is targeted specifically to mitochondria and will not show on a typical blood test!

Rapid-cycling bipolar depression is seen increasingly in children. This is a "Jekyll and Hyde" personality change involving sleep disorders, rages and explosive temper tantrums, marked irritability, oppositional behavior, distractibility, hyperactivity, impulsivity, restlessness/fidgetiness, silliness, giddiness and goofiness, racing thoughts, aggressive behavior, self-injurious behavior, carbohydrate cravings with bingeing, risk-taking behaviors, tics, and OCD. Not all these behaviors indicate bipolar depression, but several combined should raise that possibility. Lithium, Omega–3 oils, magnesium, zinc, and vitamin B_6 offer the best approach to solving these troubling behaviors. Multiple nutrient deficiencies and hypothyroidism may make it difficult to utilize the EFAs. They would

likely be more efficiently utilized when taken with a digestive enzyme containing Lipase.

Kirov has observed an association between severity of anxiety or depression and low plasma Mg. Pliszka and Rogeness measured serum Mg in 165 boys admitted to a psychiatric hospital and found low Mg levels to be associated with dysphoric (downcast) mood and sleep disorders. A French team has recently demonstrated that Mg aspartate-HCl was as effective as Lithium in stabilizing the mood swings of rapid-cycling bipolar depressives (usually seen in children). A recent Harvard study showed EPA and DHA supplements to be more effective than psychiatric medications in combating bipolar depression. One study found that even with signs of lithium toxicity, the use of a fatty acid supplement removed all the signs.

> Using an assay developed by Dr. David Horrobin of Laxdale Ltd., biochemists at the Victoria Hospital in Glasgow have shown an increase in the phospholipase A2 (PLA2) enzyme in blood cells from individuals with autism and Asperger's syndrome. The PLA2 releases polyunsaturated fatty acids (PUFA), such as EPA, DHA, and arachidonic acid (AA), from cell membranes resulting in membrane damage and the production of highly inflammatory substances known as prostaglandins (PgE2 and PgE3), leukotrienes, and thromboxanes, known collectively as eicosanoids.
>
> How can abnormal PLA2 and excessive eicosanoid production result in the physiological and psychological problems found in ASD? The cells of the neural system contain high levels of PUFA representing between 15-30% of neural tissue by dry weight and, of those, AA and DHA represent 80-90% of the total. In normal, synaptic function, AA and DHA are released into the synaptic junction by the action of PLA2, along with neurotransmitter compounds, followed by re-uptake of the neurotransmitter and PUFA. If PLA2 activity is elevated, an excess of PUFA may be released into the synapse resulting in oxidation of the free PUFA. Oxidized PUFA can set up a cascade of reactions resulting in extensive free radicals and eicosanoids causing inflammatory reactions and cellular damage.
>
> In the cells of the gut epithelium and endothelium, AA is the predominant PUFA and Omega-3 (n-3) PUFA are only minor components. If elevated PLA2 is present in these cells, free AA will be produced and a range of highly inflammatory eicosanoids produced. In addition lyso-phospholipids, which remain after phospholipase action, are potent cytolytic agents (that cause cell membrane breakdown) that may cause "leakiness" in gut cells.
>
> The cells of the immune system, including lymphocytes, macrophages, and eosinophils, require PLA2 to produce prostaglandins and leukotrienes essential for enabling immune cells to locate and destroy pathogenic organisms. While low levels of prostaglandins, particularly PgE2, are stimulatory to the immune system, high levels tend to reduce immune responses. Thus, increased PLA2 could result in immune suppression as well as increasing (inflammation and) the prevalence of autoimmune disorders such as asthma, eczema, rheumatoid arthritis, and diabetes.
>
> Work in our laboratory, using red blood cells (RBC) as a model system, has suggested that PLA2 is elevated in individuals with autism and Asperger's syndrome. The RBCs usually contain less EPA and DHA and, sometimes, more AA than control subjects. In addition, the RBC-membrane PUFA composition appears particularly unstable on storage at -20^{o}C in patients with autism, compared to control subjects. This is strongly indicative of increased PLA2 in the RBC, perhaps coupled with increased oxidation of highly unsaturated fatty acids (HUFA). Recently, in conjunction with the Victoria Hospital in Glasgow and Laxdale Ltd, increased PLA2 has been confirmed in a number of individuals with autism and

> Asperger's syndrome…. **EPA is an inhibitor of PLA2 activity**, and probably helps to stabilize cell membranes and reduce inflammatory reactions by competing with AA (limits production of) and modulating the effects of AA-derived eicosanoids…. An EPA intake of around 1-2 g per day seems to be appropriate. (Elevated AA produces excessive PgE2 and PgE3 causing inflammatory actions through the body. These can be controlled by managing fatty acids in the manner suggested in the Section "Managing Fatty Acids" which includes liberal use of antioxidants. CLO, sesame lignans, and bromelain that are powerful anti-inflammatories—WSL.)

These notes from Dr. Klinghardt: The Phospholipase 2 (PLA2) destroys essential fatty acids. Therefore PLA2 stimulants should be avoided. **A high carbohydrate intake with its resultant increase in insulin is a profound stimulator of PLA2.** So, the patients should have a diet low in carbohydrates (I'm not talking Atkins'). This will automatically lower dietary fats by 30% (high carbohydrate foods are usually high in fat). Avoid all grains, including rice. No bread! So, in the future, eat vegetables with eggs. The therapeutic goal in brain diseases is to break down long-chained, fatty acids. So, you should avoid peanut oil, rapeseed oil (Canola), safflower oil, and mustard, because they contain long-chained fatty acids. (These VLCFAs cannot be broken down largely because your child is hypothyroid and his Phase I liver enzymes may be depressed. Do the Iodine Test, and support the thyroid as outlined herein.)

Since inflammation is the root of all chronic health problems, I rehash this fatty-acid problem here in more detail: Dr. Floyd Chilton, a researcher in inflammation, in his book "Winning the War Within" offers some new insights: he says that we need to take in more GLA and less arachidonic acid (AA) (nevertheless, some Autistic kids have too little of this vital AA). A large part of the GLA goes to the liver where it is converted into AA, the source of inflammatory prostaglandins (PgE 2 and 3) and leukotrienes. Fat Cells are also major producers of inflammation. They multiply numbers of macrophages that in turn produce inflammatory messengers such as tumor necrosis factor, alpha [TNF(a)] and C-reactive proteins. Obese people release more than seven times as much TNF(a) as lean people! Obese women have more than six times the amount of C-reactive protein as their shapely sisters (obese men have twice as much).

However, the GLA is not just used by the liver to create inflammatory prostaglandins and leukotrienes, but the immune cells use GLA/DGLA to produce PgE1 that inhibits enzymes that create these inflammatory eicosanoids, turning down the fires of inflammation. Thus, the immune cells need more GLA to offset the dietary intake and the liver's activity in producing the AA. He suggests adults (with inflammation) need to take in 640 to 950 mg GLA per day (for prevention, 450 to 550 mg/day). The latter would take a supplement of 4-1300 mg Evening Primrose oil capsules, but there are GLA supplements available also.

Additionally, the amount of Arachidonic Acid allowed to accumulate by dietary intake or by conversion of GLA/DGLA to AA in the liver must be controlled. First, by avoiding foods unnaturally high in AA (farmed salmon and tilapia and other foods unnaturally fed omega-6 (corn/soy) instead of omega-3 (algae/grass/hay). Secondly, by blocking conversion of DGLA to AA by eating more omega-3 foods (specifically EPA-rich fish, not plant-based alpha linolenic acid - flax, Canola - as they don't convert well to EPA) and supplements (fish oil, which is rich in preformed EPA/DHA). EPA tends to block the Delta-5 desaturase enzyme that produces AA. To supplement GLA in high amounts without balancing it with EPA would be pro-inflammatory and, over time, very damaging. In addition to inflammation, excess AA promotes sticky platelets, predisposing to poor circulation and heart problems. The American Heart Association recommends a high intake of 1-gram of EPA plus accompanying DHA per day, and up to 4-grams to lower triglycerides. These high dosages can cause digestive problems: headache, nausea, abdominal pain, and loose stools.

Although Arachidonic acid (AA) has been given a negative association, it is the most prominent essential fatty acid in the red cells and comprises 12% of the total brain and 15.5% of the body lipid content. Although EPA can provide some limited control over Delta-5 Desaturase, this enzyme is under profound hormonal control, that of insulin and glucagon. Consistent control of inflammation is thus dependent upon our dietary's effect upon these two hormones. Additionally, when AA is depleted by overdosing with marine or flax oil, or by pyrroluria or hypothyroidism, the competitive inhibition between the omega 3s and 6s will make the establishing of a balance of the EFAs difficult.

Often, both prostaglandin one and two series are compromised when flax and marine oils are overdosed or fat intake is insufficient. When AA, the lead eicosanoid of the body, is suppressed due to excess intake of marine oils, the balance of eicosanoid control circuitry of the body is impaired as is clearly seen in the patient's presentation. Arachidonic acid is preferentially wasted in states of heavy metal toxicity (Tiin and Lin, 1998), and is sharply suppressed in RBC lipid analysis in states of heavy metal toxicity (Kane, clinical observation 1997-2002). Additionally, it is usually suppressed in Pyrroluria, hypothyroidism, and with underactive Phase I Liver enzymes. This is particularly significant in that arachidonic acid supports acetylcholine secretion, enhancing cognitive abilities. Selection of high AA-content foods (farmed salmon, tilapia, organ meats, turkey, fat pork, and eggs) can be most helpful in these instances.

To balance the recommended intake of 600 mg GLA, according to Chilton, would require 300-350 mg/day of EPA. A proinflammatory intake of 650-900 mg GLA should be balanced with 450-540 mg EPA. This is considerably less than recommended by Victoria Hospital in the above quotation. I suppose it depends upon whether you are relying only upon EPA, or whether you are depending upon GLA to help quench the inflammation. Sesame seed extract also blocks Delta-5 Desaturase, the same as does EPA (Life Extension Foundation combines them). Remember that a high intake of EPA will reduce the very desirable DGLA production by 35%.

Adults eating fatty fish two or three times a week will need to supplement only half these amount. His studies also show that children require far less fish oil to achieve the same blood levels of Omega-3 fatty acids as adults; so, I have lesser recommendations elsewhere in this paper. In supplementing these fatty acids, one must preload and supplement high amounts of vitamins C and E and selenium to counter the increased free-radical activity the oils engender. *Ambrotose AO*^{R} (by Mannatech) is a must. Remember, one with pyrroluria, hypothyroidism, and inhibited Phase I liver enzymes will be deficient in Arachidonic acid and must avoid taking EPA (supplement GLA) until the AA levels have been restored.

While one can supplement high amounts of GLA to overcome chronic inflammation, it is far better to recognize why we need a supplement. It is because of a too-high intake of Omega-6 oils (and too much carbohydrate that promotes excess insulin). We take in 20X's too much polyunsaturated oils (linoleic acids from canola, soy, safflower, peanut, etc.), and we eat such an imbalanced diet that we cannot convert these excess, Omega-6, fatty acids to GLA because the Delta-6 Desaturase enzyme is being blocked. Specifically, we eat a high-carbohydrate, high-glycemic dietary that creates a chronically-high insulin level that, along with certain nutrient deficiencies, block Linoleic acid from being converted to GLA and drives such GLA as is to be had toward AA because insulin not only blocks Delta-6 Desaturase, but it overwhelms the inhibitory effect of EPA on Delta-5 Desaturase.

In addition to chronic inflammation, what's the result of this unmetabolized abundance of Linoleic acid? According to Dr. Richard Hubbard, a fatty-acid researcher at Loma Linda University, cancer! It would surely be wise to reduce polyunsaturated oils, replacing them with monounsaturated/saturated (olive and coconut oil) and Omega-3 foods and oils, and to eat according to ones metabolic type from a low-glycemic menu (the protein to carbohydrate ratio is vital). This would restore insulin/glucagon balance and enable control of both

Delta-6 and Delta-5 Desaturase reducing the need for a GLA supplement.

Temperature determines the need for Omega-3 oils. Intake of Omega-6 to Omega-3 ratios should be: Alaska and Canada, especially in central/northerly regions 1:1, in more southerly latitudes: 3:1, in the USA, 4:1, and in the tropics and deserts, 10-1.

Let's return to the previous thread: One group with high copper and low zinc, sodium, and potassium tended to have extreme tempers, while another group with low zinc and copper, but high sodium and potassium tended to be sociopathic (aggressive, antisocial). Some factors that have been documented in depression, impulsiveness, and violent behavior are low serotonin levels, abnormal glucose tolerance (hypoglycemia), and low chromium and folate levels, which has been found to be a caused by mercury toxicity. One mechanism by which mercury has been found to be a factor in aggressiveness and violence is its documented inhibition of the brain neurotransmitter acetylcholine. Low serotonin levels and/or hypoglycemia have also been found in the majority of those with impulsive and violent behavior. It was found that treatment (including nutritional therapy) of delinquent or violence prone individuals for metals-related problems usually produced significant improvements in mood, behavior, and functionality, with complete cure in the majority of cases. Excess copper stimulates production of the neurotransmitters epinephrine, norepinephrine, and dopamine, the neurotransmitters that control aggression and irritability, tending to aggression and violence. A normal copper, low zinc ratio will have similar effect. Recent finding that copper suppresses GABA ties together pancreatic damage to disruptions in copper/zinc ratios in the body. Copper is also required for monoamine oxidase, an enzyme related to catecholamine utilization in the synapse (it clears excess transmitters).

Aggressive and violent behavior was greatly reduced, and a fantastic increase in academic performance in math and English occurred in New York City Schools in a 1986 study (Schoenthaler 1986a, 1986b). The number of learning-disabled kids fell by an astonishing 74,000 in one year. **They simply removed sugar from the school diet!** They served nothing with more than 11% sugar (fruit).

Schoenthaler has achieved similar results simply by adding a once-daily, vitamin/mineral supplement to the diets of delinquents, adult felons, and ordinary elementary school children. In one investigation, people receiving a multivitamin/mineral supplement displayed less antisocial or violent behavior, compared with those receiving a placebo. "The most common vitamins to be low among children whose conduct and academic performance improved after nutritional intervention are pyridoxine, folic acid, thiamine, niacin, and vitamin C", he said.

One study of juvenile delinquents and adult felons in five states found that the "offenders with the worst behavior consumed the least vitamins and minerals." In California prisons, convicts with up to four nutritional deficiencies were 50 percent more likely to be involved in serious violent incidents, and those with five to nine nutrient deficiencies were 90 percent more likely to be involved in such incidents.

Additionally, low DHA has been associated with increased aggression, violence, depression, and suicide. Women with low DHA have a much higher incidence of gestational diabetes, hypertension, and pre-eclampsia during pregnancy as well as post-partum depression and OCD. Nevertheless, the practice of giving DHA supplements alone is highly suspect as DHA is one of several fatty acids that need to be had in balance, as found in cod-liver oil. Taken alone, it may increase hyperactivity. Without EPA, DHA can be toxic. Some babies on DHA-enriched formulas have developed intestinal gangrene. Low DHA is a marker for low serotonin. A vitamin-A supplement (cod-liver oil), and balancing of zinc/copper ratios also affect the behaviors of these kids. Most are deficient in zinc.

Besides causing obesity, a shorter attention span, and more defiant behavior, the following is one more reason to keep those refined and sugar coated cereals away from children: Researchers discovered a child who eats too much bread may grow up with short-sightedness. They found that refined starches in breads and cereals increase insulin

levels during digestion. This can affect the development of the eyeball, making it abnormally long and causing shortsightedness. Rapid digestion of the starches forces the pancreas to pump out more insulin. That leads to a fall in a binding protein that in turn upsets eyeball development. Refined sugar intake increases magnesium (and calcium) excretion in the urine, which causes depletion of the brain neurotransmitter dopamine. The bottom line is that humans were not designed to tolerate high glycemic carbohydrates or sugar. Continued high, daily use of sugar can result in a chronic state of serotonin excess with a dopamine deficiency, resulting in irritability. Many other evils of sugar and high-glycemic foods are mentioned herein. Please take note.

Many Autistic children have an excess of serotonin packed into the platelets, but a seeming deficite in the brain. Since there is no indication that the ones with these problems of hyperactivity and aggressiveness are necessarily the ones with excess serotonin-platelet saturation, and no symptoms have been associated with that condition; I believe, where these behaviors are a problem, and the above nutrients have been first supplied and sugars greatly reduced, it warrants introducing SAMe or 5-HTP in small, increasing amounts while carefully observing behavior. If present symptoms worsen, reduce or discontinue the supplement. As always, make such a potentially serious change only in consultation with your medical professional. First, make sure the child eats protein at every meal. Disguise it. Supplement amino acid powders, Seazyme™ (a predigested concentrate of white fish), and Sunflower seeds (7.5% carbohydrate and 52 percent protein! Omega-6 content [Linoleic acid] of sunflower is 57% (sic). Interestingly, no other oil comes close to its vitamin E—222 mg per 100 grams of oil). Whatever you do, get protein down him. This is absolutely necessary for growth and development, and "normal" behavior. For sleep problems primarily, take 5-HTP (up to 100 mg) two to four hours before bedtime (each child may vary in how long it takes to work). A back-door approach would be to give the child melatonin before bedtime. At daylight, it becomes serotonin and this all occurs within the brain. No serotonin is produced within the body. This has solved the sleep problem for many. For the behavioral problems take 25 mg 5-HTP several times through the day. This could be a problem for school if the child is made to be drowsy, in that case reduce the amount or give it later in the day.

Many find the solution to sleep problems with a supplement of melatonin (1/2 to 3 mg, 20 minutes before bedtime). Since 1/2 mg will restore normal nighttime levels, more does not necessarily work better. There are, potentially, several benefits to taking supplemental doses of melatonin other than improved sleep; for example, it promotes absorption of zinc, stimulates the thyroid, inhibits tumor necrosis factor alpha, and as tests show, it protects against brain damage from mercury poisoning reducing potential for Alzheimer's (without it, glutathione was reduced 30%, and other damage occurred). It is a powerful antioxidant, able to enter every cell of the body. Dr. Reiter found melatonin to be 5.9 times more effective than glutathione and 11.3 times more effective than mannitol in fighting dangerous, hydroxyl radicals. It is reported that if you give the child a small dose of melatonin daily in the morning, and then the rest at night, it will 'steady' the melatonin levels so they don't peak out at 2:00 a.m. causing him to awake. It seems to be successful with many of these kids. For a couple of days, the child may be pretty sleepy. To avoid problems at school, start this regime on a Saturday. Nevertheless, this could result in some degree of sleep disturbance, and may interfere with the circadian regulation of certain hormones.

It is vital that you solve the problem of sleep deprivation for the sake of both you and the child. One study showed that chronic sleep deprivation leads to a cellular magnesium deficiency that in turn disrupts sleep. (Another shows that an average of less than 6.5 hours of sleep increases insulin insensitivity by 40%. The raised insulin levels tend to overweight, and diabetes.) There was an increase in the thromboxane B_2 level, thus promoting coronary arterial spasm and thrombus formation. Additionally, people are not chronically ill unless there is a coagulation regulatory protein defect as seen in Thrombophilia or Hypofibrinolysis. Raised insulin causes the blood to clot too readily and causes the conversion of macrophages into foam cells, which are the cells that accumulate the fatty deposits. Every step of the way, insulin is causing cardiovascular disease. It fills the body with plaque, it constricts the arteries, it stimulates the sympathetic nervous system, and it increases inflammation, thus increasing platelet adhesiveness and coaguability of the blood. This starves cells for oxygen

and reduces ability to detoxify the cells. Chronic disease is the result.

Glutathione has been mentioned many times. It is a small protein molecule composed of the amino acids cysteine, glutamine, and glycine. It is a powerful antioxidant found in fish and meats, and fruits, and raw vegetables (asparagus, avocados, and walnuts). It is the body's major detoxicant that binds to fat soluble toxicants, heavy metals, solvents, and pesticides, making them water soluble so they can be excreted through the kidneys (Phase II detoxification). It has been associated with prevention of cancer and cataract, and Dr. Lejeune correlated IQ and glutathione levels. It is greatly depleted in mercury poisoning, and children with autism are universally lacking in this vital nutrient, as are older people and diabetics. Increasing tissue levels is associated with improved good health in older folks. I believe it is the lack of glutathione that causes children to be heavily poisoned by heavy metals, pesticides, and arsenic. Never give your child Tylenol™ for it depletes the liver and lungs of all their glutathione in minutes! Haloperidol depletes glutathione, CoQ10, and NADH, all necessary to mitochondrial energy production. **Candida's main deleterious effect is avid binding of vitamin B_6 and coenzyme Q10.** When CoQ10 is depleted 25%, clinical symptoms occur, when levels drop 75%, death occurs! A person of 77 may have 57% less CoQ10 in the heart muscle than a 20 year old (Larsen 2002)! Lipitor™, the leading statin drug, dropped CoQ10 levels by 49% in a two-week study (Columbia). Additionally, **Glutathione requires vitamins B_2, B_6, zinc, and selenium to be formed. Vitamin C (500 mg divided into two or more doses) increases its levels by 50%, Ambrotose® by 100%, Phyt•Aloe® by 200% (both by Mannatech™).** When sulforaphane (from Phyt•Aloe's cruciferous vegetables) reaches the cell, it also activates a group of proteins called Phase II enzymes. Supplementing milk thistle, whey protein, alpha lipoic acid, SAMe, and glutamine are known to increase glutathione. These latter ones have to be used with understanding as they are contraindicated in some children.

Exercise increases the body's oxidative burden by calling on the tissues to generate more energy. Making more ATP requires using more oxygen, and this in turn results in greater production of oxygen free radicals. Studies in humans and animals indicate GSH is depleted by exercise, and that for the habitual exerciser, especially those who exercise more than an hour, supplementation with GSH precursors may be a prudent policy. Liver GSH stores are also sensitive to depletion by malnutrition or starvation and by Tylenol™. These are the symptoms of glutathione deficiency: Coordination problems, generalized cell damage, mental disorders, various nervous system disorders, tremors and twitching; red cells tend to burst, white blood cells decline in function, and nerve tissue degenerates. In animals that cannot make their own ascorbate (newborn rats, guinea pigs), GSH depletion was fatal. Supplementation of the diet with ascorbate protected these animals against GSH depletion and saved their lives. Interestingly, this story has a "flip side"- guinea pigs placed on an ascorbate-deficient diet were salvaged by dietary administration of GSH and its precursors. Thus, these two water-phase antioxidants are tightly linked: GSH can conserve vitamin C, and ascorbate can conserve GSH.

GSH deficiencies have been documented in a number of pulmonary diseases, including acute respiratory distress syndrome (ARDS), asthma, chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, and neonatal lung damage. Patients with ARDS and sepsis have a deficiency of GSH in the epithelial lining fluid (ELF) as compared with healthy subjects, and a greater percentage of the total ELF glutathione is in the oxidized form (GSSG), indicating increased oxidative stress in the lower respiratory tract. When GSH was repleted in their ELF using intravenous N-acetylcysteine, patients in intensive care regained independent lung function and left the intensive care unit significantly faster. Autistic children typically have 1/3 normal GSH levels, so it is apparent that every measure to restore GSH levels should be utilized. Oral N-acetylcysteine, Ambrotose AO, Phyt•Aloe, vitamin C, all boost GSH.

Abstract: At a single evening dose of 5-10 mg of melatonin (MLT), the pineal gland hormone can exert a positive effect on the frequency of epileptic attacks in children with sleep disturbances of various etiologies. We have shown that the sleep behavior can be normalized and existing epilepsy can be favorably influenced. Pretherapeutic

MLT secretion profiles can provide new information concerning the origin and treatment of these disturbances. In vitro experiments suggest that this effect might be the result of the interaction between MLT and MLT-specific receptors in the neocortex. Due to its favorable safety profile, MLT can be liberally administered in the specified doses and be considered as a useful antiepileptic drug—Fauteck J Schmidt H Lerchl A Kurlemann G Wittkowski W Journal: Biol-Signals-Recept. 1999 Jan-Apr; 8(1-2): 105-10 1999 1422-4933.

Hypoglycemia not only precipitates the release of glutamate in the brain where it can become an excitotoxin, but it magnifies the toxic effect of all excitotoxins. The amount of glucose in the brain regulates the removal of excess glutamate from the synapses; thus, a drop in blood glucose allows the buildup of toxic glutamate. This depletes glutathione. Conversely, a buildup of glutamate leads to the release of insulin, resulting in decreased blood sugar levels. Unfortunately, many foods have excitotoxins added to them as taste enhancers. "The excitotoxins are known to trigger the formation of enormous storms of free radicals, leading to prolonged lipid peroxidation (oxidation of cell membranes and membranes within the cell). A recent study found that newborns exposed to MSG from day 1-10 still had a free radical elevation of 56% eighty days later. Such chronic, free-radical generation is known to produce damaging secondary, lipid-peroxidation products.

Another abstract with no title credits says in part: Recent data indicate that melatonin inhibits brain glutamate receptors and nitric oxide production thus suggesting that it may exert a neuroprotective and anti-excitotoxic effect. Melatonin has been seen to prevent seizures in several animal models, and to decrease epileptic manifestations in humans....The results suggest that melatonin may have a useful role in mechanisms of neuroprotection, and they also indicate its use in other cases of untreatable epilepsy. Another study is of interest: Children's Memorial Hospital, Chicago, in a report published by Lancet, found that, though their sleep problem was benefited, children with severe nervous–system damage, using a dosage of five mg melatonin, experienced an increased incidence of seizures that returned to previous levels on discontinuance. Other potentially negative effects (likely at higher doses in a small number of users) could be daytime sleepiness (especially if taken in the morning), vivid dreams (nightmares), abdominal pain, headache, and nausea. Natural sources of melatonin include Feverfew, St. John's Wort, seeds, tart cherries, bananas, tomatoes, oats, rice bran, sweet corn, wheat-grass juice, and ginger.

Additionally, Dr. Beth Malow, University of Michigan Health System, found that sleep apnea can be a contributing factor in seizures. Many that were unresponsive to medications were found to have a sleep apnea problem. Thirty-three percent of one study group had these sleep problems, and were prone to experience seizures at night. Medications often made the problem worse.

Sleep can be poor because of sugar problems. When blood sugar drops in the middle of the night, the child will awake. This may be from vitamin B deficiency. One who is vitamin B deficient goes to sleep easily, but keeps waking up as the blood sugar goes up and down. One who lacks calcium may be restless and have difficulty falling asleep. Once asleep, he may sleep well, but it's tough getting there. If sugar is the problem, 5-HTP or melatonin may not work until you remove the offending sugars and high glycemic foods from the diet, especially from the evening meals or snacks and supplement vitamin B-complex. Feed him at least 30% protein with each meal. Remember, sugar promotes Candida, with its multiple problems (yeast grows 200 times faster), and sugar can actually make the child drunk and giggly!

One of the keys to orderly brain function is glutamic acid. When sugar is consumed, the bacteria in the intestines, which manufacture vitamin B-complex, begin to die. The vitamin B-complex level declines, and the fatty acids they give off to nourish the cells of the gut lining are diminished. When the vitamin B-complex is lacking, the glutamic acid, a major brain fuel, is not properly processed and sleepiness occurs, with a decrease in short-term memory function and a loss of numerical calculative ability. The removal of B-vitamins when foods are processed makes the situation even more tenuous. This loss of B-vitamins needed to process lipids (fats), coupled with a high glycemic,

processed-food diet creates the fatty acid deficiencies and imbalances. Vitamin B_{12} therapy is based in part upon the role of vitamin B_{12} in synthesizing essential fatty acids. Best results seem to be had with injections of methyl-cobalamin, but be advised that vitamin B_{12} injections may turn the urine red!

Healing the Leaky Gut

To heal the digestion and the leaky gut, basically seven things are needed—supplement the following divided into 2 or more servings:

1. The amino acid L-glutamine (1500 mg/day, a maximum for your child would be 3000 mg/day) that also reduces blood and brain ammonia levels. Experiments with various animal models have demonstrated that the provision of glutamine can result in better nitrogen homeostasis, with conservation of skeletal muscle. This leads to better ability to learn, to retain, and to recall. There is also considerable evidence that glutamine can enhance the barrier function of the gut. Furthermore, it is now known that the gut produces large amounts of a vital antioxidant, glutathione, when adequate glutamine is present.

Glutamine is the principal metabolic fuel for small intestine enterocytes, lymphocytes, macrophages, and fibroblasts (major players in the immune function). Supplemental use of glutamine increases intestinal villus height, stimulates the gut's mucosal, cellular proliferation, and maintains mucosal integrity. It also prevents intestinal hyperpermeability and bacterial translocation, which may be involved in sepsis and the development of multiple organ failure—Miller AL, Altern Med Rev, 1999 Aug, 4:4, 239-48.

L-glutamine is essential for the synthesis of the mucoproteins present in the mucous secretions of the GI tract. These secretions are responsible for protecting the lining of the GI tract. In addition to protective qualities, L-glutamine administration has been known to actually improve mucosal structure and healing (Arch Surg 1990;125(8):1040-45). The Merck Index reports that cabbage contains vitamin U, the anti-ulcer vitamin, used in "treatment of gastric disorders" (Merck Index, Merck & Co., Rahway, NJ. 1989, p 1581). Some of the healing properties of cabbage may be due to its high L-glutamine content. Cabbage juice suppresses Candida yeast infection (Heinerman, ibid, p56), and is an excellent laxative. Use it to clear impactions of the bowel.

Glutamine is often low due to yeast toxins. An adequate amount of this amino acid promotes the production of growth hormone. Just be careful with glutamine. When it converts to glutamate in the intestines this releases ammonia. Excess lysine tends to excess ammonia. If you have low arginine, it will be difficult to eliminate the ammonia. Arginine also promotes the production of growth hormone. It is possible that the bacteria in the gut have lowered the arginine levels. Dr. Braverman mentions a case presented by Stanbury and colleagues from MIT, where the presenting symptom was constipation. The bowel flora contained the bacteria Streptococcus fecalis, a potent source of arginine desaminase. This enzyme converts arginine back to citrulline, and an excess of the enzyme caused a deficiency of arginine in the patient.

The net results of Strep infection are depletion of vitamin K, decreased glutathione, arginine, and sulfhydryl protein levels, overstimulation of the immune system, increased TNF alpha (that triggers Tourette's syndrome, facial tics, OCD, and Schizophrenia), potential autoimmune responses, and inflammatory reactions against the GAGs in the GI tract. Supplement these nutrients while struggling with this invader (see suggestions pertaining to TNF elsewhere in this paper.

So, to overcocme leaky gut, start correcting deficiencies of folic acid, B_{12}, zinc, molybdenum, arginine, and the other aminos that help remove ammonia, before trying glutamine. If ammonia is already high, alpha-ketoglutaric acid (alpha-ketoglutarate) might be a better place to start. It will convert to glutamate when it absorbs ammonia. Glutamate then absorbs another ammonia molecule to become glutamine that delivers the

unwanted ammonia to the urea cycle leading to the formation of urea that can be passed out through the kidneys. α-ketoglutaric acid is an intermediate in the Krebs cycle, and as such can be degraded to carbon dioxide and water, or transformed into sugars. As an added bonus, alpha-ketoglutarate is needed to convert B_6 into its useable coenzyme form, P5P. Glutamate is an excitotoxin so don't overdo. Get expert guidance on using the aminos, and be very observant when you use them.

2. Bromelain (200 or more mg/day), a digestive aid and anti-inflammatory often available in item 3. It should not be used with ulcer or gastritis as the protease may eat on the raw flesh. It "thins" the blood; so don't take it with prescription blood thinners or aspirin.

3. A digestive aid of pancreatic enzymes, including lipase, amylase, lactase, cellulase, and peptidase, (with ox bile if there is evidence of indigestion of fat). Use enough to correct all observed stomach or bowel irregularities. A good one is GI-Zyme™ by Mannatech™, Kirkman's EnZym-Complete™ or SpectraZyme™ by Metagenics™ available from www.randallnutritioncenter.com/rcnc2000/spectrazyme.html, or Fern's Nutrition, 1-800-229-3376. These do not contain ox bile. There are only a couple of possible downsides. If you are taking large, regular doses of aspirin or NSAIDS, these will make your stomach so raw, and your gut so leaky, that the protease could eat on your stomach or gut. To protect the stomach from HCl and protease, drink a large glass of water one-half hour before eating (this will hydrate the mucus lining of the stomach), and take the enzymes with the first part of your meal, unless they are in veggie capsules. These take longer to dissolve. Take them 15 minutes before eating (mix it in a spoon of food for children). Therefore, if taking lots of pain pills, or if you have an ulcer, or severe gastritis, find an enzyme supplement without protease. RGardens, International, "Gamma-Zyme™", 200 capsules for $30.00, is the only one I know of (Phone 800-700-7767). The use of a supplement of arginine will greatly reduce this stomach and gut damage caused by NSAIDs. NSAIDs also rob you of copper, so care must be used if copper deficient. One can also ask the doctor about prescribing a form combined with copper, or take 4-8 mg copper, depending on the amount of NSAID being used.

Some have found MSM as effective as Tagamet™ or Zantac™ in relieving ulcer pain and heartburn. Remember too, that aspirin or aspirin-containing compounds or anti-inflammatory drugs such as indocin, butazolidin, or cortisone should never be taken when hydrochloric acid is being supplemented. This combination increases the risk of ulcer. **Two enzyme tablets at bedtime are reported to usually desensitize you to pollens and things that cause hayfever—and perhaps other allergies.** Enzymes introduced in large amounts too quickly can affect the bowel: usually diarrhea, intestinal bloating, peculiar acrid smell of the stool, and, in some cases, itching of the perianal area. Work up to dose slowly, back off if these symptoms persist.

4. Probiotics: Lactobacillus Acidophilus, Bifido Bifidus—these produce most of the available vitamins B–complex and K, and the fatty acids (butyrate) that the cells in the lining of the gut depend on for their nutrition, and they keep Candida yeast from becoming a problem. Additionally, by producing a substance, Muramil Dipeptide, that activates synthesis of B- and T-lymphocytes, the healthy gut wall is literally infiltrated, jam-packed, with B and T lymphocytes ready to protect the body from any invader. Further, the beneficial flora of the gut synthesize such antiviral substances as interferon, lizocym, and surfactiris that dissolve the membranes of lipid-envelope viruses. Take these on an empty stomach for best results, possibly with a little baking soda water to help them survive the journey. **These will not recolonize the gut without some lactic acid; so, if casein free, take some S. boulardii. Supplementing probiotics may be doubly vital when taking magnesium:** Magnesium is a wide-spectrum antibiotic. Good bacteria in the intestines are vital in nature's plan to prevent diarrhea, but magnesium in the gut can, and usually does, kill them. When taking large amounts of magnesium, use very large amounts of probiotics.

5. Supplement vitamins A and D [preferably as cod-liver oil (5000 to 10,000 IU vitamin A, 800 to 1200 IU vitamin D. Should you not use CLO, then choose a water-miscible form of vitamin A and a capsule of D_3, and the minerals zinc (15-30 mg/day) and copper (in an 8:1 zinc/copper ratio unless testing shows there is high copper already—as it probably will in autism--, but not exceeding five mg copper per day, and do not take them together) in addition to a broad-based, multi-vitamin/mineral supplement Nutrilite™ Food Supplement by Amway™ or,

preferably, GlycoBears® chewable multivitamin/mineral by Mannatech™. Zinc reduces intestinal permeability in malnourished children with diarrhea. A lack of copper may cause seizures—Arch Dis Child, 1982;57[9]:716-18. A lowered hematocrit (red blood cell count) can be indicative of lowered blood copper levels (copper induced anemia).

A 1977 South African Medical Journal study of vitamin A as therapy for excessive bleeding (bleeding is the leading cause of hysterectomies). The article cited the use of vitamin A over a ten-year period at Johannesburg General Hospital and documented a 92% cure rate! An extreme vegetarian diet, recommended and promoted by many, depletes the body's stores of vitamin A leading to malnutrition and infection, and bleeding! A search of standard nutrition textbooks confirms that persons with low thyroid function, babies, and young children are unable to convert beta carotene (found in vegetables and used in place of vitamin A in most vitamin pills) into usable vitamin A. Patients with low thyroid often have excess bleeding, and are at extreme risk of unneeded surgery to the reproductive organs. In addition to this, many foods, particularly the soy foods with a high copper, diadzen, and genistein content, are known to depress the thyroid function. The textbooks also state that vitamin A is needed for iron absorption, and the building of blood, but few indeed will direct that vitamin A be taken with iron supplements. Nevertheless, in tests of pregnant women, 68% responded to iron only, while 35% responded to vitamin A only, but 97% responded to a combination of vitamin A and iron ([Lancet, November 27, 1993, pp.1325-1328]. **People with underactive thyroids are always vitamin A deficient.** They cannot convert beta-carotene to vitamin A because of a lack of iodine (Dr. Michael Cutler, MD), nor can they convert vitamin A to the form usable by the eyes. Without adequate vitamin A they cannot convert the thyroid hormone T4 to T3! Occasionally, you will see a yellow cast to the palms of the hands and bottoms of the feet, or around the eyes and cheeks, due to an inability to handle carotene.

The antioxidant, vitamin A is vital to a child's ability to sleep through the night, to have abundant energy, and to have a strong immune system. Additionally, in South Africa, high death rates following measles vaccine were reduced to virtually zero by injecting 200,000 IU of vitamin A with the vaccine! In an American study, kids who stayed out of trouble got 8,000 IU of vitamin A in their diet, those who were usually in trouble, got 3,000! Grab that CLO! Nevertheless, like zinc, absorbability and individual need for vitamin A can vary widely. If no improvement is seen, keep increasing the daily intake by 10,000 IU per day (every 2 to 4 weeks) until benefits are experienced or until a rough, dry, dirty rash appears around the neck or upper shoulders, or nausea, or headache occurs indicating toxicity. Should this occur, stop the supplement for a few days until these symptoms disappear, then reinstitute the supplement at a lower amount (Dr. Sidney Baker). If needed in these very high amounts, use water-soluble vitamin A as it is far less likely to induce toxicity. Your doctor should monitor this type program.

Additionally, bleeding can be a sign of vitamin K deficiency. This is quite likely in autists because of a failure to eat green vegetables and a lack of friendly bacteria in the gut (they make 80% of our available vitamin K). Vitamin K is more than a blood-clotting vitamin, however. It is a powerful antioxidant, and necessary to vital function. It prevents Arteriosclerosis by preventing hardening (calcification) of the smooth muscle of the arteries and prevents osteoporosis by working with vitamin D in controlling calcium utilization, preventing excessive bone loss. Though it is a fat-soluble vitamin, vitamin K is not stored and must be absorbed on a daily basis. The pancreas contains one of the highest levels where it is involved with sugar regulation and aids in control of hypoglycemic related anxiety attacks. Vitamin K reacts enzymatically with glutamate and calcium to ensure proper placement of calcium where it belongs in bone and teeth. It is a cofactor for the conversion of glutamate to gamma carboxyglutamate. Lack of vitamin K would create a cycle of deregulation in the glutamate/calcium pathway leading to further neurological inflammation. Excess glutamate also leads to release of insulin that res,ults in decreased blood sugar levels. The amount of glucose in the brain regulates the removal of excess glutamate from the synapses; thus, a drop in glucose allows the buildup of toxic glutamate. A supplement of at least one milligram of vitamin K a day for children would be indicated, with 10 mg a day being suggested for adults. Women who took a lot of vitamin D with low vitamin K had double the hip fractures!

Dr. Woody McGinnis, MD, USA has this to say about copper: "I think a lot of our behavioral kids are intolerant of even a milligram or two of extra copper, even in the face of high Zinc supplementation. This is contrary to the usual proportional balance we like to strike. I get a serum Copper and a plasma Zinc, and try to keep the ratio less than 1:1." This intolerance is probably because normal levels of copper are toxic to mercury-poisoned people. **High copper is also one indicator of Candida.** Nevertheless, blood, urine, and even hair analysis may not reveal copper toxicity directly. Copper is stored mainly in the brain, liver, and other organs, not in the blood or urine. The detection of copper toxicity can be tricky, even with hair mineral analysis. Some people who have copper overload initially don't test high in copper because the copper is tightly stored in tissues and hasn't yet been released into circulation and deposited in the hair. If copper levels are low or normal, copper overload still can be present but hidden. Several indirect indicators on a hair mineral test are also excellent to detect copper imbalance. These include a hair calcium level greater than about 100 mg%, a potassium level less than about 3 mg%, a sodium/potassium ratio less than 2.5:1, a zinc/copper ratio less than 6:1, an elevated mercury level or a copper level less than 1.0 mg%. Severe Zn/Cu imbalance or zinc deficiency is associated with irritability and rages! For more information on determining copper overload through hair mineral analysis, have your health practitioner contact Trace Elements, Inc., at 1-800-824-2314. When copper is high, the patient has cravings for foods that have high copper to zinc ratios such as mushrooms, lobster, crab, canned prawns, cod, oysters, pecans, hazelnuts, sunflower seeds, walnuts, almonds, Brazil nuts, sesame seeds, **French fries**, brewer's yeast, chocolate, dried peaches, and liver.

Copper binds to pesticides, giving them easier entrance into organisms. "These biotoxins don't just affect the nervous system. They trigger release of inflammatory agents in the body that can inflame almost any organ and cause multiple-system symptoms." Biotoxins all do their damage by setting off an "exaggerated inflammatory response" in humans. They hide out in fatty tissues where blood-borne disease-fighters can't get at them; thus, they trick the body's immune system into launching attacks against joints, muscles, nerves and brain. (This has come to be called "autoimmune disease" where the body is said to be mistakenly attacking itself.)

"The body can turn off the macrophage cytokine response, so that the achiness, fever, headache, and fatigue of a cold will go away, but there's no negative feedback that stops the cytokine response from fat cells," says Shoemaker. "So, the illness doesn't self-heal."

Cholestyramine (CSM) is an FDA-approved medication that has been used to safely lower elevated levels of cholesterol for more than 20 years. It isn't absorbed; if it's not taken with food, it binds cholesterol, bile salts, and biological toxins from bile in the small intestine, and then the CSM-toxin complex is excreted harmlessly. Shoemaker and Hudnell don't have definitive answers yet as to exactly how or why CSM clears neurotoxins from the body, but a double-blind, placebo-controlled, cross-over clinical trial of eight, Pfiesteria patients positive for biotoxins showed that those who took a placebo remained ill, but improved following CSM treatment. Data from 30 others he's gathered since matches the original study data.

Shoemaker says while some patients notice immediate improvements, Lyme disease patients who've been sick for more than five years usually require toxin-binding therapy for 4-8 weeks, he says. "Most patients improve in two weeks, some with complete abatement of symptoms, but depending on the amount of toxin in your body, it may take longer."

He believes the response of these patients to CSM therapy shows the underlying common theme of neurotoxin-mediated illness, and that the proof that toxins were responsible for the illness is found when patients recover, i.e., have no symptoms following treatment with his protocol.

"The proof of neurotoxin effect comes from watching the biomarkers change with treatment and relapse with re-exposure," says Shoemaker. "There's very strong evidence, especially in the Sick Building Syndrome patients."

Hudnell agrees. "The best evidence that biotoxins are causing the illnesses comes from cases with repeated illness," says the toxicologist. "When you see patients with chronic illness recover vision as symptoms resolve while being treated with a drug that can do nothing but remove compounds from circulation, then see vision plummet and symptoms return following re-exposure to sources of toxins, and finally, see re-recovery with re-treatment, sometimes for three or four cycles, you become convinced that it's the toxins causing the illness." - Quotes from Ritchie C. Shoemaker, MD and H. Kenneth Hudnell, PhD. – From *Neurotoxins*, by Patti Schmidt.

Having considered all this and being reminded that these toxins can be positively removed from the body by binding the toxic bile, how can we protect ourselves on a daily basis?

Fill up on fiber. Fiber helps everything move smoothly and efficiently through the digestive tract. Fiber promotes healthy flora in the gut and binds and transports excess bile acids and potential inflammation-causing substances out of the body. Fiber-rich meals help contribute to a steady and sustained contribution to blood sugar. All that's widely recognized, yet in this country our average fiber intake is 10 grams daily, whereas 25 to 30 grams are required for good health. Good high fiber-foods include steamed vegetables, ripe fruits, lentils, black beans, barley, chickpeas, bulgur, brown rice, oatmeal, and whole-grain breads and cereals. Avoid refined and processed items such as white bread, pasta, cornflakes, cookies, candy, and other sweets. Another benefit of fiber-rich foods? They have the advantage of satisfying hunger more effectively, since they are broken down slowly in the digestive system. In contrast, simple and refined sugars (from processed foods and sweets) quickly cause blood sugar spikes... then a crash in energy that leaves you craving something sweet.

Glucomannan is a water-soluble fiber that encourages better digestion overall... helps stimulate the conversion of cholesterol to bile acids... and decreases the intestinal absorption of cholesterol and the reabsorption of toxic bile. Take one capsule 30 minutes before lunch and dinner with a large glass of water. Supplement also resveratrol that supports both paths of Phase II detoxification by providing both sulfates and glucuronides.

Returning to the subject of vitamin A, an inflammation fighter, in intestinal health: The significance and urgency of building vitamin A is seen in a recent report: "These data indicate that vitamin A is necessary for optimal function in the hippocampus, which we know to be a main seat of learning," said Salk researcher Sharoni Jacobs, "The study indicates that the detrimental effects of vitamin A deprivation (on learning) are remarkably reversible, which offers hope to the millions of children worldwide with vitamin A-deficient diets."

6. Aloe (preferably Ambrotose AO™ that contains Manapol™ and many other saccharides and antioxidants for even better results, or Man-Aloe® Classic (Manapol™) by Mannatech™ for they are the only stabilized, standardized, aloe products available).

7. Balance flora by use of antifungals and supplement flora with yogurt or a probiotic supplement. Provide fiber, preferably fructo-oligosaccharide to provide an environment for the "good guys" to overcome yeast and other "bad guys", or other non-gluten fiber. Mannatech's GI-Pro™ offers a 12-billion count for

effective colonization.

8. Restore adequate sulfate to the body as outlined in the section Phenol-sulfotransferase.

When the gut is healed and the digestion restored, bizarre eating habits will cease, and a more balanced dietary will be possible. There are three things to know about glutamine:

1. It can cause a buzz like excess caffeine—the kid will be hyper, in that case reduce the amount until this disappears. The amount recommended is not likely to do this.

2. High glutamine readings are seen in subclinical ammonia toxicity. This could be due to a weak detoxification, or to excess protein intake. In the latter case, other amino acids will be high.

3. Glutamine and arginine are the precursors that, with the help of vitamin B_6, produce the amino acid GABA. Perhaps because of this relationship, both glutamine and vitamin B_6 have been shown helpful to those suffering epilepsy. A pyridoxine deficiency decreased GABA in the hippocampal area by 32% in female rats. Additionally, according to current research done at NeuroGenesis, low levels of opioids, caused by stress, also result in low levels of GABA. In addition, low levels of opioids are correlated with high dopamine levels and low serotonin levels. Excessive anxiety and panic disorder can be related to GABA imbalances and sugar imbalances. GABA is an inhibitory transmitter that exerts a calming action; however, excess GABA is related to learning difficulties.

GABA

Recent research by Ed Cook and associates at the University of Chicago established that there are one or more genes on chromosome 15 that manifest in autism. The chromosome 15 children studied so far showed regression. Between 12 and 24 months of age, they lost skills. These children displayed low muscle tone. "They walked on time," Cook says, "and they can eat OK; it's not severe. They may have had a little trouble holding their heads up as infants, and show a history of low tone in other ways. Most kids with autism aren't like that, so the floppy ones stand out a bit. A lot of them visually look like Fragile X, with hyper-extensibility of the joints, double-jointedness, and ears that may be a bit longer than normal and incorrectly 'rotated' backward."

Some had speech delay, lack of social skills, and "stereotyped" or repetitive behaviors. In addition, these children had seizures and hypotonia, or low muscle tone, characteristics that are not normally associated with autism. These children all had a duplication of part of chromosome 15.

The prospects for knowledge of chromosome 15 leading to a biomedical treatment for autism are high. This is so because the affected region on chromosome 15 contains three genes that code for the neurotransmitter gamma-amino butyric acid (GABA), This is the neurotransmitter involved in preventing anxiety and is essential to integrating motor and mental functions. It is used as an aid to restoring speech following stroke. Lou Gehrig's disease (ALS) and other neurological conditions result from altered metabolism of the neurotransmitter glutamate, needed to form GABA, which leads (in ALS) to motor-neuron degeneration and loss of motor function. Excess copper suppresses GABA and also suppresses thyroid function. Those suffering ALS actually have twice as much serum glutamate as normal, apparently from a lack of glutamate transporter protein that normally removes excess glutamate (this defect has only been seen in ALS), storing it in the Astrocytes. Aspartate levels were also elevated while other amino acid levels were normal! Glutamate and Aspartate are excitotoxins when in excess at the neuron, and cause death of the neurons. It has been shown that exposure to high concentrations of excitotoxins in short term most often produces ALS and Parkinson's, while long term, chronic exposure produces dementia. There is increased risk of stroke and seizures. These excitotoxins are a distinct problem with autistic and other children due to the large amounts of flavor enhancers and aspartame being consumed by many.

Excessive glutamatergic stimulation is associated with epileptiform activity, which is common in autistic subjects. This excessive stimulation, with its potential loss of neurons, is greatly increased when brain energy supplies are reduced as in hypoglycemia and uncontrolled seizures (which use enormous amounts of energy). When a seizure occurs, the brain undergoes some drastic biochemical changes. It's metabolic rate increases enormously, and glucose and oxygen consumption increases to supply the needed energy. Unfortunately, the oxygen delivery system is unable to keep up with the enormous demands. The brain becomes oxygen starved, and must shift its metabolism to a much less efficient energy producing system called glycolysis. A lactic acid buildup occurs in the brain, and if the seizure is not stopped, neurons begin to die. Glutamate levels are elevated in absence of adequate energy. High extra-cellular levels of glutamate cause extrusion of intracellular cysteine resulting in glutathione depletion. Low levels of magnesium also result in decreased levels of Glutathione, as does infection or inflammation that causes elevations in TNF (a). A supplement of vitamins C, E, K, and B_6, the amino acids Theanine (precursor to GABA), taurine, glycine, and acetyl-L-carnitine, the minerals magnesium, manganese, zinc, and lithium, oral or transdermal glutathione, melatonin, and large amounts of L-leucine (induces Glutamate Dehydrogenase) greatly reduce the excitotoxic effects and significantly improves neurological function.

Alcohol, anticonvulsants like Gabapentin (Neurontin™) (sic), and anti-anxiety medications like benzodiazepine, Xanax™, and Valium™ all work by attaching to the GABA receptor. Vigabatrin™ binds to enzymes that inactivate GABA, knocking them out of commission. This ensures that GABA stays at a level that will keep the message delivery system working properly. GABA is an "inhibitory" neurotransmitter; it prevents cells from firing. Some call it the brain's "braking system". Taking 750 mg of GABA, divided into 3 doses daily (Adult) is very effective even in acute anxiety, and may reduce nighttime urination. Taurine is a second calming neurotransmitter that proves very effective in conjunction with GABA. It is known that vitamin B_{12} may be important for many conditions including anxiety, depression, mood swings, and memory loss, so it should be supplemented also (serum B_{12} is not necessarily an accurate way of measuring B_{12} status).

The above statement is in error as far as GABApentin (Neurontin™) is concerned. Here from the PDR (US medical handbook) 2002 is the statement regarding GABApentin: GABApentin is structurally related to the neurotransmitter GABA (gamma-aminobutyric acid), but it does not interact with GABA receptors, it is not converted metabolically into GABA or a GABA agonist, and it is not an inhibitor of GABA uptake or degradation. It is not metabolized, but leaves the body unchanged. Studies with radio-labeled GABApentin have revealed a GABApentin binding site in areas of rat brain including neocortex and hippocampus.

This brings us to another line of converging evidence: in the cerebellum, the Purkinje cells (that Margaret Bauman has found to be diminished in the autistic brain) release GABA.

Bolte notes that tetanus infection of the intestines leads to the formation of toxic compounds called phenols. As a corrosive substance, phenol (carbolic acid) denatures proteins and generally acts as a protoplasmic poison. Studies of autistic individuals have detected markedly elevated levels of the phenolic metabolite of tyrosine called 3-(3-hydroxyphenyl) - 3-hydroxypropionic acid (HPHPA). Several autistic children with high HPHPA levels, "…have shown a significant reduction in stereotyped behaviors when treated with antimicrobials effective against intestinal Clostridia"—a genus of bacteria that includes tetanus. "When certain bacteria of the CLOSTIRIDUM family (genus) are present in high numbers, phenylpropionic acid or 3-hydroxytrosine may be formed in the intestinal tract. Either of these compounds may then be converted to 3-hydroxphenyl-propionic acid that is, in turn, converted to HPHPA by the enzymes in the human mitochondria that break down fatty acids"—William Shaw, Great Plains Laboratory. This could be a major contributor to the phenol toxicity of the PST child.

These phenolics prolong the life of and intensify cellular responses to catecholamines (epinephrine, norepinephrine, etc.). They each act as cardiac stimulants, which accounts for the accelerated pulse that Dr. Arthur F. Coca so wisely deduced was symptomatic of an allergenic response. Nicotine was observed to have a pronounced effect on biological membranes, that is, it increases the permeability of these membranes to certain pharmacologically active substances, such as norepinephrine, epinephrine, and dopamine. Peristalsis is increased in the intestine and distribution of blood is altered by these phenolics because of the sensitizing of smooth muscles to epinephrine, norepinephrine, and other physiological stimulants. There is evidence for increased entry of potassium ions into the cell under the influence of epinephrine. This could account for the electrolyte imbalances and water retention (edema) noted in allergies.

"We have noticed that the molar ratio of the urinary concentration of the dopamine metabolite homovanillic acid (HVA) to that of the epinephrine/norepinephrine (adrenaline/noradrenaline) metabolite vanillylmandelic acid (VMA) is commonly elevated when HPHPA is elevated. This appears to indicate that a by-product involved in the formation of HPHPA likely inhibits the conversion of dopamine to norepinephrine **leading to relative dopamine excess**. Animal studies indicate that dopamine neurons mediate behaviors such as hyperactivity and stereotypical behaviors common in autism. Of course, the drugs such as the phenothiazines and Haloperidol (and Risperdal™), commonly used to treat autism and schizophrenia, are well known to block the action of excessive dopamine at the receptor level"—Biological Treatments for Autism and PDD, Wm. Shaw. **It is noted that excess dopamine contributes to sleep disorders, tics, OCD, and Exposure Anxiety that keeps the autistic child in constant fight-or-flight mode. It would seem that a test for and treatment of Clostridia could be very well indicated. Additionally, supplements of magnesium and potassium will tend to balance the Autonomic Nervous System, calming the child. Choline (Lecithin) is antidopaminergic, as is anything that will build acetylcholine. Vitamin B_6 and zinc deficiency tends to excess dopamine and a relative lowering of acetylcholine needed for cognition.**

Now, the $64.00 question is, what raises HPHPA and interferes with the neurotransmitters? That is a well-known answer. It is from Clostridia acting on the amino acid phenylalanine! Now, why would this essential amino acid be a problem? Two reasons: 1) you inherited a problem with metabolizing it called Phenylketonuria (PKU). This is a condition tested for at birth, and if found, a diet free of phenylalanine is prescribed, but it is notorious that the guideline in USA for treating what I will call subclinical phenylketonuria is allowing many to have the problem without being treated. Disruption in tyrosine production in hepatic cells, arising from this genetic condition, also results in autism (Gillberg & Coleman, 1992, p.203). PKU babies are born with pale-colored eyes, pale skin (lack of melanin), and are born with or quickly developed blond hair (90% have blond hair, others are significantly lighter than their family). As retardation develops, there are behavior problems: irritability, hyperactivity, impulsivity, and destructive outbursts. They have a predisposition for eczema, and are recognized by their peculiar body odor. The high phenylalanine level is due to a genetic lack of phenylalanine hydroxylase, which converts phenylalanine to tyrosine. It is possible that mercury, cadmium, lead, and arsenic could depress this enzyme producing hyperphenylalanine. Subclinical PKU creates many symptoms associated with autism. Nevertheless, Great Plains Laboratory found only one case of PKU in 10,000 tests. 2) Clostridia overgrowth: When these are present in high numbers, the phenylpropionic acid or 3-hydroxytyrosine may be formed by these bacteria from phenylalanine in the intestinal tract. These are then converted to HPHPA in the mitochondria. What is the chance you have Clostridia? You might want to have an OAT and a stool test by Great Plains Laboratory to determine if you have the Clostridia problem creating an excess of dopamine, or if you have PKU creating many autistic symptoms. If formation of these phenols proves to be the cause of high dopamine, then you are drug free! If your PKU test shows a value five or higher, then treat for PKU (restrict phenylalanine). Kill off any Clostridia found.

The children treated for clostridia (usually with Flagyl™) become more sociable, speak more, improve their eye contact, and are less hyperactive and hypersensitive. It should be noted that very high doses of L. Acidophilus GG is usually equally effective as metronidazole (Flagyl™) except for systemic overgrowth. Additionally, Flagyl™ has a lot of side effects (including disabling the biochemical paths of energy generation, producing symmetrical brainstem damage), and can upset the ecological balance in the gastrointestinal tract leading to a yeast overgrowth. Dr. Shaw warns that the die-off effect can be even more severe than that of Candida. Some combination of Alka-Seltzer Gold™, bentonite clay, and charcoal should be used to minimize the die-off effect and protect from damage. Supplemental Alpha Lipoic Acid and N-acetylcysteine (NAC) detoxify this poison also.

Bolte adds, "Parents also noted that regression occurred very quickly" after treatment was discontinued. Given these findings, Bolte says, "Parents, doctors, and researchers must combine efforts to determine if some people diagnosed as autistic are actually suffering from unrecognized forms of sub-acute tetanus." This is very significant to that large block of children who do not handle phenol well (PST). The use of Organic Acid Testing (OAT) can provide a valuable tool guiding therapy so that harmful microorganisms may be eliminated before treatments with amino acids like phenylalanine that might actually cause neuropsyciatric symptoms to worsen. It is most interesting to note that phenol poisoning, as suffered by the PST child, deadens the nerves endings much as does aspirin (a phenol), thereby masking pain.

In addition, she notes, inhibitory neurons that release the neurotransmitter GABA are a preferred target for tetanus neurotoxins—and the Purkinje cells of the cerebellum, that often appear highly abnormal in autistic individuals, are inhibitory neurons that release GABA. Additionally, GABA is reported to stimulate the brain to release human growth hormone (HGH), and to stimulate the anterior pituitary function.

Glutamine, a precursor of GABA, readily passes through the blood-brain barrier and is a good supplement to take if one wants to increase brain levels of GABA, since glutamine, once it is in the brain, converts into GABA, however, excess glutamine can become excitotoxic. Due to that possibility, GABA may be the preferred supplement. GABA activity is found in glands controlled by the sympathetic nervous system, namely: the pancreas and thymus. If the pancreas is not healthy, the result can be high glutamate, low GABA levels, decreased Secretin and CCK levels, and decreased vitamin K, among other imbalances. It is estimated that 30–40% of all CNS neurons utilize GABA as their primary neurotransmitter! Glutamic acid decarboxylase (GAD), the active enzyme capable of decarboxylating glutamate to GABA, requires pyridoxal 5-phosphate (P5P) as cofactor.

Nevertheless, magnesium will not suppress the immune function, as does Dilantin: Evidence is accumulating that this anti-seizure medication may have significant immunosuppressive effects (Hadden 1986). National Toxicology Program studies in mice exposed to diphenylhydantoin demonstrated a selective effect on immune function resulting in depressed serum IgA levels and altered bone marrow function. Researchers are trying to correlate these findings with the IgA deficiency and increased sinuopulmonary infection that occurs in humans on long-term diphenylhydantoin treatment (NTP 1984).

GABA"B" receptors are metabotropic receptors that are coupled to G-proteins and thereby indirectly alter membrane ion permeability and neuronal excitability. Activation of GABA-B receptors in many brain regions results in an increase in K+ (potassium) channel conductance with a resultant hyperpolarization of the neuronal membrane. This increase in K+ conductance is often blocked by pretreatment with pertussis toxin (pertussis toxin uncouples Gi-protein from receptors), indicating that many postsynaptic GABA-B receptors are indirectly coupled to K+ channels through an intervening G-protein. There is considerable evidence that a large proportion of GABA-B receptors are coupled to G-proteins, but there is also evidence that some presynaptic GABA-B receptors may be directly linked to K+ channels. The fact that GABA-B receptors are coupled to G-proteins may also explain, in part, the reported effects of GABA-B receptor agonists on calcium (Ca2+) conductance and

secondarily neurotransmitter release.

One mother has noted increased verbal capacity after supplementing the amino acid GABA! An adult, Polly Hattemer, says, "I tried GABA. It made me regress intellectually. I could hardly recall any nouns. GABApentin was helpful." The usual effect of too much GABA is lethargy (fatigue). It should be noted; GABApentin has been associated with a worsening of hyperactivity in some cases. **The types apt to respond to GABA are the clearly identified "chromosome 15" kids, and those with high phenol levels (See PST below).** That encompasses about everybody! Methinks, maybe we should try glutamine with vitamin B_6 (P5P), or GABA, or even Bethanechol, before Pepcid™? Once again, strengthen the immune function by following the suggestions herein.

There is a growing interest in an amino acid Theanine (not Threonine) that induces a very relaxed frame. L-theanine is a natural antagonist to the structurally similar amino acid, glutamate. The similarity enables L-theanine to physically block glutamate. Although researchers aren't positive how theanine works yet, they theorize that it blocks the NMDA receptor which is the doorway that glutamate uses to affect cells. Because of the similar structure, theanine can also fit in this doorway keyhole, blocking access to glutamate. Although it can fit in the keyhole, theanine does not have the same effect on the cell as glutamate does (i.e., opens the calcium channel). Rather than causing damage, theanine acts like a shield against damage by acting as a Calcium Channel Blocker along with magnesium, manganese, and zinc. Together, they should reduce excitotoxic excitation of neurons and cells, preventing hyperexcitability and lowering blood pressure. Theanine is a precursor known to increase GABA, an important inhibitory neurotransmitter. You might like to use this instead of GABA. Theanine has also been found to have beneficial effects by raising the levels of serotonin and/or dopamine in various important brain regions, particularly the hypothalamus, hippocampus (memory center), and striatum. Theanine reduces norepinephrine and epinephrine activity, turnover, and urinary excretion. Adult dosage is reported to be 100 mg 1 to 4 times per day.

Additionally, Bukowski explained that L-theanine (found in tea) is broken down in the liver to ethylamine, a molecule that primes the response of an immune-system element called the gamma-delta T-cell. That's the T-cell that prompts the secretion of interferon, which is an important way our bodies fight infection. "We know from other studies that these gamma-delta T-cells in the blood are the first line of defense against many types of bacteria, viral, fungal, and parasitic infections. They even have some anti-tumor activity."

Some additional thoughts on the importance of supporting the thymus: Thymus glandulars taken orally with a multiple-vitamin/mineral supplement have been **proven to be modulators** of the immune system, normalizing the ratio of T-helper cells to suppresser cells whether the ratio is low as in AIDS, chronic infections, and cancer; or high as in allergies, migraine headaches, and autoimmune diseases. Thymus glandulars can be dramatically effective in children suffering chronic infections. **In autoimmune diseases, a high ratio of T-helper cells to suppresser cells causes a higher than normal number of antibodies to be produced which can damage body structures. A robust thymus will normalize this ratio and suppress "immune complexes".** Who needs to rebuild the thymus? Typically thymic hormone levels are very low in the elderly, in those prone to infection, in cancer and AIDS sufferers, and in those undergoing chronic stress. Specifically, those with multiple sclerosis (MS), diabetes, hepatitis, allergies and other autoimmune diseases, the nutrient deficient (that is, those eating quantities of white sugar and refined foods), those with high cholesterol levels, and all children who never had a mother's milk for at least four months. Did I miss anyone? **Support the thymus by using a Thymus Glandular and a multivitamin/mineral supplement!**

When the thymus gland dries up, no one treats that as a medical condition even though every doctor and nurse is taught that the thymus gland controls the immune system. It controls the immune system in two ways. First, it is a source of T (thymus)-cells or T-lymphocytes. It is these T-cells that fight the battle against viruses, bacteria, yeast, and other foreign invaders that attack the body's immune system. The thymus gland seeds the bone marrow with immature T-cells that multiply and mature. Second, the thymus gland produces a variety of hormones that

stimulate the maturation of T-cells and increase production of other hormones, such as interferon and the immune globulins. Several hormones have been isolated from the thymus, but the one receiving the most attention in medical studies right now is Alpha 1. Supplementation as recommended has been shown to increase Alpha 1 from 300% to 700% depending on the dosage—My Experience Treating Immune System Disorders with Glandular and Vitamin Supplements, by Dr. Carson G. Burgstiner, MD, PC. Zinc is specific to the improved function of the thymus. Except for nursing infants, 15 mg zinc daily is safe, however, when taking zinc and high amounts of vitamin C one must check copper status or run the risk of depleting copper and creating a copper anemia. So, to support the thymus, supplement zinc, arginine, vitamin A and pantothenic acid with a good multivitamin/mineral.

Dr. Burgsteiner speaks of Thymus extract and a good multivitamin/mineral healing his Hepatitis C. Dr. Jonathan Wright, MD, recommends a protocol developed by Dr. Burton Berkson, MD, that emphasizes Lipoic acid (600 mg), Silymarin (Milk Thistle, 900 mg), and selenium (400 mcg), adult amounts. Selenium, according to Dr. Wright, slows the replication of the virus. Lipoic Acid significantly alters thiol [a compound that contains the functional group composed of a sulfur-hydrogen bond (-SH)]. Being the sulfur analogue of an alcohol group –OH, this functional group is referred to either as a *thiol group* or a *sulfhydryl group*. More traditionally, thiols are often referred to as **mercaptans**. Lipoic Acid significantly alters thiol metabolism, excretion, and distribution - significantly increasing plasma cysteine levels and bile excretion of glutathione resulting in depletion of the liver stores of glutathione – actually decreasing bile output according to one source. These side effects contradict the proposal for a sustained megadosing of LA. Ambrotose®, by Mannatech, Inc. has been successful in restoring liver function and energy output. Be mindful of my concerns, mentioned elsewhere in this paper, about Milk Thistle and high amounts of Lipoic Acid.

Candida

Yeasts are single-celled forms that reproduce by budding, whereas molds form multicellular hyphae (filament tails). Dimorphic fungi grow as yeasts or spherules in vivo, as well as in vitro at 37C, but as molds at 25C. Dimorphism is regulated by factors such as temperature, CO_2 concentration, pH, and the levels of cysteine or other sulfhydryl-containing compounds. Regardless of their shape or size, fungi are all heterotrophic and digest their food externally by releasing hydrolytic enzymes into their immediate surroundings (absorptive nutrition). Fungi can use a number of different carbon sources to meet their carbon needs for the synthesis of carbohydrates, lipids, nucleic acids, and proteins. Oxidation of sugars, alcohols, proteins, lipids, and polysaccharides provides them with a source of energy. Differences in their ability to utilize different carbon sources, such as simple sugars, sugar acids, and sugar alcohols, are used, along with morphology, to differentiate the various yeasts. Fungi require a source of nitrogen for synthesis of amino acids for proteins, purines and pyrimidines for nucleic acids, glucosamine for chitin, and various vitamins. Depending on the fungus, nitrogen may be obtained in the form of nitrate, nitrite, ammonium, or organic nitrogen; no fungus can fix nitrogen. Most fungi use nitrate, which is reduced first to nitrite (with the aid of nitrate reductase) and then to ammonia.

Generally, either low temperature or pH favors the development of budding yeast. Our human ideal basal temperature of 98.6 degrees F. has a purpose. It is just a tad higher than favored by strep and the yeast families, namely, Candida species. This is why it is so vital to support the thyroid. High copper is also one indicator of Candida for it suppresses thyroid function. Other substances such as biotin, cysteine, serum transferrin, and zinc are said to stimulate dimorphism (changing forms from yeast to fungus) in this yeast. **Experiments designed to test the biotin-yeast hypothesis have demonstrated that the concentration of simple sugars in the culture medium is the only reliable variable to directly determine the form Candida cells will take.** Below a certain sugar concentration, the yeast remain single-celled, and stay in the gut. When sugar concentration rises above a

certain threshold, the organism becomes fungal, and tends to enter the blood and thrive in moist warm areas including the brain. (Importance of some factors on the dimorphism of Candida albicans. Vidotto V; Picerno G; Caramello S; Paniate G; Mycopathologia, 1988 Dec, 104:3, 129-35).

Sugar also kills the bacteria that control Candida. Further, a serving of cake and ice cream or a large bottle of sugary, soft drink will reduce the immune function by 50% for up to five hours—make that all day for those who indulge their sweet tooth several times a day. Remember, sugar promotes Candida, with its multiple problems (yeast grows 200 times faster), and sugar can actually make the child drunk and giggly! In fact, 50 years ago, Dr. Sandler proved that sugar causes polio and other viral infections due to this loss of immune function. (Diet Prevents Polio, by Benjamin P. Sandler, M.D., and published in 1951 by The Lee Foundation for Nutritional Research, Milwaukee, WI). Is it any wonder that our kids harbor several chronic viral infections? Our goal is to strengthen the body and weaken the infectious agent. Eliminating simple sugars and starches with a high glycemic rating does this most effectively. Sugar and starch in excess are deadly poison to these beautiful children. You wouldn't give them arsenic would you?

Yeast species like Candida are known to induce immune changes, and to produce neurotoxins, and most autistic children have yeast problems. Yeast binds the B-vitamins, and in absence of Bifidus flora, creates subclinical pellagra and beriberi. This lack of B-vitamins, particularly vitamin B_6, will interfere with the production of serotonin, melatonin, and other important neurotransmitters that control behavior—so normal brain chemistry in the presence of yeast overgrowth is unlikely.

Just the elimination of Candida has been found to cure or alleviate a third of all eczema, irritable bowel, asthma, joint pains, and migraine. A multitude of symptoms such as "heartburn" and reflux; diarrhea, or alternating diarrhea and constipation; year-round nasal congestion; pounding heart; palpitations; paroxysmal atrial tachycardia; mitral valve prolapse; edema; cold, sweaty hands and feet; dysmenorrhea (painful menstruation); PMS; endometriosis; vaginitis; muscle soreness, tenderness, aching, stiffness, weakness, and cramping (probably due to decreased blood flow); easy fatigability; dry skin; acne; anorexia; a red circle of rash around the anus; and virtually all psoriasis often disappear when an anti-yeast regimen is instituted. Mentally, there may be irritability, a tendency to anger, fears, panic attacks, an impending sense of doom, worry, depression, and loss of interest in enjoyable activities. There may be trouble concentrating and remembering, indecisiveness, and being fuzzy or dull-headed. There may be extreme hunger or sugar cravings that may be chronic or periodic. Hypoglycemia is common, with its weakness, fatigue, shaking, anxiety, headache, and sleepiness. Another symptom of Candida: internal bloating of the lower abdomen that is aggravated by beer, bread, pasta, sweets, or juices. Another good clue (90% probability) is when one reacts adversely to taking vitamins orally. To this, add a high sensitivity to yeast and fungi or products containing them, like yeast, yeast breads, beer, mushrooms, cheese, mustard, vinegar, and mold spores that will cause discomfort when in bathrooms, basements, areas with wet leaves, summer beach houses, etc.

Of great seriousness is the subgroup with severe intolerance to virtually all chemicals including food, drugs, and inhaled chemicals. One third of these suffering Multiple Chemical Sensitivities have been found to have low T-cells (a class of white cells in which are the helper and suppressor cells). Any and all the above symptoms, if present, may vary in degree and intensity. In addition to diagnosis by the above symptoms, on arising, obtain a glass of water and spit a mouthful of spit (quite a lot) in the water. Observe it for a while. If the sputum begins to grow "legs" or if it settles to the bottom, you likely have Candida. Do not take lightly indications of Candid overgrowth, but set up an effective anti-Candida program as suggested elsewhere in this paper. (Note: Good Housekeeping and Heloise have determined that regular vinegar kills molds at 90% and bacteria at 99.9% efficiency.)

Persistent candidiasis/dysbiosis associated with Hg burden can compromise the absorption of aromatic amino acids such as phenylalanine, tyrosine, and tryptophan, which are precursors to dopamine, norepinephrine, and serotonin, respectively (Quig, unpublished observations). Additionally, tyrosine manufacture in the body can be interfered with

and nearly shut down by exposure to certain herbicides, which are commonly used in agriculture, and often abused in lawn care. Exposure to any of these, or any other halogenated compounds, can really muck up our thyroid highways, and even give false-normal lab tests. Dioxin and thyroxine are chemical cousins, and dioxin can plug itself into receptor sites meant for the thyroid hormone and block the real thing, or worse yet, turn things off or to yet another function. Low tyrosine levels will mean low epinephrine neurotransmitters and low T4 hormone levels (hypothyroidism).

There are 3-types of Candida infection: Superficial (most common) - characterized by inflammation of tissue linings, i.e., skin, GI tract, pharynx, upper and lower respiratory tract; Locally invasive—i.e., pneumonia, cystitis, and esophagitis, the most common being ulcerations of the intestinal, respiratory or genito-urinary tract; and Systemic—an invasive infection, characterized by lesions of the heart, kidneys, liver, spleen, lung, brain, and other organs.

We have to hypothesize that Candida, in the moment it is attacked by the immunological system of the host or by a conventional antimycotic treatment, does not react in the usual, predicted way, but defends itself by transforming itself into ever-smaller and non-differentiated elements that maintain their fecundity intact to the point of hiding their presence both to the host organism and to possible diagnostic investigations. The Candida's behavior may be considered to be almost elastic: when favorable conditions exist, it thrives on an epithelium; as soon as the tissue reaction is engaged, it massively transforms itself into a form that is less productive but impervious to attack—the spore.

"Treatment of the latter (Candida) with conventional synthetic antifungal agents often causes impairment of liver detoxification functions, and a **decrease in synthesis of phospho-sulfotransferase, an enzyme necessary to cleave food proteins, e.g., casein, into smaller easily absorbable peptides**."—Dr. Hugh Fudenberg, MD. Thus, fungicides exacerbate the opioid problem, and increase the potential for toxicity in PST kids. Further, the first order of implementation is restoration of digestive function with betaine HCl, pancreatin, and bile acids, as needed, to replace the normal output of stomach acid, pancreatic fluid, and bile. There is growing evidence of the efficacy of re-inoculation with favorable species of Lactobacilli. Feeding of non-absorbed fermentable carbohydrate like fructo-oligosaccharides (FOS) and inulin stimulates growth of the genera Bifidobacteria and Lactobacillus. These forms of carbohydrate are found in onion, garlic, chicory, Jerusalem artichoke, and wheat. Long-chain Inulin can be selected to feed only the good bacteria while starving out the bad ones. Inulin, being non-digestible, reaches the colon where healthy Bifidobacteria and Lactobacilli use it as food. This lowers the pH level in the colon, creating an unfavorable environment for unhealthy bacteria such as E.Coli, Salmonella, Staphylococcus, and Clostridium. Insoluble fiber lowers yeast, Clostridia, Staphylococcus, and Proteus in stool cultures and lowers output of ammonia and phenols. Additionally, FOS prevents germs and parasites from attaching to the digestive tract.

Zinc deficiencies have been frequently noted in women suffering from Candidiasis (Michaud E & Feinstein A., Prevention Magazine's 30-day immune power program. Rodale Press, Emmaus, Pa. 1989. p144).

Another important consideration is Metabolic Typing based on the understanding that genetic inheritance defines metabolic individuality, and metabolic individuality defines nutritional requirements. This is why what works for one person, doesn't work for another with the same problem. There will never be one diet or nutritional approach for a given problem that works for all people. The essence of this article on Candida overgrowth is the understanding that Candida is not the problem. The problem is a compromised immune system that fails to control the Candida. This is the reason that so many people fail to rid themselves of Candida overgrowth. They limit their approach to trying to kill off the Candida, but when the protocol is stopped, the Candida overgrowth problem comes right back again, or it is replaced by equally damaging overgrowth of

Clostridia or Klebsiella. The only real, final solution is to restore efficiency to the immune system, a task that can speeded by addressing individual nutritional requirements through defining one's Metabolic Type.

Metabolic Typing provides a scientific means of identifying individual nutritional requirements based on the determination of the individual's "metabolic type". Once the metabolic type is determined, a diet and supplementation program can be recommended to meet individual nutritional requirements, thus providing an ideal means of restoring proper biochemical balance.

There are several things to consider in a state of candidiasis: a) The inflammatory response must be treated; b) Lactobacillus count needs to be increased in order to keep Candida in check; c) The immune system needs strengthening, which decreases adherence ability; d) Antibiotics, steroids, and other immune-suppressing drugs, along with simple carbohydrate foods (eat foods with a low Glycemic Index Rating) should be avoided; e) Digestive secretions should be increased; f) Nutrient deficiencies should be reversed; g) Liver function should be optimized to increase ability to filter toxins; h) Mercury and other heavy metals must be removed.

Caprylic Acid is a naturally occurring fatty acid. It is readily absorbed in the intestines. Standard dosage is 1,000 to 2,000 mgs with meals, and it is totally lethal to Candida. It is available over the counter and appears to be equal to Nystatin™ in effectiveness. However, it is not known to produce the sensitivity side-effects of the Nystatin™ drugs. Of the caprylic acid products on the market, CAPRYSTATIN, KAPRICIDIN-A and ORITHRUSH, when used together, appear to be the most effective by virtue of their capacity to address the entire digestive tract. These three products are available from Ultra Life / Synergistics, P.O. Box 440, Carlyle, IL 62231, (800) 654-8191 or (618) 594-7711, or Email: info@ullife.com.

A most interesting version of Caprylic Acid is Caprol™ (www.wholeapproach.com), containing liquid caprylic acid (3600 mg per oz) and oleic acids. It is a broad-spectrum, anti-fungal agent against Candida albicans and other fungi. The Japanese Niigata University School of Medicine stated, "The fungicidal effect of caprylic acid on Candida albicans was exceedingly powerful...Caprylic acid exhibits the most remarkable fungistatic and fungicidal properties of all normal saturated fatty acids with even numbered carbon atoms studied." Two decades later, a Canadian, Andrew Gutauskas, B.S. Pharmacy, discovered that the benefits of caprylic acid are further enhanced when its transit through the intestinal tract is slowed. Caprylic acid must exert its fungicidal effect in the intestinal tract or not at all. The longer it can react the better.

Unfortunately, caprylic acid is a substance that is normally quite rapidly absorbed by the intestinal tract and routed directly to the liver where it is quickly metabolized. For this reason, the quite powerful caprylic acid has little anti-Candida effect, both intestinally and systemically. This fact, however, is significantly altered if its absorption can be slowed, allowing it to remain in the intestine for a longer period of time in order to complete its fungicidal mission. In this program, caprylic acid acquires its needed sustained-release properties from gel, formed by the mixture of Caprol™, colon cleansers, and water. This thick gel traps the caprylic acid and slows its transit through the colon. In this gelled state, caprylic acid does not escape into the liver and no adverse reactions to this gelled form of caprylic acid have been reported, even among individuals who previously reacted to other caprylic acid products.

Oleic acid, the second acid ingredient in Caprol™, is found naturally in olive oil. It, too, has significant CRC battling effects. Candida albicans can convert, or mutate, into a disruptive mycelial form with root-like tentacles that allow the new harmful fungi to penetrate the mucosa (or lining) of the intestinal wall and enter the blood stream. From there, the fungi easily gain access to other parts of the body. Oleic acid follows the mycelial, root-like tentacles of Candida albicans to the base of the root and kills it there. Oleic acid also hinders any additional conversion of Candida albicans yeast into its mycelial fungal form. This program is a bit expensive, but after a month or two, one could change to a

less costly method of containing the Candida, like Yeast Avenger™ and probiotics.

The reason for sure failure of treatment is the misunderstanding of how important it is to remove these sugars and starches from the diet. It is important to remember that sugars are sugars, whether from natural sources or from processed cane sugar (sucrose). Antifungal drugs will not be successful without removing sugars from the diet. This includes all sweetened drinks and sodas, fruits and fruit drinks, corn syrups, and other high sugar (high glycemic) containing products. Studies have emphasized the fact that Candida ferments and rapidly proliferates in the presence of simple sugars. Not only is this the case, but research has shown that sugars dramatically increase the ability of Candida to adhere to epithelial mucosa cells and may be one of the most important factor in the chronic states of gastrointestinal Candidiasis (Saltarelli). Further, sugar kills the controlling bacteria Lactobacillus Acidophilus and suppresses the immune function.

Complex carbohydrates/polysaccharides (starches) and even disaccharides (sucrose - table sugar, (milk sugar), sometimes fructose (fruit sugar), et al, can pass far down the gastrointestinal tract before they are broken down into glucose molecules and absorbed. Ninety-five percent of African-Americans cannot tolerate lactose, and many others also lack the enzyme (lactase) needed to break down lactose into glucose and galactose. This sugar is then broken down in the intestines by bacteria, and the results can be gas, bloating, and intestinal distress, or by taking the enzyme lactase, it can be a source of B-vitamins and other nutrients, if proper bacteria are available. Lactose doubles the amount of calcium available from a bonemeal supplement.

Candida supposedly resides and proliferates far down the gastrointestinal tract, but when lacking HCl production in the stomach, they will move up into the small intestine. Complex sugars and polysaccharides can therefore be made available to Candida throughout the gastrointestinal tract (Chan). High protein diets and elimination of sugars and concentrated starch will help avoid this. **Small amounts of lactose from fermented sources may actually be helpful for it establishes the slightly acid state preferred by the Acidophilus but not by the " Bad Guys".** In dysbiosis, it is vital that there be a source of lactic acid required by the "Good Guys" of the gut, so when casein free, if you cannot tolerate goat yogurt, you must supplement Sacromydes boulardii that can make lactic acid from any carbohydrate.

Thus, in regard to questions about Ambrotose®, Candida cannot use long-chain carbohydrates directly, and the sugars of Ambrotose® are not broken down into glucose. Studies with Ambrotose® showed phagocytosis (ingestion) of Candida by macrophages was enhanced and the kill rate was increased from approximately 6% to 95%—Stanley S. and Doris L. Lefkowitz, Ph.D.s., Proceedings of Fisher Institute for Medical Research, Vol. 1, No. 2, February 1999. Additionally, concerning glucosamine and N-acetylglucosamine (NAG—one of the conditionally essential sugars found in Ambrotose®): numerous studies have shown that glucosamine, a derivative of chitin from fungal cells, has the ability to prevent the binding of Candida to epithelial mucosa cells (Saltarelli). It has also been suggested to directly aid in restoration of the mucosa.

Ambrotose AO™ in vegetable capsules contain **twice** as much Ambrotose Complex™ (no fillers, thus no rice content) Phyt•Aloe® (Phytonutrients from mature, vine-ripened vegetables, also sold separately), and a synergistic blend of antioxidants [Mtech AO Blend™ of Mixed tocopherols, Quercetin, Resveratrol (from grape skins), green tea polyphenols, and whole-food vitamin C and flavons (from Australian Bush Plum grown by Aborigines). The plum has 50 times the vitamin C of citrus fruits. The whole plum is used, thus it has all its valued nutrients including the entire vitamin C molecule with accompanying flavons, not just ascorbic acid]. Ambrotose AO™ is 100% whole food! The best antioxidant supplement of 91 tested provided approximately 5375 ORACo activity units from labeled dose (most supplied far less, partly due to oxidation in storage), but the Mtech AO Blend™ found in 2 capsules of Ambrotose AO™ guarantees 17,250 units! Normally, one will not need additional vitamins

E and C, nor will Pycnogenol™, grapeseed extract, or any other antioxidant be needed other than minerals, such as selenium. This should cut costs significantly. Additionally, all this added value (the Antioxidant blend with twice the Ambrotose Complex™ plus 1/6th capsule of Phyt•Aloe®) for only $7.80 more than for a bottle of Ambrotose®! The 240-capsule bottles are priced so there is no increase in monthly cost!

For comparison, tests show that adding five additional servings of fruits and vegetables, for a total of 10 servings providing double the potential antioxidant power, increased serum antioxidant capacity an average of only 13%, but the Mtech AO Blend™ found in two capsules of Ambrotose AO™ increased serum antioxidant levels 37%! In the referenced test (McBride 1999b), James Joseph also found that rats fed a specific combination of high ORAC substances exhibited brain cells that were twice as responsive as those of unsupplemented rats (based on a series of neurological tests), and that in aging rodents, the compound enhanced memory-associated neuronal signaling and general brain activity. For the seriously ill, I recommend that an additional amount of Advanced Ambrotose™ Bulk Powder be taken with two or more capsules of Ambrotose AO™.

Another powerful anti-fungal is iodine (in higher doses, it seems to be anti-viral also), but it is much weaker and milder than chloride as an anti-fungal. Its reduction below the RDAs may well be a cause of a higher rate of fungal infections like schizophrenia, asthma, IBD, arthritis, lupus, etc. Modern day dietary reduction of table salt with iodine is a negative factor. Do the iodine test, and restore iodine to normal level. To restore needed chloride without the sodium of table salt, consider magnesium chloride or potassium chloride. Supplement HCl with each meal to improve digestion and immune function, and to drive Candida back into the area normal to them.

Pasteur and others found that lethal strains of bacteria could be rendered harmless if other benign bacteria were given simultaneously. High intake of Lactobacillus Acidophilus GG [20 billion count, as supplied by Culturelle™ (Klaire Laboratories), available from VRP at 775-884-1300 (and from Kirkman) but said to contain 15 PPM casein, or Pro-Culture Gold™ (Kirkman Labs), guaranteed casein free], or Theralac™ [www.theralac.com, (800) 926-2961] is sometimes an effective way to replace these, and can be one means of controlling the Clostridia family of bacteria (as well as the Candida), some of which are unaffected by broad spectrum antibiotics! These good bacteria work primarily by exclusion and by environmental changes in the gut creating a favorable lactic-acid, living space for themselves. Other bacteria and Candida prefer alkaline. Unfortunately, the acidophilus usually convert lactose from milk, and without milk they cannot do their thing. To reestablish these, one must provide some source of lactic acid. Many lactobacillus species do not ferment lactose—Lactobacillus GG primarily ferments fructose; so, provide Fructose Oligosaccharides (FOS), and the Lactobacillus GG will use it to make lactic acid. DAN! doctors also recommend S. boulardii, a yeast that excludes Candida and ferments any carbohydrate to produce lactic acid, and reduces some of the other gut organisms that produce glucuronidase, an enzyme that blocks Phase II detoxification.

Another way to encourage recolonization found very effective by Dr. David Williams (Alternatives Newsletter) is the use of Lactic Acid Yeast wafers (Standard Process Laboratories, available from your health practitioner) containing a blend of ingredients including a mycelium type of yeast (Saccharomyces cerevisiae) that converts all forms of carbohydrate into lactic acid. According to Dr. Williams, these wafers are effective in controlling diarrhea. I am informed that it includes corn. We have seen elsewhere that some have an excess of lactic acid in the blood, so this should be used in that case with consent of your health practitioner. Further, it includes active Baker's Yeast, and some believe that is a negative when fighting Candida. According to Dr. Kurt W. Donsbach, who has successfully treated Candida at his clinic for many years, eating yeast is not a problem. It may well be a positive way to restore balance when taken with a good probiotic, but again, consult with your practitioner.

The majority of celiac, IBD, Ulcerative Colitis, Crohn's sufferers have unusually high anti-Saccharomyces Cervisiae antibodies. In essence, that means they are very allergic to baker's/brewer's yeast. (The same yeast that

is used to produce HepB antibodies for the vaccine.) They also have high antibodies to transglutaminases. These are common fungal enzymes produced by many species, including Candida, Saccharomyces, and Aspergillus.

Soil-based organisms (SBO) found in Nature's Biotics (800-713-3888) have given tremendous benefits including a supply of GLA, and activation of nearly all the immune defense systems, specifically the activation of three antibodies: IgM, IgG, and IgA that are highly effective against fungi, harmful viruses, and bacterial pathogens. It is said to stimulate not less than 16 of the 20 types of alpha-interferon, and the production of the powerful systemic antioxidant enzyme SOD. The enzymatic activity of SOD increases the efficiency of energy production within the cells, allowing them to nourish and repair themselves at a more efficient and effective rate. There are very few food sources for SOD, so this is a valuable attribute of SBO, Spirulina, Ambrotose AO, and phytosterols (beta-sitosterols) as found in Mannatech's PLUS and SPORT (Yefim Sosonkin MD, and Professor Isaac Sosonkin, Ph.D. have this to say, "Sitosterols raise superoxide dismutase (SOD) levels, which are basic to lifespan... The SOD is involved in the first step of the process against free-radical activity…." Beta-sitosterol is a highly effective anti-inflammatory.

Taking probiotics on an empty stomach, with a little bicarbonate of soda water (1/4 teaspoon in 4 oz of water), will help them make the journey safely. The Bifido Bifidus should also be supplemented when concerned with Candida. The Theralac™ mentioned above and Mannatech's GI-Pro (12 billion count) provides both Acidophilus and Bifidus. Use of a digestive enzyme can greatly improve overall results. Next time Flagyl™ is suggested, use L. Acidophilus, SBO, and enzymes, and skip the fluoride and the side effects (nausea, headaches, disorientation, and a metallic taste in the mouth). Fluorides are cumulative toxins. Approximately one-half remains in the body! One study of fluoride in drugs found that fluorinated steroid was more detrimental to IQ than the nonfluorinated steroid; in particular, reading comprehension; arithmetic calculation, and short-term working memory deficits were greater. New research from the Harvard Medical School has discovered that fluoride accumulates in brain tissue where it can damage the central nervous system. Flagyl™ will likely exchange a Clostridium overgrowth for a Candida overgrowth unless you take preventive measures.

I realize that such drugs are occasionally necessary, but I am concerned by a reported 85% increase in drugs for children in the last five years. There has been a six-fold increase in drugs like Prevacid™, Nexium™, and Prilosec™ for upset stomach. These largely stop digestion! Only 30% of drugs being prescribed for children have been tested and approved for children! Don't turn to drugs first. They should be the last resort.

It is interesting to note recent research that shows that babies normally get their first gulp of Mother's bacteria as they travel down the birth canal. Normally, this has meant a dose of Lactobacillus and Bifido bacteria that stake out the first claim to the gut environment, and the baby's developing the immune system accepts these early invaders. Modern medicine is altering this. For babies born by cesarean section, the first gut inhabitants are common hospital bacteria such as Streptococci and Clostridia, and this may make it very hard to get them displaced later. Additionally, Mothers with autoimmune diseases may themselves not have the "right" balance of bacteria in their gut, birth canals, and milk, and this may affect their children adversely. According to Dr. Hulda Clark, Clostridium is the tumor-making bacteria that supply the DNA, the toxic amines, and also isopropyl alcohol, which will eventually contribute to malignancy. The net results of Strep infection are depletion of vitamin K, decreased glutathione, decreased sulfhydryl protein levels, overstimulation of the immune system, increased TNF alpha (that triggers Tourette's syndrome, facial tics, OCD, and Schizophrenia), potential autoimmune responses, and inflammatory reactions against the GAGs in the GI tract.

A Second Scenario

The stomach does not produce enough hydrochloric acid (HCl) and pepsin to breakdown the proteins in the stomach. Additionally, reduced HCl cannot activate the enzyme protease that is necessary to complete protein digestion. Other stomach hormones are reduced or lacking, and harmful bacteria are allowed to enter the gut with the food. The chyme leaving the stomach is not acid enough to trigger the Secretin release. Digestion is greatly hindered for want of pancreatic enzymes (including peptidase), and the person so afflicted lacks the nutrients of protein, vitamins A, C, E, B-complex, and most of the minerals, all of which depend on HCl to be digested and assimilated effectively. One symptom may be Vitiligo. The lack of pancreatic enzymes, including peptidase, leads to peptides of casein and gluten passing into the blood stream and to the brain, creating many of the autistic symptoms including a 30% incidence of epilepsy. A small help is to choose supplements in the citrate, gluconate, orotate, or aspartate forms that will be utilized even in absence of HCl. Magnesium citrate, the magnesium salt of citric acid, is somewhat laxative. Additionally, in most cases, citric acid in our country is made from corn, and such citric acid contains processed, free glutamic acid (MSG).

Additionally, a certain amount of aspartate is essential. It breaks down the ammonia that is sometimes a problem with autistic children. It is also vital to the synthesis of glycoprotein that is essential to cell-to-cell communication and proper immune function. It enhances immunoglobulin production and antibody formation. Being one of two main excitatory amino acids, an excess is found in Epilepsy and ALS (Lou Gehrig's disease). **A deficiency is seen in calcium and magnesium shortages.** A low level of aspartate should lead to a test of calcium and magnesium status. In protein, aspartic acid exists mainly in the form of its amide, Asparagine. Among the biochemicals that are synthesized from aspartic acid are asparagine, arginine, methionine, threonine, isoleucine, and several nucleotides. Aspartic acid performs an important role in the urea cycle. Glutamate and aspartate are also very important in the tricarboxylic acid cycle (Krebs cycle), from which most of the energy is produced by metabolism. Their reaction in this pathway is by what is called the malate-aspartate shuttle for the transportation of energy into the mitochondria. One of its metabolites is a precursor of the pyrimidines. Clinically, aspartic acid may be used to treat fatigue or depression. Its effect on the thymus gland lets it be used as a mild immunostimulant. It should be noted that both glutamate and aspartate are potential excitotoxins.

Autistic children are typically lacking in lysine. This would tend to cause them to be deficient in glutathione and carnitine, an essential amino acid. That is, the body cannot manufacture lysine. It must be supplied in adequate amounts in the foods. Some is likely used as lysine, but most is rapidly converted to carnitine. Now, here is a real clue, Carnitine is the "fireman" that pumps fats into the mitochondrial boiler to form energy. If one is short of carnitine, and this can be tested for, there will likely be excess cholesterol and triglycerides in the blood for they are not being used for energy. A lack of lysine will reduce the ability to concentrate, and it will produce chronic tiredness, fatigue, nausea, dizziness, and anemia. Antibody formation will usually be reduced. Insufficient intake leads to poor appetite, decrease in body weight, anemia, and enzyme disorders. It is used therapeutically to enhance growth of children, and to assist gastric function and appetite. It is now realized that lysine is one of the most important factors in preventing cancer cells from spreading in the body. There was a 7-fold range of need observed in only 55 people! This is given to be from 400 mg to 2800 mg a day for adults. The need is cited as 12 mg/kg of body weight. First class protein supplies 50 mg per gram. For an adult to get 2000 mg a day, he would need to eat 40 grams of protein. Excess will tend to excessive ammonia buildup.

Some do not convert lysine to carnitine. Dr. Leon Chaitow says that is due to malnutrition, most likely a lack of vitamins B_6, C, and niacin. These are needed to make the conversion. It is of interest to note that the body can make carnitine from methionine, tryptophan, and threonine. Bland mentions genetic inability to convert lysine and methionine to carnitine.

Should this prove true, I would suggest a supplement of carnitine would be in order to provide necessary energy and lower cholesterol and triglycerides. The major foods that are high in lysine, low in arginine are fish, chicken, beef, lamb, milk, cheese, beans, Brewer's yeast, and mung bean sprouts. Most fruits and vegetables are higher in lysine too. Limit high arginine, low lysine foods: gelatin, chocolate, carob, coconut, oats, whole-wheat and white flour, peanuts, soybeans, peas, and wheat germ.

So, in summary, to increase carnitine, if it is low, feed the high-lysine foods and supplement lysine modestly and supplement vitamins C, B_6, and niacin. If this isn't successful, then supplement carnitine to raise needed energy levels and reduce blood fats, and then press your doctor for an answer as to why lysine is not converting to carnitine.

The presentation of autism is sometimes linked to ornithine transcarbamylase (OTC) deficiency, the most common urea cycle defect. Damage to this enzyme can occur with exposure to mercury. A low level of OTC leads to states of hyperammonemia, seizures, and stroke, critical issues in states of epilepsy and autism. The often spacy, confused behavior, "brain fog", that is frequently observed in these disorders may be attributed to states of hyperammonemia as ammonia reaches the brain. This behavior may be attenuated with bicarbonate of soda, Ca/Mg butyrate, or phenyl butyrate in doses spread throughout the day.

Children with mild or moderate urea cycle enzyme deficiencies may not show symptoms until early childhood, or the symptoms may go unheeded. This childhood onset can be seen in both boys and girls. Symptoms include hyperactive behavior, sometimes accompanied by screaming and self-injurious behavior, agitation or irritability, and refusal to eat meat or other high-protein foods. Later symptoms include vomiting, lethargy, delirium, seizures, and finally, if the condition is undiagnosed and untreated, coma and death. Childhood episodes of high ammonia (hyperammonemia) may be brought on by viral illnesses, including chickenpox, or even exhaustion. There is likely to be an ammonia smell to the urine. Protease digestive enzymes may relieve the burden. The condition is often misdiagnosed as Reye's syndrome.

The lack of HCl causes the environment of the gut to be greatly changed, inviting overgrowth of Candida yeast that produces a multitude of adverse symptoms. One of the characteristics of some severe fungal infections is that the patient never gets a cold. We hear, "He is the healthiest person in the family." We know fungi provide protection from bacterial infections; however, when yeast is killed off without reestablishing proper flora, bacterial infestations are quick to take over. Bacterial overgrowth, such as citrobacter fruendii (that destroys the mucus lining of the gut), is also a result of this lack of HCl. Another nearly impossible to kill bacterium is Klebsiella Pneumoniae. Here is one successful way to beat them. Dr. Amy Holmes, Baton Rouge, Louisiana says, "I finally was able to completely rid Mikey of the ever-present Klebsiella Pneumoniae. It had been 4-plus in each and every stool culture for at least the last 3 years, despite throwing everything reasonable, both antibiotics and natural substances, at it. I finally realized that nothing was able to get at this bug because of its heavy LPS coat, so I 'uncoated' it with bismuth subsalicylate, and killed it with PO Neomycin. I used Neomycin 250 mg/bismuth subsalicylate 50 mg capsules—a compounding pharmacist must make these. It can be made as an oral suspension too. The dose is 1 capsule three times a day for 10 days. We are celebrating its defeat. Mike went through a period of apparent die-off for about a week, but has now gotten over that. His progress has been astounding lately." See my Electronic Book "Self-help to Good Health", Chapter "Candidiasis".

Great Smokies Diagnostic Labs does a stool test to determine what bacteria are present, and the natural substance to which they are susceptible. These are the substances that may overcome these "bugs": Lauricidin®, Berberine, amphotericin B, Oil of Oregano, Plant Tannins, Uva-Ursi, and Tanalbit (3 caps per meal). [Intensive Nutrition Products, 1-510-632-2370, Oil of Oregano (2 drops AM meal/2 drops PM meal in juice, or 2 drops under the tongue. Capsules are available that can be used simultaneously, 800-769-7873]. Nystatin™ is a polyene antibiotic produced by the bacteria Streptomyces noursei. When given by mouth, it is not absorbed to any significant extent

and remains in the intestine. This keeps the drug where it is needed and minimizes any systemic effects. The usual dose schedule is one to two million units a day, either as a single dose or in divided doses. Doses of up to 10 million units a day, or more, may be needed initially to eliminate yeast. Maintenance doses of one or two million units a day for in excess of a year are common. Please ensure that it is not formulated in a sugar base that feeds the Candida! Side effects are limited to nausea and gastrointestinal upset, usually only seen at doses over 5 million units daily, however, die-off reactions may cause regression, nausea, rash, vomiting, or diarrhea that may last for a week to ten days. Since it is not absorbed, the yellow color of the drug will modify the stool color, which may alarm some parents if they are not forewarned. Nystatin™ and other treatments will work best if an anti-yeast diet is followed. Principally, this means to eliminate all fermented foods and anything with vinegar or barley malt in them. Eliminate all simple sugars, high Glycemic Indexed foods, and fruit juices.

Amphotericin B™ is more effective and less allergenic than Oregano, and all aromatic oils place an extra demand on Phase I liver enzymes that is undesirable for most autistic. Nystatin™ and Amphotericin B™ seem to work well in combination.. For most children Nystatin™ is ineffective, and Candida, like bacteria with antibiotics, has become resistant to Nystatin™ (and other antifungals). Oral Amphotericin B™ is said to be safe, and about four times as effective as Nystatin™. Like Nystatin™, it is said to stay in the gut. For systemic invasions, injections are necessary. Injections, however, come with a long list of possible side effects, including aplastic anemia that would indicate it is preferable only to use it orally. Be aware, however, that it depletes potassium and magnesium, both vital minerals already in short supply. It may be best to use the natural things first. It is available from Wellness Health and Pharmaceuticals (800-227-2627) and College Pharmacy (800-855-9538).

Some use the herb Una Del Gato (Cat's Claw) to fight Candida and other parasites. This is dangerous for long term use, for it is toxic to the liver and to peripheral mononuclear blood cells. It also inhibits cytochrome p450 (Phase I) liver enzymes causing unnatural and dangerous retention of the toxins of the Candida die-off! Additionally, long-term use would also cause a buildup to possibly poisonous levels of several classes of drugs and body toxins, and of substances like fatty acids, body alcohols, prostaglandins, steroids, estrogens, retinoic acid, and glycine. It also destroys the gut lining creating a condition favorable to "leaky gut" syndrome. Should you choose to use it, buy only the "TOA free" product that is being effective against Lyme disease. Some drugs also inhibit Phase I. For example, certain H2-blockers (cimetidine), macrolide antibiotics, and SSRIs can bind to the reactive site of one or more of the Phase I detoxification enzymes and competitively inhibit their activity.

Speaking of Lyme Disease, Tami Duncan (www.lymeinducedautism.com) says, "We are not saying that Lyme Disease is the exact cause of autism for every child. What we are saying is that Lyme Disease could be an inciting factor that is suppressing the child's immune system, which would make them more susceptible to heavy metal toxicity and environmental factors. There is a large subset of autistic children in which this is happening. However, most children with Lyme Induced Autism cannot begin to heal until this infection is under control."

Currently, several doctors have stepped forward talking about this. Dr. Warren Levin, of Vienna, VA, recently appeared on the on-line radio show, www.autismone.com. He stated that of the 10 children with autism he tested for Lyme Disease, 100% of them came back positive for Lyme Disease. If your child is not responding as well as you would have it, find a Lyme Specialist and have the test.

Treatment is typically an ineffective 30 days of antibiotic (effective only when very recently infected). Once entrenched, it will take a year or several years of antibiotic treatment. Antibiotics have so many deleterious effects on autistic children, as past research has shown, that, if other non-antibiotic treatment protocols, such as oral salts, dioxychlor, phosphatidylcholine (lecithin), Acyl-L-Carnitine, Vitamins B_5 (or pantothene), B_6, and C (buffered) in high doses, Lysine, S-Adenosylmethionine (SAMe), Cat's Claw (TAO-free), and Artemesia hold hope for eradication of Lyme Disease, then these should be tried before antibiotics. In any case, be prepared for heavy die-off, and cut back if symptoms are intolerable.

Lyme Spirochete toxins diminish the release and availability of acetylcholine. Dietary supplements that help the body produce or release acetylcholine are listed above. Taurine, DMAE and CDP-choline also help to increase acetylcholine. The production of acetylcholine is also dependent on carbon dioxide, which will be in better supply when there is higher cellular energy. - Bradford R, Allen H "Biochemistry of Lyme Disease: Borrelia burgdorferi Spirochete/Cyst" Townsend Letter, 2006 http://www.townsendletter.com/FebMar2006/lyme0206.htm

Dr. Robert Bradford, through the Bradford Institute, an independent research entity, funded by American Biologics, is the developer of Bismacine (TM), a chemical compound of Bismuth. This formulation has shown to be effective at the Ingles Hospital against spirochete and cyst forms of the Lyme organism.

Whether with Candida or Lyme, almost all remedies lose effectiveness in time and must be alternated; however, goat yogurt and hydrogen peroxide therapy (H2O2) seem to continue effective with Candida. If your child cannot tolerate goat yogurt, supplement a high-count probiotic and S. boulardii. Perhaps an easier way is to periodically use colostrum (Kirkman Lab's Colostrum Gold™ is casein free—others may not be), or whey, if you can tolerate it. (Whey must be undenatured. There are two I know of, Immunocal™ that may not be readily available, and is very expensive, and "The Ultimate Whey™" by Next Nutrition, Inc., www.designerprotein.com, that is available at most health food stores, or may be ordered from Nutrition Express 800-338-7979.) These provide lactoferrin that deprives these bacteria of the iron they need to replicate, and it contains a peptide, lactoferricin, that is bactericidal against E.coli, Klebsiella, pseudomonas, Proteus, Yersinia, Staphylococcus, Listeria, and other bacterial species. Lactoferrin also kills viruses, fungi (Candida), and certain tumor cells. When fed to adult animals and human infants, lactoferrin showed a dramatic increase in good micro flora—such as bifidus—and a decrease in bad bacteria, such as E. coli, streptococcus, clostridium, and others. Recent research in N.Z. is very exciting – When injected into bone, lactoferrin was found to inhibit the formation of cells that resorb bone and stimulate the cells that form bone. In any case, use of these natural aids will protect the "good guys" unlike antibiotics that destroy everything including the gut. Whey, because of its cystine content, may be undesirable where there is a sulfoxidation problem.

Virtually all bacteria, except for Lactobacilli and Bifidobacteria, require iron for growth. The liver produces lactoferrin, an iron chelator, when challenged by infectious agents. Animals protect themselves from infection by making chemicals that bind iron so that the microbes cannot use it. These iron-binding proteins, called lactoferrin, are concentrated in human milk and are found inside human white blood cells. The high lactoferrin in human milk protects breast-fed infants against intestinal infection. Pure lactoferrin is now available in capsules or as a major component of Colostrum, and has proved to be very useful for the prevention and treatment of intestinal infection, without side effects. It inhibits the growth of pathogenic bacteria and protozoa by starving them for iron, while improving iron absorption by the human host. It is recommended that travelers and other people who cannot control the cleanliness of their food supply **take one thousand milligrams of lactoferrin at bedtime** and the artemisinin-berberine herbal mixture after meals.

Lactoferrin is the transporter for iron, and if you are low in lactoferrin, you will suffer from iron-created free radicals following behind the traveling, free-iron particles for the iron has not been encapsulated within lactoferrin for safe delivery to cells. This can be very damaging, and it is one aspect of the excess iron problem. Colostrum and its derivatives are the only antimicrobials that make the claim of differentiating between friendly bacteria and pathogenic bacteria. The difference is in the way iron is required. Pathogens require free iron to proliferate, but friendly bacteria do not require iron.

Lactoferrin, from bovine colostrum, is showing "surprising results". It binds free iron, denying it to bacteria so they cannot freely multiply. It also enhances Natural Killer Cell function and glutathione production. Colostrum and whey have high levels of lactoferrin that kills Candida very well (Email: Dr. Darryl See).

Researchers showed that when yeast cells were deprived of iron, the hierarchy of the cell rationed the available iron, making sure the most vital functions of the cell received what little iron was available, while cutting back on the iron supply to more than 80 different genes that require iron to function. The genes that went without included genes responsible for protecting the cell from free radicals, genes that copy the cell's DNA for long-term survival, and genes that generate energy. This would seem to be how bacterial cells are inhibited as well.

Only vitamin A, monolaurin, and lactoferrin inhibited the growth of Cytomegalovirus (CMV). Lactoferrin and immunoglobulins, prevent colonization of the gut by pathogenic enterobacteria (Ann Pediatr Paris 1993; 40(1):13-22). The majority of antibodies and immunoglobulins in Colostrum are not absorbed, but remain in the intestinal tract where they attack these pathogens before they can penetrate the body's defenses. "The Proline Rich Antibodies (PRP) in colostrum have the same ability to regulate activity of the immune system as does the hormones of the Thymus gland. It activates an underactive immune system helping it move into action against disease-causing organisms. PRP also suppresses an overactive immune system, such as is seen in autoimmune diseases. PRP is highly anti-inflammatory and also appears to act on T-cell precursors to produce helper T-cells and suppresser T-cells"—Drs. Staroscik, Molecular Immunology. "Before using Lactoferrin, check RBC ferritin and iron (Fe) levels carefully"—Patricia Kane, Ph. D.

A major difference between formula and mother's milk is the presence of oligosaccharides in breast milk. Breast milk contains six of the monosaccharides present in the glyconutritional supplement that was used in this study that are known to be important in cellular functioning. The eight are fucose, sialic acid, galactose, mannose, N-acetyl glucosamine, N-acetyl galactosamine, xylose, and glucose. Colostrum contains the antibody immunoglobulin A (IgA) and five of the six monosaccharides found in human milk (the exception being mannose). IgA comprises 70-80% of all human antibodies. There are also other important immune system agents in breast milk, including cytokines, human-milk-fat globule, and phosphorylated glycoproteins, protectin, **lactoferrin**, and glycosphingolipids. These components have been shown to be important in brain development—Dr. Kathryn Dykman, MD.

The results of a Polish study shows that New Zealand Black (NZB) mice treated for a prolonged period with bovine lactoferrin (BLF) exhibit a decreased frequency of positive Coombs' reaction. [A Coombs' test is performed to detect the presence of antibodies against red blood cells. The test is used to support the diagnosis of immune-mediated hemolytic anemia (IHA)]. The data indicated that lactoferrin may be of therapeutical value in treatment of autoimmune disorders. Arch Immunol Ther Exp (Warsz), 1995, 43:3-4, 207-9.

From the above, we may have been overlooking a more successful way to overcome gut pathogens and to possibly inhibit the autoimmune reactions of autism. To restore L-Acidophilus, those on a milk-free diet need to use the yeast, S. boulardii, that will convert any carbohydrate to lactic acid. Lactobacilli will live only in a lactic acid environment.

Yersinia is the name of a genus of bacteria. Yersinia pestis (bubonic plague) is the most well known. In addition, there are several other species of Yersinia that can and do infect humans. One of the troubling aspects of Yersinia infections is that the immune response to them is severely impaired. Apparently, one of the ways that Yersinia does this is to "hide" in macrophages (a type of white cell which, in the blood stream, is called a monocyte) and then to suppress thyroid function, interact with the normal inflammatory response to cause it not to work correctly, and to alter the ability of the blood/brain barrier allowing foreign material, bacteria, etc. to get in there. When the Yersinia infected cells are found in the gut, they contribute to malabsorption of gluten (breads) and cause colitis—Susan J. Leclair, Ph.D., CLS(NCA).

Uva-Ursi is normally used for lower, urinary-tract infections (bladder and urethra) and as a mild diuretic. Cranberry

juice (not drink) is very effective in clearing urinary infection, and Kirkman has an extract that is highly concentrated. D-mannose is also highly effective. Candida infection of female organs and bladder can be readily controlled by either a boric acid suppository (98% success rate), or by filling the cavity with yogurt! Some are using Uva-Ursi for dysbiosis. It probably should not be used by children for it may damage the liver, nor should it be used for prolong periods, or in high doses. Use it only under a doctor's supervision. Dr. Susan Lark, MD, suggests that women applying estriol cream daily for two weeks will likely stop the infection for good. This will usually get rid of any unwanted facial hair that has appeared.

The above named remedies do not treat systemic Candida, however, and it may require Diflucan™, Sporanox™ or Lamisil™ for that purpose. Please note that Diflucan™ is fluoride based, and it is best to avoid it if possible. Medicines prescribed should all be anti-fungal, i.e., nor-nicotine and nicotine (very limited usage), along with the nutrients vitamins B_1 through B_6 (especially nicotinic acid (niacin - that is strongly antifungal), potassium, lithium, iodine, sulfates and sulfur (MSM, Epsom salts), and iron. Soda breads (pancakes, waffles, crackers, and biscuits) are said to be helpful, but you must not use sugars with them. **Glyconutrients containing 11 polysaccharides have been found to enhance phagocytosis of Candida, and killing of Candida was 95% greater than in controls (Fisher Institute for Medical Research "Proceedings", November 1997).** Those with Candida have been shown to have significant deficiencies of vitamins B_1, B_6, and magnesium. Some of the vitamins, especially vitamin B_{12}, are best supplemented by sublingual tablets in their coenzyme forms. Unfortunately, sublinguals often contain dyes and sweeteners you may find unsuitable. There are liquid vitamins that can be sprayed into the mouth and held there. You may want to check their suitability. Using these sublingually will supply the needed help regardless of digestive problems.

Remove all yeast and raw vegetables from the diet, and boil all vegetables in salt (NaCl) water—drain, and cook normally. This will remove all bacteria and fungi the child's body is not yet able to handle. Supplement HCl, as suggested elsewhere, to provide an additional barrier and enhance digestion. Also avoid the strongly pro-fungal pill binder, lactose (milk sugar), and milk products, and the chlorophylls. All forms of stress must be avoided for that produces cortisol and other steroids that feed the fungi. Heavy or even modest physical workouts must be avoided because they generate lactic acids at a rate that the body cannot handle. If this cannot be avoided, then Mannatech's *Sport* and *Em•Pact*™ have been shown to give rapid recovery from lactic-acid overload.

A most appealing way to rid the body of Candida is the use of an inexpensive, transient, spore-forming, soil bacteria that are nontoxic, nonpathogenic, and has an extremely antagonistic effect on Candida albicans. It is believed to actually "feed" selectively on Candida, coexisting with Bifido-bacteria and L. Acidophilus that the formula also supplies. It is called "Bacillus Laterosporus BOD", and can be obtained as Yeast Avenger™ from www.cfsn.com [888-801-2376, outside USA (503) 590-9519]. DAN! doctors sometimes use S. boulardii for the same purpose. You may be able to control the rate of die-off by how much you take, and can avoid reinfestation immediately, as often occurs when quitting drugs, by continuing a small amount periodically. An interesting idea is to use these bacteria as a challenge test. If you experience no die-off symptoms, then you likely do not have Candida overgrowth. These should be coupled with Culturelle™ (Klaire), or Pro-culture Gold™ (Kirkman) 20 billion count L. Acidophilus.

Die-off of yeast can produce severe regression in all autistic symptoms, explosive diarrhea, severe diaper rash, lethargy, fever, bloating, nausea, vomiting, eczema, aching, headache, stuffiness, seizures, and an intense craving for sweets. To quickly relieve these intense cravings, mix a quarter teaspoon of sea salt in a cup of warm water and drink it down. Obviously, this is by stimulating the adrenals to release glycogen from the liver. This would speak of the need to support the adrenals as outlined elsewhere in this paper. To quickly break an irresistible craving, open the capsule of glutamine and place it under the tongue. Another suggestion: mix a teaspoon of

baking soda into a glass of warm water and rinse the mouth for a few seconds. Drinking it may relieve the other symptoms listed, or use AlkaSeltzer Gold™ (sodium/potassium) to relieve die-off. To overcome chocolate cravings, sip a cup of ginger tea. It contains the same chemicals, but not the calories. The cravings for sweets and creamy foods that are high in fat may be triggered by a deficiency of zinc. Taking up to 30 mg zinc picolinate daily over time will help reduce these cravings. The amino acid glutamine (250 to 500 mg up to three times daily) and the mineral chromium (200-400 mcg), supplemented regularly, will also reduce cravings for sweets and starches caused by hypoglycemia by stabilizing delivery of sugar to the brain. Additionally, with adequate chromium (a good source is Brewer's yeast), the body doesn't produce as much insulin, reducing chance of hypoglycemia.

One will likely never be free of Candida until five things are occur: 1) eliminate mercury and other toxins interfering with energy pathways, 2) eliminate excess systemic alkalinity—these individuals exhibit a sodium-potassium ratio of less then 2.3:1, indicative of adrenal burnout, induced hyper-alkalinity, and an impaired immune system, 3) restore deficient HCl and bile secretions—these shortages lead to an excessively alkaline gut, to poor digestion of proteins, to poor assimilation of most minerals and vitamins, and to poor digestion of fats that creates fatty acid imbalances leading to amino acid imbalances, and 4) restore biochemical energy production (mitochondrial function)—the energy pathways require optimal amounts of copper, iron, manganese, potassium, magnesium, carnitine, alpha lipoic acid, NADH, and CoQ10, (see the Section "Healing the Leaky Gut"), 5) Correct carbohydrate intolerances—stress causes a rapid depletion of zinc and of the bio-unavailability of copper resulting in a severe derangement of glucose metabolism. Poor absorption of carbohydrates in the intestines creates fermentation by gut organisms. This, as well as sugar in the diet, actually makes children drunk, and some have the smell of alcohol on their breath. This causes hypoglycemia, insulin resistance, and a proliferation of yeast in the gut.

This is a quotation from Dr. Shaw's book "Biological Treatments for Autism and PDD": "Many of the yeast byproducts are acids, and release of the acids that are absorbed into the body may cause a condition called metabolic acidosis. An extremely simple therapy is to supply a mild antidote that neutralizes the excess acids. The most convenient product is a nonprescription drug called Alka-Seltzer Gold™. Do not use any other kind of Alka-Seltzer™. Alka-Seltzer Gold™ is simply a very safe product (sodium and potassium bicarbonate) that helps to neutralize excess acids of any kind. The dose for children is on the label. Do not exceed the number of recommended doses." One mother wrote, "It worked so well for both of my children that the die-off was an uneventful experience, even though they both had very high levels of yeast." The restoring of acid/alkaline balance also relieves many allergies.

In any case, it should take no longer than six months to rid the body of parasites. If it has been longer, you are probably not being aggressive enough, or you are not using a proper protocol. It will likely be necessary to make three or more tests for parasites since shedding of the eggs tends to be cyclical, and may not show in a single test. In any case, it is unlikely to detect the parasites that inhabit the upper intestine. Most parasites, except giardia and amoeba, will elevate levels of the white-blood-cell eosinophil (EOS) that is produced in response to allergens and infections. Giardia Lamblia is usually associated with food intolerances, gastrointestinal symptoms (including diarrhea), and fatigue, but severe hypothyroidism may be a result. A published study of 96 patients with chronic fatigue demonstrated active Giardia infection in 46%. Giardia infection was found in about half of a group of two hundred patients with chronic diarrhea, constipation, abdominal pain, and bloating—Leo Galland. Giardia is often accompanied by Candida. It is imperative you take aggressive action to rid the body of parasites and heavy metals. With them will go many "autism" symptoms.

This additional information from Dr. Shaw: Most of the abnormal microbial products found in urine testing are almost surely from yeast and/or fungi in the gastrointestinal tract, since they decline following the use of an

antifungal drug, Nystatin. Many autistic children have a background of frequent infections (especially middle ear infection), which are treated with broad-spectrum antibiotics (even though the ear infections are usually of viral origin—WSL). Some children may have elevated yeast metabolites after only a singular antibiotic exposure. Over 700 articles in the medical literature document antibiotic stimulation of yeast growth. Since both early onset and high frequency of ear infection are associated with greater severity of autism, a yeast connection seems worthwhile to evaluate. Autism is usually a regression. This regression is often associated with thrush and/or frequent antibiotic use.

Dr. Shaw's laboratory has biochemically documented the "yeast die-off" or Herxheimer reaction that follows the initial use of antifungal drugs. During the first three days of antifungal use, values for these microbial metabolites increase dramatically, and begin to normalize near day four. Die-off usually lasts about 7-14 days, and after that time, the change in the child can be rather dramatic. Parents report that after the yeast is under control the frequency of inappropriate noises, teeth grinding, biting, hitting, hyperactivity, and aggressive behavior decrease. The child no longer acts almost drunk by being silly and laughing inappropriately. If the die-off does not end in 14-17 days, it is generally a reason to change one's choice of anti-fungal. Additional reasons for teeth grinding may be parasites and too many apples/juice (feeding Candida).

"All the mainstream medical textbooks talk about how people with hormone imbalances due to pituitary problems get yeast. Mercury causes pituitary problems. (In fact, heavy metals like lead, mercury, and cadmium, as well as pesticides and chemicals in plastics we daily use, are hormone disruptors—WSL.) As if that isn't enough, yeast is controlled by neutrophils generating oxygen radicals, and mercury prevents your neutrophils from generating oxygen radicals! (Mercury inhibits macrophage and neutrophil defense against Candida by its effects on Th1 and Th2 cytokines—WSL). So, it seems reasonable that mercury toxicity causes yeast problems. The fact that lots of adults with intractable yeast problems have them suddenly go away, without special treatment, once they start mercury detoxification supports the view that mercury causes yeast. So, if you are mercury toxic, you have a high chance of having a yeast problem, and the yeast will cause its own symptoms. You can reduce those symptoms modestly if you treat the yeast, but you will never really get better until you treat the mercury—and once you do that, you can stop treating the yeast because your body will be able to keep it in check"—Andy Cutler.

When Candida has become fungal and entered the bloodstream (Candidiasis), it is an extremely serious problem that is best controlled by hydrogen-peroxide infusions. Done properly in a clinic setting, the allergies can be disappearing in five to ten days, and the yeast can be gone in 21 to 28 days. A palatable oral form of hydrogen peroxide is available from the health food store under Dr. Donsbach's brand, SuperOxy Plus™.

In addition to having estrogenic effects, mercury has other documented hormonal effects including lowered levels of neurotransmitters dopamine, serotonin, and norepinephrine, and suppressed thyroid function. Some of the effect on depression is also related to mercury's effect of reducing the level of posterior pituitary hormone (oxytocin) and depressing the thyroid. The concentrations of mercury in the pituitary and thyroid glands are much higher than found in the kidney, brain, or liver in humans.

Copperheads

An inordinate number of children with autism have an excess of copper stored in tissues. Women tend to have copper levels 1/3 higher than men, making them more susceptible to copper toxicity. This is because "The Pill" often has copper in it and IUDs are copper. At one laboratory, it is reported that more than 50% of all hair samples show a copper imbalance. This copper is unbound with protein (ceruloplasmin), and thus, unavailable for normal

uses, including its use as an antifungal to fight Candida. Most copper is bound to ceruloplasmin, but MT proteins can serve as a temporary storage site in the presence of excessive amounts of copper. Once the MT proteins bind copper, they are unable to bind zinc and become disabled. Dr. Wm. Walsh reports that only 10% of copper is normally unbound, but in children with autism, this often runs as high as 40% unbound! Unbound copper, like unbound iron, is a disaster of free radical damage, calling for the best antioxidant combination that you can find, Ambrotose AO!

"We have measured serum copper, serum ceruloplasmin, and plasma zinc for more than 2,000 of our 3,300 autistic patients. More than 95% exhibit a copper overload that usually is quite extreme. In autism, the problem with copper is overload, not deficiency. We've measured the blood levels after treatment in thousands of these patients, and the copper elevations are slow to correct, even with aggressive zinc therapy. Copper supervision in the body occurs in intestinal mucosa through the action of metallothionein. Since the MT system is AWOL in autism, it's not surprising that copper overload is prevalent in ASD. We believe the best way to correct this serious metal metabolism problem is to normalize MT levels in intestinal mucosa and the blood-brain barrier." Email from Dr. Wm. Walsh, December 14, 2003.

In one long-term study, the U.S. Army found that the immunized group had depressed serum iron and elevated serum copper. **When inflammation rises, iron levels fall and copper levels rise.** Inflammation is the cause of almost all chronic conditions, including Autism. Aggressively address all infection and inflammation. CLO is an effective way as is the use of a bromelain supplement.

These "Copperheads" have very active minds, but the excess copper causes GI disturbances, impaired protein metabolism—causing a weakness of protein structures by interfering with the cross-linking process (one effect being breakage or leakage of capillaries that may cause small strokes and/or a dangerous aneurysm in vein or artery—also a symptom of too little copper), salivation, acne, a metallic taste, dizziness, headache—including migraine, loss of appetite (underweight), no desire for the zinc of red meat (yet an inordinate desire for chocolate, avocados, soy, or carob that are very high in copper), anxiety, various female difficulties, severe fatigue—even after adequate rest, detachment from reality termed spaciness, alternating moods, panic, fearfulness, schizophrenia, phobias, and weakness. Excess copper also raises sodium and lowers potassium and manganese tissue levels. Excess copper, by displacing zinc and manganese, is often associated with thyroid and pancreatic dysfunction. Pro-oxidant copper ions affect glutathione distribution in several ways. **Jaundice and high bilirubin levels are signs of copper toxicity, as are earaches and ear infections. When inflammation rises, your iron level falls and copper level rises.**

Some people with high copper dislike all protein. They crave high-carbohydrate diets, and **don't like water**. Copper-toxic individuals may be drawn to sweets or salty foods due to adrenal insufficiency. Some sea salt is often beneficial. Sweets, including fruit juices, provide a temporary lift, but may worsen the condition. Protein feels heavy, or causes other symptoms. Eating protein stimulates glandular activity that releases stored copper, which causes the symptoms. These individuals usually need to eat protein. The taste for meat often returns when copper is brought into better balance.

Additionally, copper imbalance (both excess and deficiency) can contribute to heavy metal poisoning by slowing the rate of metabolism (slowing the thyroid), reducing the body's ability to detoxify heavy metals. Severe cases cause hypertension, liver damage, kidney failure, and death. In schizophrenia, there is found increased levels of copper and mercury and reduced levels of zinc, magnesium, and calcium that are known to be inhibited by heavy metals and to affect neurotransmitter levels.

Citrus fruit increases intestinal absorption of copper, and monosodium glutamate (MSG) binds and transports it, however, large amounts of vitamin C, with vitamin B_6 and zinc, will remove the excess copper from the brain. These should be combined with manganese in a 3:1 zinc/manganese ratio, as a prolonged zinc therapy can result in

manganese deficiency. These supplements will favorably influence the emotional and psychological symptoms listed. Before undertaking this, one should have a hair test to determine the zinc/copper status. However, caution is urged in the interpretation as animal studies show that reduced dietar0y zinc leads at first to low zinc levels in the hair, but when zinc depletion continues, values seem to return to the normal range, presumably because reduced hair growth resulting from impaired protein synthesis leads to a compensating increase in concentrations of zinc and other elements in the hair as it grows.

Dr. Wm. Walsh in an Email stated, "I learned that extremely elevated sulfur in a hair analysis is a tell-tale sign of an improper sample, cross-contamination, or some other factor which results in crazy, meaningless values. The first element I look for in a hair analysis is sulfur. If the values are extremely high or low, I don't waste my time studying any of the data. It's usually worthless. Another telltale sign of a worthless analysis is very high levels of chromium, nickel, strontium, and iron in the same sample. A surprisingly high percentage of hair analysis results are meaningless, usually because an improper sample was submitted to the lab. It takes a lot of experience to spot the bad ones. Bob Smith of Great Smokies Lab is probably the best person in the world at identifying contaminated samples."

Major contributing factors to this excess copper is the use of birth-control pills (depletes zinc, magnesium, and vitamin B_6), copper intra-uterine devices, antibiotic therapy, stress, Candida overgrowth, and strict vegetarian and refined food diets that are deficient in zinc. **Certain food dyes and colorings have a high hydrazine content that causes zinc depletion.** Excess copper can be from swimming pools and Jacuzzis using copper sulfate for algae control. Foods rich in copper include nuts, soy, avocado, chocolate, and carob. Persons with the Cu/Zn chemical imbalance need to be vigilant in limiting sources of copper. When dumping copper (when stress and or estrogen levels are high), there will be increased levels of insomnia and depression, skin rashes, anxiety, fatigue, headache (usually migraine), digestive disorders, abdominal bloating, and a flare-up of a wide variety of chronic conditions listed above, such as hypoglycemia and Candida yeast overgrowth, including vaginal yeast infections. A hallmark is the feeling that no one understands them. These reactions usually last a couple of days, and then subside to their chronic levels again. Redness or red tints to the hair is also an indicator of a copperhead. Additionally, high estrogen levels from high intake of soy, flax, or other sources (such as fat cells and increased aromatase production) increases levels of a protein called thyroxine-binding globulin (TBG) that binds to thyroid hormone in the blood, preventing it from entering cells! The Pill, HRT, pesticides, cadmium, and other sources of estrogen are producing hypothyroidism! (Dr. Whitaker's Health and Healing, Sept 2003).

Estrogen causes calories to be turned into fat, and the fat cells then produce more estrogen. So, when symptoms of hypothyroidism are present, high estrogen levels could be the cause. To counter this effect of estrogen, topical progesterone is recommended. Low progesterone in women between the ages of 30 and 50 may lead to autoimmune hypothyroidism, or Hashimoto's disease, as a consequence of immune stimulation by the dominant estrogen. Stress may have the same effect on mitochondria. To improve mitochondrial function, supplement Acetyl L-carnitine, CoQ10, and Alpha Lipoic Acid. This improves liver and gall bladder function also. (Dr. Raphael Kellman, Sept 2004 Life Extension).

There has been a lot of controversy over estrogen replacement causing breast cancer, stroke, and, cardiovascular disease. Dr. Jonathan Wright reports that a recently published study showed that real human progesterone and estrogen didn't cause any of these problems, and horse estrogen didn't either. When it comes to breast and vascular problems estrogen isn't dangerous, progestin (Provera™, Prempro™) is!

Dr. Schmitt says that, in his opinion, rashes are a sign of excessive copper working itself out of the system. Unavailable, excess copper is one of the normal clinical findings for people with Candida infections. The problems may not be due to copper toxicity, but rather with its interference with the absorption and

distribution of other metals such as iron (which cannot be absorbed without available copper—fortifying iron will not help, but will actually make the anemia worse) and zinc.

The distressing symptoms of copper toxicity are often due to both dietary and stress-induced zinc deficiency, not an excess of copper. **Adrenal insufficiency prevents synthesis of ceruloplasmin**, necessary to utilization of copper (and many of these kids are adrenal deficient). When unbound with ceruloplasmin, copper begins to accumulate in tissues and organs. It is the zn/cu ratio that counts. The ideal zinc-copper ratio is 8:1. If below 6:1 (hair), one should consider the above symptoms to be copper toxicity. **The principal reason for copper toxicity is adrenal insufficiency (in 70 to 80%) resulting largely from stress, leading to a deficiency of zinc (imbalancing the ratio with copper), sodium, manganese, pantothenic acid, inositol, folic acid, rutin, and vitamins A, B_1, B_6, C, and E.** The adrenals are strengthened and copper absorption and utilization are increased by supplementing adrenal glandular, molybdenum, iron, sulfur, niacin, inositol (as Inositol Hexaniacinate), choline, and the above listed nutrients, including extra biotin and PABA. Additionally, lead and mercury interfere with the synthesis of ceruloplasmin and ferritin contributing to copper and iron toxicity. It is important to learn to cope with stress in order to spare the adrenals and to reduce the loss of zinc. Supplementing 200 mcg of chromium has been shown to reduce cortisol levels by 47%! Magnesium, melatonin, vitamin C, and pantothenic acid further reduce this deadly hormone. A 45-minute massage (backrub?) showed a similar reduction. The practice of a relaxation-meditation exercise would be similarly effective. Maintaining a positive expectation would work, as would strong religious faith, and an expectation of sustaining help from the Lord. This will reduce loss of zinc, and help to prevent the buildup of excessive copper in tissues. Supplement the diet with 20 mg zinc daily, and with up to 60 mg of zinc during any acute, disease state or other severe stress, along with the other supplements mentioned. Where the excess copper is non-bioavailable, it may be necessary to supplement a small amount of copper to enable the body to produce the ceruloplasmin that is necessary to the bioavailability of copper.

Copper deficiency predisposes to molybdenum excess. Significantly elevated moly is unusual, and some toxic effects are due to displacement of copper or inactivation of copper enzymes. Copper enzymes form vital neurotransmitters, such as dopamine and norepinephrine. The brain, other than the cerebellum and hypothalamus, has these transmitters decreased 30% to 60% in various sectors by a copper deficiency [Feller 1983]. Neutropenia is the earliest symptom in copper deficient babies [Cordano, et al]. The immune system is very sensitive to adequate copper [Prohaska & Lukaseqycz]. Copper deficient mice have lower number of antibody cells even though the spleen weight is greater [Prohaska & Lukasewicz]. Rats were fed diets deficient in copper for 35 days. This resulted in a significant increase in serum cholesterol levels and a significant decline in plasma thyroxine concentrations and body temperatures. Compared with rats fed the adequate diet, those fed the marginal and deficient diets had significantly lower plasma concentrations of triiodothyronine (T3) and significantly higher TSH levels. The activity of thyroxine 5'-monodeiodinase (the enzyme that converts T4 to T3) was reduced in the liver and brown adipose tissue of copper deficient rats. Copper deficiency is rampant in the United States. The best test for copper deficiency is intracellular (red blood cell), while serum or plasma copper tests are too insensitive, and hence not worth obtaining, unless a ceruloplasmin reading is also obtained. Emphysema can be produced in animals by a copper deficiency [Soskel, et al]. The emphysema seems to have an elastin defect greater than can be explained by cross-linking alone [Soskel, et al]. Dilated superficial veins (varicose veins) are observed in copper deficient organisms. Elastin is about as flexible as a rubber band, and it can stretch to two times its length [Carnes 1977]. Collagen is about 1000 times stiffer; so, it is vital that one doesn't induce a copper deficiency when supplementing high amounts of vitamin C and zinc.

If suffering from high copper levels, avoid high copper foods: soy, avocado, chocolate, nuts, and seeds, and all things that raise copper tissue levels such as copper IUDs, birth control pills, antibiotics, and foods with high content

of phytoestrogens (soy and flax). Some children do a lot more stimming when using soy. Unfortunately, copper sulfate is added to some city water supplies, and to swimming pools, as a fungicide. Unfortunately, also, the Mother may transmit her copper/zinc imbalances to her unborn child.

Excess copper depletes zinc and vitamins B_6 and C, and a zinc deficiency results in impaired absorption of folic acid and also hinders the liver from releasing vitamin A. The best way to overcome copper toxicity is to rebuild the adrenals, as listed above, and to supplement significantly vitamins B_6 and C, chromium and zinc. Large amounts of these will excrete the copper. Unless tests show the copper to be extremely high, our purpose is not so much to excrete it, but to make it bio-available so the body can use it rather than store it. Attempts to reduce copper levels will likely precipitate a copper dump and a flare up of symptoms including depression. One already suffering depression should attempt to lower copper levels only under a Doctor's guidance. These symptoms signal a beneficial elimination of excess copper, and are indications of a healing process, and though uncomfortable, should be welcomed. Some, however, cannot tolerate the symptoms, and should reduce the amounts of the supplements, or should skip a day or two and begin again at lower amounts, or should take the supplements only once a day. Do whatever is necessary to reduce the uncomfortable symptoms to bearable levels, but do not cease the program if you desire to regain optimal health.

Sometimes, one will feel really good for a few days before the dump, with its discomfort and changing moods, hits. When the dump occurs, the individual will begin to feel hopeless, and will often go off their supplement program. This is a very grave mistake. While these symptoms may appear to be related to the supplement program, as often as not, they are caused by stress or a coming menstrual period. Any stress, physical or emotional, results in a necessary increase in metabolic rate. This frequently results in a dump of excess copper into the blood. Since an increase in one's metabolic rate will cause a flare-up in symptoms, it becomes desirable to temporarily slow one's rate of metabolism. This is accomplished by increasing one's calcium intake, which also avoids a copper-induced calcium deficiency. One should also increase dietary fat intake 25-30% using Evening Primrose oil, cod-liver oil, salad oils, cooking oils, and where permissible, dairy products. Slowing one's rate of metabolism is definitely of value in reducing the symptoms associated with copper toxicity. When the symptoms are once again under control, it is time to resume the original nutritional program. To slow the metabolism indefinitely, especially through a high intake of dairy, would result in increased storage of copper and a likely weight gain.

How does this all manifest in autism? Copper toxicity is associated with symptoms of mind racing (commonly seen in ADHD) due to enhanced activity of the neurotransmitters epinephrine, norepinephrine, dopamine, and serotonin resulting in inability to stop thoughts. Elsewhere in this paper, see how to reduce these transmitters. Common problems will be loss of appetite, failure to eat protein, failure to thrive, insomnia, getting up in the middle of the night jumping and stimulating the metabolism, resistance to drinking water, and headache. This constant, self-stimulation is to enhance the metabolic rate by stimulating the burned-out adrenals. They are tired, and yet will compulsively do anything to stimulate the adrenals and make themselves feel more normal. This "stimming" raises the blood sugar, and may allow them to get back to sleep eventually. This activity further drains the adrenals, however, leading to complete adrenal exhaustion unless something is done to support the adrenals. Copper and mercury being elevated usually means not enough bile and glutathione are being made by the liver. One of the roles of bile is to help excretion of toxins and metals, but fiber in the gut is needed to bind the bile leading to excretion rather than reabsorption, so a low fiber diet hinders this process. Taking milk thistle extract, taurine, glycine, and ensuring adequate fiber intake can improve the situation.

pH

The acid/alkaline balance is one of the most overlooked aspects of health, though Gary Null and others have written much about it. In general, the American public is heavily acid, excepting vegetarians. A too-acid system speeds enzyme

activity. Children with autism often are heavily alkaline. A too-alkaline system slows enzymes to a crawl. Minerals have different pH levels at which they can be assimilated into the body. Sodium and magnesium have wide pH assimilation ranges. It narrows somewhat for calcium and potassium, and narrows more for manganese and iron, and yet more for zinc and copper, which are HIGH up on the atomic scale, requiring NEAR PERFECT pH for assimilation into the body. Iodine, as you may know, is one of the most important minerals for proper functioning of the thyroid, but **the thyroid doesn't get access to iodine unless the body pH is near perfect!** Obviously, a less than optimum pH will predispose to a deficiency of iodine, zinc, and copper. These three are critical for thyroid function.

Additionally, the environment is so heavily polluted with **chlorine, fluorine, and bromine compounds**, all in the same family (halogens), and a lot more chemically active than iodine - **the functional component of thyroid hormone**. These elements are known to **interfere with the receptor sites at the cell level where real thyroid hormone plugs in, and they trigger autoimmune diseases in the body**. In the latter, the immune system recognizes the foreign element as **not quite right and attacks**. Unfortunately, the immune system can neither destroy nor eliminate the wrong halogen, so the attack continues, **eventually destroying the gland itself. Fluoride destroys iodine, creating a deficiency of this vital mineral. Pesticides (estrogenic) and all forms of estrogen (including unfermented soy) slow the thyroid secretions and interfere with conversion of T4 to T3. Large amounts of beta-carotene and/or PABA, polyunsaturated oils, and vegetarian diets (particularly for blood type O and B) inhibit the thyroid.**

Obesity increases the requirement for iodine – as does a high fat intake, and up to 100 mg (yes, mg) elemental iodine/day may be required to achieve and maintain sufficiency! Smoking increases serum thiocyanate levels, interfering with the sodium/iodide symporter function. Sources of goitrogens are available from medical textbooks, and, although the halides, fluoride, and bromide are not listed as goitrogens, fluoride interferes with the uptake of iodide by the thyroid gland symporter system, but is itself not transported inside the thyrocyte, suggesting that fluoride causes oxidative damage to the halide-binding site of the symporter. The goitrogenic effect of bromide, even at low concentrations is significant. Additionally, patients who use water from wells and municipal plants may be exposed to potassium perchlorate, a very powerful goitrogen that behaves like fluoride, binding to the halide-binding site of the symporter without itself being symported. A recent Internet publication by Kirk et al reported the presence of high concentrations of perchlorate in dairy milk sold in grocery stores and in human milk. The mean levels of perchlorate were 5 times higher in breast milk than dairy milk. Perchlorate has a selectivity factor of at least 30 over iodide. To compete effectively against this goitrogen, the peripheral concentration of inorganic iodide must be at least 100 times higher than the concentration of perchlorate. Kirk et al observed that breast and dairy iodide levels were inversely correlated with the levels of perchlorate. Perchlorate and fluoride, due to their high redox potential, may cause oxidative damage to the halide-binding site, decreasing its efficiency for iodide transport.

Additionally, certain brassica (cruciferous) plants and fruits: Bok Choy (Chinese Cabbage), Collard Greens, Kale, Mustard Greens, Spinach, Turnip Greens, Broccoli, Brussel Sprouts, Cauliflower, Cabbage, Rutabaga, Peaches, and Strawberries are often referred to as containing Goitrogens, and one is often cautioned not to eat them, at least if a sluggish thyroid is suspected. This may be bad advice for it narrows the food choices and eliminates some of our most valuable and nourishing foods. How do they suppress the thyroid? They use up the iodine stores. To overcome the effects of goitrogens in the food chain, the amounts of iodine used in Japan would be necessary —Hormone & Metabolic Res 1995, 27:450-454. Abraham describes a Graves', exopthalmic female with undetectable TSH, elevated T3, T4, and free T4. She started on 1200 mg per day magnesium for one month, which calmed her, improved sleep, reduced burning, irritated eyes and lacrimation, and reduced palpitations – and then she started on 12.5 mg elemental iodine per day. All findings normalized in a month. So, **rather than avoiding these valuable foods, just do what is needed in the first place, supplement iodine. Additionally, an adequate intake of iodine**

will heavily chelate bromine, fluoride, and heavy metals restoring thyroid function and inhibiting bacteria and viral infections. Do the iodine test periodically to ensure the iodine stores are adequate. Additionally, cooking eliminates the goitrogens—http://oregonstate.edu/dept/hort/233/toxic.htm.

These vegetables supply Indole-3 Carbinol (I3C) that provides two powerful phytonutrients, Sulforaphanes and glucosinolates that enhance the liver's ability to break down estrogens. I3C appears to work on sensitive tissues of breast, colon, lung, rectum, and elsewhere giving a protective effect against cancer of these vital tissues (Bradlow, 1994, and Wong, 1997). Sulforaphane, fed in its natural state, showed 95% elimination of cancer induced in rats. When given isolated sulforaphane, the protection dropped to 10%! Similar poor results were found for companion antioxidants Lutein and Zeaxanthin. A new study shows that (assuming that you didn't keep it in the refrigerator for a week incurring greater losses) up to 80% of the glucosinolates along with 60% of the flavonoids and other goodies are lost from the time broccoli is picked to the time it lands on your plate This is why Phyt•Aloe® by Mannatech, Inc. is so valuable. These 12, freeze–dried, cruciferous vegetables have a full measure of all their natural phytochemicals present to provide full synergistic activity. The significance of this is shown in a study from China. Women with the most cruciferous metabolites in their blood had half as much breast cancer! Other studies show that cancer cells stop growing and begin to die when exposed to sulforaphanes and other isothiocyanates (which combine with NAC to create glutathione)! Sulforaphane also reduced DNA damage by 80% in one test. Furthermore, tests show that I3C protects against toxicity of chemotherapy drugs without interfering with the drug's ability to kill cancer cells, in fact it enhanced the effectiveness of Trabectidin by increasing tumor reduction from 54% to 71%! It enhances the effectiveness of Mytomycin C against some cancers that lack an activating enzyme. Sulforaphane also overcomes H. Pylori, a very difficult bug to kill.

We have just read Kane on the need of carbonates to acidify the system. Elevated citric (due to the glutathione deficiency) with low 2-oxo-gluteric (in urine tests) would affect oxygen getting into the cells. You can compensate by getting some carbon dioxide by using a rebreather mask, and by taking carbonates between meals to increase CO_2 as Kane has recommended. The carbon dioxide acidifies the blood, and helps the red blood cells release the oxygen to the cells. Supporting the thyroid helps the cells make more carbon dioxide, so that is something else to do. Obtain a packet of pH paper, and test the saliva and urine as indicated elsewhere in this paper. Dr. Cheney treats Chronic Fatigue (CFIDS) patients.

Dr. Cheney's Oxygen Treatment

By Carol Sieverling (slightly edited)

Dr. Cheney prescribes oxygen for patients with alkaline venous blood. An hour of oxygen in the morning can provide half a day of significant improvement, and numerous benefits. He had seen alkaline blood results for years, but dismissed it as insignificant, based on medical school teaching. His growing suspicion that it was very significant was confirmed when a speaker at an international conference in London began a presentation by announcing, "Ladies and gentlemen, I'm here to tell you that CFS patients are alkalotic." Blood alkalosis inhibits the transport of oxygen to tissues and organs, constricts the blood vessels, and lowers overall circulating blood volume.

The putative cause of the alkalosis is the glutathione deficiency that is pervasive in CFIDS (and autism). Low glutathione causes an elevation in citrate, which in turn lowers a substance (2,3 DPG) that controls the release of oxygen from hemoglobin. Our blood can be full of oxygen, but without enough of this substance, it cannot break free and get into the cells. This causes oxygen deprivation in the tissues (hypoxia), which makes the body switch over to anaerobic metabolism, which can be painful.

This blood alkalosis is unusual in that Cheney usually sees venous blood pH values over 7.4 and urine pH values under 6.0. When both blood alkalosis and urine acidosis are seen, it's a metabolic problem not a psychogenic reaction to a needle stick. A blood pH above 7.4 shows impairment. Above 7.5 there is significant impairment and almost no oxygen transport at all. A urine organic acid test will also reveal this problem. Elevated citrate and/or low 2-oxo-glutaric are markers. The really terrible thing is the vicious cycle. The blood alkalosis further lowers the levels of 2,3 DPG (inhibiting the release of oxygen), causing tissue hypoxia, which then causes blood alkalosis, which lowers 2,3 DPG even further—and around and around we go. **(From this, I must assume that Autistic children with alkaline pH must not use the citrate forms of minerals! —WSL)**

The ultimate treatment for this situation is Immunocal™ or IMUPlus™, the undenatured whey protein supplements that help restore glutathione, but some patients cannot afford them, and they do not work for all patients. An immediate solution to the oxygen transport problem is to use a partial rebreather mask set at 35 to 40% FIO2 (Fraction of Inspired Oxygen), which requires a flow rate of about 10 liters per minute. Do an hour a day, broken into one, two, or three sessions. You can do more than one hour a day, but do not do more than one hour at a time. Do not breathe heavily – breathe normally. Most CFS patients have headaches, and this can help those headaches. If a prescription is written for headaches, insurance may cover it. One hour of oxygen a day can run $75 to $100 a month.

Oxygen through nasal prongs will not work. Oxygen alone in a mask will not work. It has to be a partial rebreather mask, which has a bag attached. This allows you to rebreathe your expired carbon dioxide along with the oxygen that is flowing into the mask. It is important to the function of the rebreather that the bag contract and expand with the breathing cycle. It's not working properly otherwise. Breathing increased levels of both carbon dioxide (CO_2) and oxygen (O_2) at the same time is essential. The CO_2 breaks the cycle. It corrects the alkalosis and frees the O^2 in your blood to move into your cells. With proper functioning, vessels dilate and you start perfusing your brain and tissues, bringing out the toxins and bringing in the nutrients. Raising oxygen levels will also help kill off yeast and other pathogens. Lack of oxygen allows them to multiply.

The speaker at the London conference sends his patients to breathing experts like Teresa Hale, who wrote "Breathing Free". Most patients are walking around over breathing, and thus becoming more alkaline. Learning to under breathe can help increase oxygen perfusion and transport.

Two problems can be seen in some patients on a rebreather mask. (1) Rapidly correcting blood alkalosis or overcorrecting (i.e., acidosis) can provoke vasodilation. If there is significant blood volume contraction some patients will become hypotensive and feel dizzy or faint. This problem can be prevented by taking oxygen lying down, and by expanding blood volume with an isotonic electrolyte drink such as Gookinaid ERG (Electrolyte Replacement with Glucose) (http://members.aol.com/Gookinaid) (1-800-283-6505). You can also address this problem by reducing the time spent on the mask rebreather. (2) Patients with a history of migraine may provoke a migraine in the moments just after going off the rebreather. Again, expanding blood volume and reducing the time of the rebreather can help this side effect.

The ultimate treatment mentioned (whey) has little or no casein, but it can be dangerous to some with

sulfation problems (PST), so several other ways to build glutathione are suggested herein. Use them rather than the expensive, time consuming breather mask or expensive, long term, hyperbaric oxygen. These both have value in short term, but do not "cure" the basic problem of alkalosis. To learn more about balancing the pH, see the Chapter "Digestion and Utilization" in my Electronic book, "Self-help to Good Health", 34 Chapters, 535 pages, $24.95 US.

More than 25 years ago, IAHP was the first to recognize that among the various adverse environmental conditions which affect the brain-injured child, the most important is chronically insufficient oxygen supply to the brain. In their experience, this is almost universally present to some degree in brain-injured children, although not ordinarily in obvious form. The shallow and erratic breathing patterns and small chests seen in the majority of our brain-injured children are primary indications that such subclinical, oxygen deficiency exists.

Associated with oxygen insufficiency in various combinations are other adverse environmental factors contributing to seizures as well as other problems of the brain-injured child. Among these factors are: 1) blood sugar levels too low or unresponsive to the brain's changing needs 2) nutritional imbalances or deficiencies, very common among children, most of whose diets are extremely poor both quantitatively and qualitatively, and 3) increases in pressure within the skull due to intake of liquids and water-retaining substances, such as salt, in amounts beyond the child's needs or capabilities for handling. Additionally, magnesium, vitamin B_6, and dimethylglycine (DMG) all have strong anti-seizure properties, and can be effective even when other anti-seizure medications fail. The deficiency of vitamin B_1 has also been reported as a cause of epileptic seizures. Magnesium is an essential cofactor in the conversion of thiamine into active diphosphate and triphosphate esters. **There have been reports of thiamine deficiency aggravated by magnesium depletion with refractory response to thiamine until magnesium was given.** It seems plausible that magnesium depletion could provoke Wernicke's encephalopathy, possible by suboptimum thiamine phosphorylation. **Pyridoxine (B_6), too, is only phosphorylated into its coenzyme (P5P) in the presence of magnesium.** Some 70% of the enzymes are dependent on magnesium.

In a placebo-controlled study on prisoners with a history of impulsive/aggressive behavior, the group taking low amounts of lithium (10-15 mg twice a day) had a significant reduction in aggressive behavior and infractions involving violence. It also helps to raise white-blood-cell count and to protect against loss of white cells in chemotherapy and radiation. Lithium also tends to normalize thyroid function, particularly in Grave's Disease. Researchers at Wayne State University (Detroit) found that **high-dose lithium has the ability to both protect and renew brain cells (3% increase in gray matter in four weeks)!** In Ischemic stroke (loss of blood flow), death of brain cells was reduced by 56%! Further, anticonvulsant medications cause abnormal levels of brain-cell death, but lithium significantly protects against this type of cell death.

During the first week of magnesium deficiency, Substance P and CGRP are increased. The second week, histamine is increased, along with PgE2 (inflammatory), and TBAR molecules. The third week, cytokines IL-1, IL-6, TNF alpha are increased (Weglicki & Mak, 1994). The cytokines, IFN gamma, IL-2, 4, 5, 10, 12, and 13 are also increased in magnesium deficiency (Weglicki, 1996). I believe that these, except IL-10, are all inflammatory!

Clinical symptomology of magnesium deficiency is dominated by neuromuscular hyperexcitability (Rayssiguier, 1990; Durlach, 1997) exhibiting latent tetany (Durlach, 1997) and spasmophilia (muscle cramps and spasms) (Galland, 1991). Hyperarousal (Galland, 1991), with sensitivity to noise, bodily contact, and excitement (Langley, 1991; Goto, 1993) in the precipitation of neuromuscular hyperexcitability has been described in magnesium deficiency. Choreiform and athetoid movements can be produced by magnesium deficiency (Holvey,1972). Some tics may be forms of atypical latent tetany (Ploceniak, 1990). A chronic tissue magnesium deficit is found in HLA B35 individuals (a genetic type - Zeana, 1988; Henrotte, 1990; Durlach, 1997). A few clinical disorders that can

be associated with magnesium deficiency are: migraine (Thomas, 1994), bruxism (Lehvila, 1974; Ploceniak, 1990), restless leg syndrome (Popoviciu, 1993; Hornyak, 1998), asthma (Fantidis, 1995), seizures (Galland, 1991; Goto, 1993), hearing loss, TIA (mini stroke - Galland, 1991), heart arrhythmia (Burtis, 1994), and mitral valve prolapse (MVP) associated with HLA B35 (Rybar, 1989). Vitamin A deficiency increases sensitivity of the inner ear to noise as well as susceptibility to noise-induced hearing loss.

When there is current exposure, mercury binds to Hemoglobin in the red blood cell and will reduce the amount of oxygen that can be carried in the blood—a major cause of fatigue. Mercury at a level of 1 part per ten million will actively destroy the membrane of red blood cells. Hyperbaric oxygen has been used with great results, but at great expense in time and money, and may be contraindicated due to oxidative damage, especially where mercury toxicity is present. No oral antioxidant protects against the Superoxide radical until now. Tests show that a new form of SOD prevents the DNA damage that could not be offset by vitamin E or n-acetylcysteine. See Sodzyme™ by Life Extension Foundation.

A simple way to increase oxygen in the cells is through addition of 2 drops of tasteless Cell Food™ (Eden's Secret, 888-755-7715, 1 oz, $21.95) to water being drunk. Another that builds oxygen in the blood is OxyCharge™ (800-800-9119, 2-oz spray bottle, $29.95 plus shipping), a tasteless spray into the mouth. Each bottle will last about a month. I have seen these work in my grown son who was greatly anemic from multiple transfusions, and gasping for oxygen! It gave almost instant relief of breathlessness, even though deficient of red blood cells! The Cell Food™ supplies 78 trace, colloidal, ionic minerals, 34 enzymes, and 17 amino acids. Cell Food™ is used by many naturopaths and natural healers. Remember, more oxygen means more superoxide free radicals producing more hydrogen peroxide free radicals that do great harm, especially to the lungs, if not neutralized with SODzyme™! You must supplement with antioxidants when doing oxygen. The best antioxidant formulas available are Mannatech's Ambrotose AO™ and SODzyme™.

Live Blood Analysis is a method of prescreening the blood that can be most revealing of a condition usually ignored. That is, the clumping of the blood. Blood clumps or sludges for several reasons. Platelets can become sticky. Red cells can fail to repel one another, especially following a high fat meal that lacks sufficient lipotrophic factors (chiefly lecithin, and vitamins B-complex, E, and C). It will show undigested carbohydrate particles circulating in the blood (signaling a need for digestive enzymes). It has been shown that when these clumped platelets, red cells, or undigested carbohydrate particles reach the small capillaries, they create a slowing or stoppage of blood flow robbing the cells in that area of necessary nutrients and waste removal. Additionally, a deficiency of glutathione tends to cause red cells to deform or burst, white cells decline in functional activity, and an alkaline condition of the blood ensues that constricts the blood vessels and reduces blood flow and oxygen transport still further. All this is evident by looking at one drop of blood under the electron microscope! Further, mercury binds to oxygen-carrying sites on hemoglobin reducing oxygenation of cells. All these causes of reduced oxygenation of cells lead to undesirable symptoms, many classed as autistic. Very low mercury concentrations block intestinal vitamin B_6. Bind mercury by supplementing 50 mcg of selenium at each meal and 1 -3 mg of melatonin at night.

Garlic, vitamins E and C, bromelain, the flavonoids (with rutin), and omega-3 fatty acids all "thin" the blood. Use these in preference to aspirin. Under high stress, it is reported that aspirin fails to affect the platelets. Recent studies by Dr. John Folts, Ph.D., who first touted aspirin, shows these nutrients reduced activity of platelets about 52%, the same as aspirin, without the side effects or failure of aspirin. If taking coumarin or other prescription for thinning the blood, consult with your doctor before adding these supplements. He can help wean you off the drug that has considerable side effects. Ginkgo Biloba effectively increases circulation and nutrient supply to the brain that is desperately needed by these children, however, because it enhances Phase I liver enzymes, it should be used for only a few weeks unless you are certain that Phase I needs to be enhanced. It should not be used at all by one with a lack of fatty acids or with the PST problem. St. John's Wort enhances Phase I by 100%, and reduces

effectiveness of blood thinners and "The Pill" as much as 40%. See my Electronic Book, "Self-help to Good Health", Chapter titled "Sludged Blood" for additional details of how to improve circulation and oxygenation.

While a large number suffer Thrombophilia (sludging of the blood), not a few suffer nosebleed. This is caused by a number of things:

1. Copper deficiency causes blood vessel fragility and can lead to aneurysms and stroke. This is a very serious condition that should not be overlooked. Closely related would be a zinc deficiency.
2. Vitamin K deficiency that prevents proper blood clotting. This has many ramifications spelled out in my post to www.yahoogroups.com/group/Williss dated 7/22/02. Join my group, and look in the FILES section.
3. Calcium deficiency as a result of vitamin C deficiency. Actually, this is a symptom of Scurvy.
4. Vitamin B_{12} deficiency. This is likely with those on a vegan/vegetarian diet. A lack of vitamin B_{12} weakens blood vessels and causes easy bruising and possible nosebleed.
5. Low phosphorus levels, leading to mishandling of iron, possibly a result of mercury poisoning.
6. Formaldehyde poisoning.
7. Side effects of Cipro and possibly other drugs that mess with the above nutrients.

As stated above, several things "thin" the blood. They are not the cause of bleeding, but could make it harder to stop the bleed. You might want to reduce vitamin E to 200 IU for the same reason. When you solve the cause, then you could consider increasing these again.

Transfer Factor

As previously indicated, bovine colostrum is very effective is helping the immune system destroy bacterial, viral, and fungal infections (including Candida) in that it supplies large amounts of IgA and lactoferrin, and boosts the natural killer cell function and glutathione production, too, when sufficient substrates (the amino acids cysteine, glycine, and glutamine) are available. It has been used effectively in reducing inflammation in autoimmune conditions. It also increases Growth Hormone (hGH) that benefits the transport of amino acids into cells, and elevates the uptake of blood glucose, and causes greater utilization of fat for energy. It (hGH) also tends to increase muscle mass. Increased production of growth hormone greatly increases the need for EFAs.

Researchers at the University of Pittsburgh School of Medicine have been able to demonstrate, for the first time, that children who face a greater risk for the illness, through family history of major depression, produce significantly less growth hormone than their normal peers when given growth hormone releasing hormone. This builds on their research from 1994 that discovered children and adolescents with acute episodes of major depression secrete less growth hormone during and after their illness.

There is a product called "Transfer Factor™" (TF) derived from colostrum in which the factors in colostrum that boost the immune system's ability to recognize and destroy antigens (foreign substances or bugs it has never been exposed to) are concentrated to about 100 to 1. This "messenger molecule" is not destroyed in the stomach as a protein antibody would be. Thus, the immunity of the cow, which contains many of the antibodies of the human, is transferred to the human. It is also said to be an immune modulator, boosting Natural Killer Cell function and activity significantly while either boosting or suppressing T-cell activity as needed. You purchase it from 4Life™ at: www.supercolostrum.com/colostrum/Information/information2.htm. There is a general "Transfer Factor", and there are specific "Transfer Factor" products, (e.g., one where the source was infected with a specific virus should enable the body to overcome a chronic infection by that virus). There is a version of "Transfer Factor" from Chisolm Biological Laboratory that uses eggs as the source. Dr. Fudenberg's group did considerable work with this, I

understand. While the 4Life™ "Transfer Factor" gives the wide exposure of the cow to the human, the Chisolm ImmunFactor™ gives the free-range exposure of the chicken, plus the chicken is then exposed to specific human antigens to produce eight combinations of "Antigen Specific Transfer Factors". Thus, several select antigens such as various viruses and Candida can be specifically targeted (www.chisolmbio.com or 800-664-1333). The need and benefit of such products is easy to understand when one recognizes most of these children are suffering with one or more low grade, chronic infections, and their immune system either does not recognize it, or does not have the antibodies sufficient to destroy it. Dr. Hugh H. Fudenberg has done the definitive work with TF in autism. An abstract of a study with autistic youngsters follows:

Fudenberg, H. H. Dialysable lymphocyte extract (DLyE) in infantile onset autism: a pilot study. Biotherapy 1996;9(1-3):143-7. Immuno Therapeutics Research Foundation, Spartanburg, S.C., USA. Abstract: 40 autistic patients were studied. They ranged from 6 years to 15 years of age at entry. Twenty-two were cases of classical, infantile autism; whereas 18 lacked one or more clinical defects associated with infantile autism—dubbed "pseudo-autism". Of the 22 with classic autism, 21 responded to transfer factor (TF) treatment by gaining at least 2 points in symptom severity score average (SSSA); and 10 became normal in that they were mainstreamed in school, and clinical characteristics were fully normalized. Of the 18 remaining, 4 responded to TF, some to other therapies. After cessation of TF therapy, 5 in the autistic group and 3 of the pseudo-autistic group regressed, but they did not drop as low as baseline levels. PMID: 8993773, UI: 97146917.

I understand that the product should be used for three or more months, and then to prevent regression, it should be pulsed (used for a few days) every three months.

Negative Effects of Secretin

Let's stop and think what Secretin does to lipid (fat) metabolism. Autistic kids are universally deficient in the fatty acids. Secretin is a pro-oxidant hormone. The metabolic impact of Secretin is that it stimulates the arachidonic acid cascade (contraindicated in seizure disorders) and bicarbonate production, oxidizes or burns off (beta oxidizes) fatty acids (including both essential fats, insulating fatty acids, and very long-chain, fatty acids), increases the metabolism of bile acids, and, theoretically, may stimulate Cholecystokinin-B (CCK-B) that plays a neuromodulatory role in the regulation of GABAergic neuronal activity perhaps (theoretically) stimulating speech. **When a child receives Secretin repeatedly without replenishing the lipids (fatty acids) and catalysts (vitamins and minerals), the impact could ultimately be quite negative.**

On the other hand, children with autistic spectrum disorder tend to have a buildup of very-long-chain, fatty acids (VLCFA) indicative of suppressed, peroxisomal, beta-oxidation. Support for the thyroid, and supplementation of manganese, selenium, carnitine, and vitamin B_2 stimulate beta-oxidation of fatty acids, but high carbohydrate meals stimulate insulin response and inhibit beta-oxidation. Characteristically, plasmalogen synthesis (any of various glycerophospholipids in which a fatty acid group is replaced by a fatty aldehyde group) and beta-oxidation of very-long-chain fatty acids are affected. It's been found that patients with generalized, peroxisomal disorders have a profound brain deficiency of docosahexaenoic acid (DHA; 22:6 n-3) and low DHA concentrations in all tissues and in the blood (is it any wonder since DHA has only been allowed in baby formula very recently). Supplementation with docosahexaenoic acid (DHA) [22:6 (n-3)] ethyl ester (EE) (DHA-EE) normalized blood DHA values within a few weeks. Plasmalogen concentrations increased in erythrocytes in most patients and after DHA concentrations were normalized, amounts of VLCFAs decreased in plasma. Liver enzymes returned almost to normal in most cases. From a clinical viewpoint, most patients showed improvement in vision, liver function, muscle tone, and social contact. In three patients, normalization

of brain myelin was detected by magnetic resonance imaging. In three others, myelination improved. In a seventh patient, myelination is progressing at a normal rate. Balancing these fatty acids can control brain performance! While characteristic alterations are varied, they classically involve elevations of AA/EPA/DHA and suppression of GLA/DGLA in autism; suppression of AA/DHA in Schizophrenia and bipolar; suppression of GLA/AA/EPA/DHA, and adrenic acid in ADHD; variable EFA instability (high or low AA/DHA) in depression; low Omega 6 (including AA) and elevated Omega 3 in Chronic fatigue syndrome. Curiously, DHA is a VLCFA.

The use of Secretin stimulates the burning off of these aberrant, excess lipids (VLCFAs) that irritate the brain (and many other systems of the body); thus, in that degree, Secretin is of immediate benefit. The administration of Secretin, DHEA, pregnenolone, or thyroid hormone stimulates the beta-oxidation (burning within the mitochondria for energy) of VLCFAs, as would nutrients (riboflavin, pyruvate, manganese) and oxidative therapies that stimulate oxidation, prostaglandin synthesis, and detoxification. Excess VLCFAs indicate a deficiency of cytochrome p450 (Phase I) liver enzymes, and pregnenolone increases Phase I activity by conserving existing Phase I enzymes. Milk thistle, Turmeric (curcurmin), ginger, Royal Jelly, Sheep Sorrel, and Pau D' Arco enhance Phase I activity. Stimulating beta-oxidation, however, concurrently stimulates the burning off of all essential fatty acids (EFAs), as I said. These must be supplemented.

Children with ASD most often present with alkalosis, low CO_2/Bicarbonate, and low oxygen. The spacy, dreamy, lack of clarity state you observe in most autistic children is often associated with a low bicarbonate and disturbed electrolyte status. Insufficient oxygen in the brain can lead to a spacy, confused, non-alert quality also. Infusions of Secretin will correct the alkalosis that most children with ASD present, ultimately impacting their hyperammonemic states that may be stabilized with the increased bicarbonate production (bicarbonate released from the pancreas plus ammonia yields urea that can be excreted). Sulfur containing amino acids become ammonia and remain ammonia without adequate folic acid, B_{12}, zinc, and molybdenum. Excess ammonia in the blood is associated with excess lysine. Elevated, systemic levels of ammonia are toxic, and possible symptoms include: protein intolerance, headaches (migraine), fatigue, irritability, diarrhea, and nausea. These may be episodic symptoms associated with high-protein meals. Chronically elevated ammonia in the CNS can result in decreased cognitive function, confusion, slurred speech, and blurred vision. When the bloodstream is extremely acid, the kidneys use a different method and excrete ammonium ions, which contain four hydrogens, into the urine. In this instance, it may be a mistake to reduce urine ammonia levels before correcting the body pH.

"Peroxisomes are organelles within cells that are pivotal in the biotransformation of endogenous compounds in lipid metabolism such as fatty acids, steroids, prostaglandins, the formation of myelin, neurotransmission, and detoxification of exogenous compounds and xenobiotics (phenols and other compounds discussed under the section PST). VLCFAs are fatty acids with 22 or more carbons. **Normally, these are oxidized down to C20 or less by p450 oxidase enzymes in the peroxisome organelles in the liver. These C20s are then shuttled by carnitine into the mitochondria for further metabolism.** However, mitochondria cannot metabolize VLCFAs, so, they then accumulate in the nerve cells where they have toxic effects. This is almost universally true in autistic children, but is also seen in Alzheimer's patients, chronic fatigue, Zellweger's, and cardiovascular disease. The accumulation of VLCFAs [Docosahexaenoic (DHA), Docosapentaenoic w3, Behenic, Lignoceric, and Nervonic] inside the cell membrane represents defects in peroxisomal, beta-oxidation, rather than a mitochondrial disturbance. This accumulation may be used to profile the deleterious effects upon the brain, endocrine, gastrointestinal, and immune systems, as well as the cytochrome P450 liver enzyme derangement involving nitric oxide synthase (NOS) characteristic in autistic spectrum disorder due to autoimmune presentation. Therefore, the toxic aspect so often described in autism may be defined clearly through examination of Red Blood Cell lipids with elevation of VLCFAs being a reflection of blocked

detoxification mechanisms"—Patricia Kane. This would indicate an inhibited Phase I pathway, probably hypothyroidism, and a lack of vitamin B_2 and manganese.

Additionally, a recent study shows another disturbing aspect of this fatty acid imbalance on cell walls: Abstract: Red blood cell fatty acid compositions in a patient with autistic spectrum disorder: a characteristic abnormality in neurodevelopmental disorders? J. G. Bell, J. R. Sargent, D. R.Tocher, J. R. Dick Nutrition Group, Institute of Aquaculture, University of Stirling, Stirling UK

"Summary: The fatty acid compositions of red blood cell (RBC) phospholipids from a patient with autistic spectrum disorder had reduced percentages of highly unsaturated fatty acids (HUFA) compared to control samples. The percentage of HUFA in the RBC from the autistic patient was dramatically reduced (up to 70%) when the sample was stored for 6 weeks at (-) 20 degrees C. However, only minor HUFA reductions were recorded in control samples stored similarly, or when the autistic sample was stored at (-) 80 degrees C. A similar instability in RBC HUFA compositions upon storage at (-) 20 degrees C has been recorded in schizophrenic patients. In a number of other neurodevelopmental conditions, including ADHD and dyslexia, reduced concentrations of RBC HUFA have been recorded.

"Evidence suggests that the HUFA instability observed in a patient with ASD, and found in other neurodevelopmental disorders, may be caused by increased phospholipase activity, perhaps in conjunction with increased auto-oxidative stress. The evidence available suggests that autistic spectrum disorder involves an aberration in lipid metabolism that results in alterations in cell membrane phospholipid structure and function, and that these alterations are similar in a number of other neurodevelopmental disorders. The tryptophan metabolite, indole acroyl glycine (IAG), has been found in the urine of the majority of patients with ASD, and has also been identified in numerous other neurodevelopmental disorders. The precursor of IAG, indole acrylic acid, when added to cells in culture affects the cellular PUFA compositions and the production of PgE."

Autism is said to often involve a demyelination of the myelin sheath of nerves, disrupting nerve transmission. Brain autoantibodies to both myelin basic protein (MBP) and neuron-axon filament protein have been found in autistic children who have about 8.3 times greater incidence of antibodies to MBP than control children. The perineuronal nets around neurons, which modulate their function, are primarily composed of chondroitin sulfate. Low sulfur would thus yield less modulation of neurons. Hepatitis B vaccine was found to inhibit sulfation chemistry for at least one week in typical people. When TNF (tumor necrosis factor) is elevated (frequently in autism), through interference with dioxygenase and sulfite oxidase, it can inhibit the conversion of cysteine to sulfate. This could be a contributing factor in PST. This can lead to decreased blood flow into the brain, a loss of Purkinje cells (often found on autopsy), alterations in neurotransmitters and neuropeptides, and possibly demyelination as found in multiple sclerosis (MS). TNF also competes with insulin at cell receptors, contributing to Insulin Resistance.

Mercury and other heavy metals (such as lead) can cause progressive myelin degeneration with the development of antibodies to myelin basic protein (MBA) and glial fibrillary acidic protein (GFAP). Recent discovery of herpes virus-6 in the damaged areas of the brains of 73% of Multiple Sclerosis sufferers is indeed disturbing. The nervous system, once the insulation is stripped, can be likened to your home with bare wires inside the walls—a dangerous situation. In the body, symptoms may be many and varied:

1) tremors, shaking, "palsy" due to malfunction of nerve transmissions
2) uncoordination in walking, writing, and other automatic physical movements
3) slurred speech
4) excessive salivation
5) deterioration of memory and thinking processes

6) blurred vision
7) difficulty urinating, incontinence
8) environmental sensitivity, allergic to smells, food, clothing, electrical equipment
9) breathing problems, short of breath
10) nervousness or nervous breakdown
11) numbness and tingling in extremities
12) heart problems/arrhythmias.

Some have found Sphingolin™ most helpful (Ecological Formulas 800-888-4585). Vitamin B_{12} is often lacking, and it is essential to sheath formation. Additionally, nervonic acid, EFAs, and very-long-chained-fatty alcohols have clinically been shown to yield positive outcomes. These benefit the myelin sheath, increasing perception and response. Dr. Jeff Bradstreet, however, reports that children who took oral, myelin-basic protein (Sphingolin™) seemed worse when they were infused with Secretin. The Secretin burned off the fats (needed to make myelin and prostaglandins, both the insulating fats and the very-long-chain fats). It is a big "no no" to stimulate with peptides (Secretin) or with Sphingolin™ without fats! (Patricia Kane) If you choose to infuse, you must supplement generously with Evening Primrose oil (EPO); and always with fatty acids, you must supplement with the antioxidants vitamin C and vitamin E with selenium, preferably before beginning the EPO. A failure to do so may promote seizures, neurological disorders, and increased cancer risk due to increased free-radical activity. Additionally, Dr. Woody McGinnis, MD, USA, has reported investigating two seizures that occurred during or immediately following Secretin infusion. One was near fatal. Make sure the one infusing is ready for any emergency. It is probably inadvisable to infuse one who is subject to seizures. Dr. McGinnis tells of a doctor whose son started having seizures (not immediately, but delayed) after Secretin. She found the urinary pH really alkalotic, gave him generous unbuffered vitamin C, and says the seizures abated. Perhaps, before infusion, one should check for an overly alkaline urine, and do so again after the infusion to anticipate and forestall any possible seizures.

In the case of inadequate HCl production, infusion or transdermal supply of Secretin may indeed help, but it does not fully address the most basic need—that of necessary digestion and utilization of food. The proper course for many seems not to be Secretin infusion, but a supplementing of hydrochloric acid to the degree necessary to trigger release of the Secretin so vital to proper digestion and hormonal response. In at least a minority of these children, the gut will be able to release adequate Secretin. The supply of adequate acidity to the chyme would then "Kick Start" Secretin production. One mother reports, "Since I followed your suggestion, and supplemented HCl, my son has the same responses he had to his Secretin infusion!"

Hydrochloric Acid May be a Solution

In view of the above, I think it better to address the need for HCl first. Low HCl production is associated with many problems. Iron deficiency anemia, owing to poor iron absorption or to lead or cadmium poisoning, and osteoporosis, resulting in part from decreased calcium absorption, are two important problems. Lead depresses potassium, zinc, iron, and copper levels in the body, and causes excretion of calcium. The Cincinnati Health Department screened 3,337 children for lead poisoning in 2001. Of those, 3,139 had blood-lead levels lower than 10 micrograms/deciliter, the maximum amount the government considers safe; 161 had levels of 10-19; and 37 had levels over 20. A study by the University of Medicine and Dentistry of New Jersey showed that nearly **60 percent of four-to eight-year-olds consume too little calcium. When exposed to lead in the environment, these children "may be faced with anemia, reduced IQ and learning difficulties as well as aggressive, violent, and anti-social behavior," reports the study's co-author, Dr. John Bogden**. Tests have shown the highest lead levels correlate with the lowest calcium levels. Calcium binds lead and prevents its absorption. Similarly, selenium, zinc, and melatonin binds mercury, cadmium, and arsenic and prevents their absorption. I

suggest selenium be consumed with all fish to prevent mercury absorption. These four nutrients must be supplemented adequately to reduce heavy metals poisoning, however, as noted, the minerals require HCl for absorption and utilization.

When deficient of minerals, the body will, in desperation, take up look-alikes from similar or same chemical families with similar outer orbitals. Without the real thing the final enzyme or hormone will not work correctly, creating more body dysfunction.

Other toxic mineral elements that substitute or interfere with essentials and cause great bodily harm are: LEAD - which substitutes for calcium and interferes with magnesium and zinc; CADMIUM - 10 times more toxic than lead and found in cigarette smoke and welding, substitutes for zinc; and MERCURY - substitutes for selenium. Selenium is essential for an enzyme necessary for thyroid hormone production, as an antioxidant to help prevent cancer and aging, to prevent viral mutations to more aggressive forms, and to devitalize toxic substances. For every essential mineral, there is at least one toxic substitute. **When the body gets enough of the real thing, it will release the toxic substances.**

Notes from a lecture by Dr. Garry Gordon, MD: "You understand that if I gave you 1,000 mcg of selenium a day, that would be toxic, that's a really big dose. But what if it didn't increase your plasma or serum levels for one-week, two weeks, three weeks, or four weeks? I've done this with some cancer patients giving 4,000 mcg of selenium and it didn't go up, sometimes for six weeks! When it finally goes up, they can get symptoms, the nausea, the metallic taste, some Paresthesia, numbness, but during that time what was I doing? I was tying up every atom of mercury. We estimate there are about 40 million atoms of mercury in the average cell in your body. I was tying up every one of them into a lifelong marriage so that the mercury was not able to depress glutathione synthesis, and I was therefore able to see results in treating my cancer patient who couldn't afford to take it all out.

"By giving selenium, you can virtually prevent mercury toxicity, so I don't have to treat a patient who's got a mouthful of mercury, and force them to spend $20,000 they don't have. If I mainly am focusing on saving their life, I will do it with selenium."

Additionally, sweet potatoes contain something called "phytochelatins" that help bind harmful substances like copper, cadmium, mercury, and lead that most of us are exposed to on a regular basis from air pollution. The phytochelatins help pass these toxins out of the body. Heavy-metal overloads can effectively be treated using oral supplements of Ambrotose AO™ and PLUS by Mannatech, Inc., zinc, manganese, selenium, N-acetylcysteine (NAC), serine, iodine, melatonin, cilantro, transdermal or oral glutathione, and vitamins B_6, C, and E, and sweet potatoes. The initial treatment must be gradual to avoid a sudden dumping of metal toxins from tissues, which could cause kidney damage and a worsening of symptoms. Incidentally, cilantro tones up digestion.

General allergies and, specifically, food allergies are correlated with low HCl. Poor food breakdown and the "leaky gut" syndrome are associated with food allergies. More than half the people with gallstones show decreased HCl secretion compared with gallstone-free patients. Diabetics have lower HCl output, as do people with eczema, psoriasis, seborrheic dermatitis, Vitiligo, and tooth and periodontal disease. With low stomach acid levels, there can be an increase in bacteria, yeasts, and parasites growing in the intestines, and an increase in allergies. Ironically, food allergies (particularly to milk and dairy) are one of the many causes of low stomach acid. For some, it is a vicious cycle of allergy lowering HCl, causing more allergies with resultant lower stomach acid. Zinc is critical to production of HCl, and thus its deficiency can be causal to all the above conditions.

You may obtain Betaine Hydrochloride or Glutamic Hydrochloride, 10-grain capsules from the health food

store. If allergic to beets, choose Glutamic Hydrochloride. If sensitive to sulfites [MSG—Chinese restaurant syndrome, or diagnosed as suffering from phenol-sulfotransferase deficiency (PST)], choose Betaine Hydrochloride. Glutamic acid hydrochloride is only mildly acidic, and does not work as well as betaine hydrochloride. Betaine may be used alone, in supplements, but preferably with pepsin and other digestive agents. A child should get good results with one to five, 10-grain capsules, adults with five to ten (a predominantly pasta meal would need less than a high protein one). Start with one, and increase gradually. For children who will not swallow a capsule, it may be mixed with the food, or mixed in a small amount of drink that will be consumed completely. Woodlands Healing Research Center reports an older autistic boy showed marked improvement in digestive function, and a dramatic reduction in agitation when the mother began mixing betaine hydrochloride with pepsin into meat, poultry, or other protein foods before meals.

Low stomach acid can be corrected by eating a balanced diet of wholesome foods, and by reducing our daily levels of stress. Niacin stimulates HCl production. This can be taken before meals, as can potassium chloride and pyridoxal-5-phosphate (the active form of vitamin B_6) to help stimulate the body's own HCl output. Zinc is essential to HCl production. Drinking the juice of half a lemon squeezed in water or a teaspoon of apple cider vinegar in a glass of warm water 30 minutes before meals helps, and supplements taken during or after meals should be swallowed using the lemon or vinegar treated water. This may well eliminate stomach pain among other benefits. Use of Swedish Bitters or gentian has been helpful in improving digestion.

We are talking acid here. One 10-grain tablet of HCl in 1-1/2 ounces of water will have a pH of about three. This is not nearly as strong as what you may have experienced when you burped, and the acid really burned your throat; but, when HCl is mixed with food, it must be swallowed right down without chewing. Do not leave this food in the mouth. It could damage the enamel on the teeth. Additional food should be eaten immediately to clear the throat. If mixed with a drink, drink it with a straw to protect the teeth. Rinse the mouth, and swallow to clear the throat. Try it yourself, Mama. You may be surprised to learn that a Coke™ is even more acid (2.8 pH)! As with all such matters pertaining to your child's health, consult with your medical professional.

If the hydrochloric acid is sufficiently strong, and the gut is able to release Secretin, and the pancreas is functioning, the use of an enteric-coated, alkaline tablet will not be needed to neutralize the acid in the intestine. The pancreas will normally release enough bicarbonate based on the strength of the Secretin signal. The amount of Secretin released is dependent on the amount of hydrochloric acid in the chyme entering the gut.

Where HCl is adequate, but Secretin is not being adequately produced, or the pancreas is not functioning well, the proteolytic enzymes may not be released; or, because of a lack of bicarbonate of soda, they will be destroyed by the acidity of the chyme. This can result in incomplete breakdown of proteins. These "foreign" protein molecules may be absorbed into the bloodstream, and circulated throughout the body. These "peptides" can cause all types of allergic (autoimmune responses) or toxic reactions, in particular those relating to breathing and skin irritation. Taking an alkalizing substance (an enteric coated pill) in that case, will neutralize the stomach acid in the gut, prevent the destruction of the proteolytic enzymes if any are available, and maintain an environment for the flora of the gut. If a tablet is not available, taking 1/2 teaspoon of bicarbonate of soda in a glass of water after the stomach begins emptying (about 2-1/2 hours after eating) can be just as effective. Without sodium being present glucose cannot be absorbed. Picture a revolving door in the wall of the gut with two segments. Without these two substances filling the segments, the door won't turn. Mercury causes excessive sodium excretion, as shown in studies of dental amalgam placed in monkeys and sheep (Lorscheider et al, 1995). This glass of soda will lift your spirits and sustain you in times of stress.

Do not take any water, tea, or other nonfood drink with a meal or within two hours as that will dilute the HCl and hinder digestion. If you must drink water to take pills, put a tablespoon or more of lemon juice or

apple cider vinegar in the water to help preserve stomach acidity. A convenient way to overcome gastric reflux that affects so many is to take the HCl with meals, or to drink a glass of warm water with one teaspoon of raw, unfiltered, apple-cider vinegar when you experience it. You may sweeten it with some honey if you must.

As to the amount of acid in the capsules, you will not begin to administer as much as a normal stomach produces for an average adult meal (estimated to be equivalent to 30 capsules). It is the quantity as well as the degree of acidity that is important. Normal pH must be below three (preferably two) to convert pepsinogen into pepsin (needed to digest protein). It is often as low as one (the strongest acid).

If there is burning or pain, or if the digestive distress experienced previously (bloating, belching, heartburn, reflux) becomes worse, discontinue the use of the hydrochloric acid. Sensitivity of the stomach to acid (especially a burning pain just below the sternum) may indicate an ulcer. However, it likely indicates the person is dehydrated, or using aspirin or NSAID for pain. Everyone should drink a large glass of water 30 minutes before eating. That will rehydrate the mucus lining of the stomach, and protect the stomach from the acid. If there seems to be adverse reactions other than pain or burning, an allergy to Betaine (beets) Hydrochloride may be the cause. Try Glutamic Hydrochloride instead.

The zinc-dependent enzyme, carbonic anhydrase, controls HCl production. Toxins of bacterial overgrowth, gluten-casein peptides, metabolic acidosis, and lack of zinc all depress this enzyme. An inflamed, irritated gut present in autism will not absorb zinc well. You must supplement zinc, balance your zinc-copper ratio, and restore the proper body pH to restore HCl production. This pH can be improved by supplementing ionic calcium—that autistics are universally lacking. When there is adequate calcium, the saliva will be near pH 7.0 between meals, anything less than pH 6.5 is cause for concern.

There are some simple tests that may help determine if you or your child lack HCl. There is a hydrochloric acid reflex present on the bottom of the lowest rib (right side) approximately one inch lateral to the midline. If this area on the rib is tender to palpation there is a strong likelihood the person is deficient in hydrochloric acid, and would benefit from supplementation (a tenderness on the left rib indicates a lack of digestive enzymes.)

Additionally:

1. Drink four ounces of beet juice on an empty stomach. If this turns the next urine red, suspect low HCl for there isn't enough acid to break down the red pigment—but, you could be iron deficient.
2. Check the pH of the urine—drink four ounces of grapefruit juice, or a lemon–orange juice mixture, on an empty stomach. Test the pH of the urine one hour later. If it is significantly more acid (lower pH number), suspect low HCl. The citric acid should have been broken down.
3. If you have heartburn or a too–acid feeling, swallow a tablespoon of fresh lemon juice. If it makes the symptoms worse—you have more than enough hydrochloric acid. If the symptoms are relieved, you need HCl.
4. If it appears that you may need additional HCl, obtain a bottle of 10-grain HCl (with pepsin) **in capsule form** from the health food store; "Adults...take five...of such a product with a meal. If you do not suffer the usual burps and belches, you have proven in one hour that you have need for digestive support. If five...solve your problem, then try four the next meal, then three...you will finally have a recurrence of the old symptoms. Slowly increase the dosage each meal to find the dosage needed to prevent symptoms. Continue that dosage indefinitely."—*Indigestion* by Doctor Kurt W. Donsbach.

You may need more than five, usually ten is enough for an adult; however, if your symptoms worsen, you are overproducing HCl. To aid in restoring vibrant health, strength, and normal weight, utilize that number of

capsules of HCl with each meal. Be sure to take the HCl after the meal, so as to allow starch digestion to proceed for the first 45 minutes, and so as not to discourage the stomach from supplying all the HCl that it can. The Betaine can be discontinued once the reflex point is non-tender to deep palpation, or the other tests show no further need. Additionally, since amino acids must be digested from the diet, low levels of at least three of the essential eight on a fasting, plasma, amino-acid test would likely indicate a lack of HCl.; however, a gluten intolerance could be impairing protein assimilation. A deficiency of pancreas function could also be involved.

Biochemical Observations

Common features in those with autism include: raised blood or serum lactate, regional disturbances in glucose uptake in the brain, particularly in the cortex, and reduced brain levels of high-energy phosphate compounds. This is another curiosity of autism. Actually, children's diets are overloaded with phosphate, and that is one reason for hyperactivity. Children are at increased risk to other conditions that result from excessive phosphate intake. These include: infant colic, sleep disturbances, eczema, allergies, and asthma. Avoidance of phosphates in sodas, processed meats, and baked goods has often been found to be effective against these conditions.

These observations would suggest a mitochondrial energy disorder in the brain. Mitochondrial dysfunction may result from any of the following four imbalances:

1. Impairment of mitochondrial fatty acid oxidation due to carnitine deficiency. Carnitine pumps fatty acids into the mitochondria. With the help of vitamins B_6, C, and niacin, the body produces carnitine from the amino acids lysine and methionine found in high quality protein. Adequate amounts are not thus formed so some carnitine must come from muscle and organ meats in the diet for it is not found in vegetables. Obviously, a low protein or a vegetarian diet would likely create a deficiency of this vital nutrient, and impair the mitochondrial function causing a loss of energy and a build up of triglycerides and fatty acids in the blood and cells.

The Cincinnati Children's Hospital Medical Center's Department of Enzymology has identified two patients with the "carbohydrate deficient glycoprotein syndrome" through alpha-1-antitrypsin phenotyping. The carbohydrate deficient glycoprotein in the serum of these patients produces a band on polyacrylamide gel isoelectric focusing that moves cathodally of the Z-band. In the area of carnitine deficiency, there is, for example, less than 5% of normal muscle carnitine concentration. After carnitine supplementation, patients unable to talk or walk, with hypotonic musculature and symptoms of autism, became able to walk with the help of a walker. They could stand alone for short periods, and they acquired an interest in their surroundings. The common findings of carnitine deficiency were an impaired ability to walk, muscular hypotonia, reduced muscle carnitine concentration, and an improvement in locomotion while on carnitine.

Cellular energy production itself produces free radicals that can damage cell structures, including the mitochondria, and ultimately lead to various diseases if the body's natural antioxidant capacity is inadequate. Acylcarnitine and lipoic acid are both endogenous (naturally present in the body) antioxidants that have been shown to restore the mitochondrial function and reduce free radical damage. (Hagen TM et al., 1998; Lyckesfeldt J et al., 1998). Together with coenzyme Q10 and NADH, they work to maintain the function of the mitochondria.

It should be noted that not only fatty acids are needed, but glucose must be able to enter the mitochondria to produce energy needed by the cell and by the muscles. Just as L-carnitine pumps in fatty acids, Alpha Lipoic Acid pumps in glucose, thus, its supplementation tends to overcome syndrome X, where the cells are resistant to glucose. This resistance produces unnaturally-high, blood levels of insulin and sugar.

Since the amino acid L–carnitine is frequently lacking in the autistic, this could predispose to heart problems and a lack of energy. The primary function of carnitine is to escort fatty acids into the mitochondrial furnace where the fat is

burned to fuel ATP for energy. In this action, it reduces blood levels of triglycerides and cholesterol dramatically and aids weight loss. It boosts energy levels for those suffering from elevated blood sugar levels and kidney insufficiency. This reduces fatigue. Tests by Dr. Carl Pepine at the University of Florida showed that carnitine increases blood flow in the heart by 60%, and reduced vascular resistance 25%. It reduces heart arrhythmias by 58% to 90% in patients with chronic heart problems. He reported that patients were enabled to walk 80% farther before discomfort set in. Dr. A. Feller (1988) reported in the Journal of Nutrition that arrhythmias are usually a result of a carnitine deficiency. The heart is enabled to pump more blood, with fewer beats, and with less tendency toward oxygen deprivation. Vitamin E would be its ally in this for it enables muscles to function on 40% less oxygen. This would relieve angina and reduce risk of heart attack. A deficiency of carnitine may result in chronic tiredness, fatigue, nausea, dizziness and anemia. Lysine is converted to carnitine, and carnitine increases Acetylcholine an important neurotransmitter. Autonomic system abnormalities can be caused by disturbances in Acetylcholine levels, known to be deficient in both autism and mercury poisoning.

L-carnitine (500 mg capsules twice daily on an empty stomach, or with a carbohydrate snack) reduced ketone, triglyceride (up to 40%), and cholesterol (up to 21%) levels, and increased HDL levels (up to 15%). Acetyl-L-carnitine is equally effective with one added benefit. It decreased oxidative damage to the brain that was not observed with L-carnitine. The suggested use is 200 mg three times a day, increasing after one week to 400 mg three times daily, to improve brain energy levels. Basic L-carnitine may draw moisture and become unstable, and it is not the most bioavailable. While the citrate, lactate, and tartrate are good forms, the most effective form is L-carnitine fumarate. It is up to 9% more bioavailable. Carnitine will conserve calcium, magnesium, and potassium, and may reduce heart arrhythmias and fatigue—which will reduce risk of heart attack.

Due to increased fat burning, carnitine supplementation creates a significant need for caloric increase. If none is supplied there will likely be weight loss. It also generates increased free radicals that can severely damage cells unless additional antioxidants are supplied—particularly vitamins C and E and selenium. Additionally, lower than normal levels of certain essential fatty acids, such as cholesterol (needed as the precursor to many hormones) and triglycerides (a large proportion of the blood's fatty substances) can be exacerbated by supplemental carnitine. One Mother says, "We lost our seizure control, and did not regain it until calories had been upped significantly...Please, everyone, let's consider very carefully the premise that carnitine supplementation creates a significant need for caloric increase." The level of fatty acids in the autistic child is an important factor because the endocrine system and its hormones, the brain and its neurotransmitters, the myelin sheath, and all the immune system components are derived from lipids (fats).

However, mitochondria cannot metabolize very-long-chain fatty acids (VLCFA) which many autistic have accumulated; so, if carnitine pumps additional ones into the cell, they can accumulate in the cells where they have toxic effects. Adrenoleukodystrophy (ALD) is a rare, fatal, degenerative disease caused by a build up of very-long-chain, fatty acids (c22 to c28) that destroys the myelin (protective sheath) of the nerves (remember Lorenzo's Oil? It's a preparation of 20% erucic and 80% oleic acids that might be useful to the autist with accumulated VLCFA). It helps to normalize these fatty acids. Canola oil is a very-long-chain fatty acid (c22) that should be avoided. Inability to handle VLCFAs is almost universally true in autistic children, but is also seen in Alzheimer's patients, chronic fatigue, and cardiovascular disease. The accumulation of VLCFAs inside the cell membrane represents defects in peroxisomal, beta-oxidation that is likely the result of hypothyroidism and a high-starch (high insulin) diet. Therefore, the toxic aspect so often described in autism may be defined clearly through examination of Red Blood Cell lipids with elevation of VLCFAs being a reflection of blocked detoxification mechanisms (that is, the Phase I liver enzymes are sluggish). These can be safely enhanced with Milk Thistle, Bistort, Royal Jelly, Sheep Sorrel, and Ginger, but other herbs that enhance Phase I are usually, potentially, liver toxic. Elevation of DHA is not particularly disturbing unless Omega-6 fatty acids (particularly Arachidonic Acid) are suppressed (both EPA and DHA in excess suppress them). In some cases, the VLCFA DHA is reduced. In that case, supplementation of DHA has proven most

helpful in relieving many symptoms of VLCFA disease.

Carnitine supplementation holds great promise, and it must be supplemented when Depakote™ is being used, but I think there are some things we must guard against. Additional carnitine will pump more fatty acids into the mitochondria to produce additional energy. It would help to know, from a previous blood test, that the triglycerides and cholesterol were normal or elevated. When using carnitine, to avoid creating a deficiency in fatty acids, we must supplement with Evening Primrose and cod-liver oils as outlined elsewhere in this paper, and ensure the child is getting enough calories for his size and activity. The wild card is the VLCFAs. To determine their status run the Red Blood Cell Lipid test. Symptoms of fatty acid deficiency would tend to be thirst, dry skin and hair, brittle nails, excess urination, dandruff, eczema, and rough skin. **If these symptoms, or low triglyceride/cholesterol levels, or excess VLCFAs were present, I would not supplement manganese, selenium, vitamin B2, and carnitine until these problems were being corrected.** As I understand it, carnitine could lower the fatty acids and blood fats adversely, and could overload the cell with VLCFAs that it cannot burn. Look to the thyroid, do the iodine test, and if indicated, support the thyroid.

Autoimmune presentation may be depicted by this elevation of VLCFAs, vaccenic acid, Mead acid, EPA and DHA due to upregulation of nitric oxide synthase and nitric oxide. Status of the immune system is viewed primarily through the balance and sufficiency of EFAs of both the Omega 6 and Omega 3 series. Immune function is highly dependent upon the AA cascade. Although many disorders are indeed inflammatory in nature, depicting elevation of AA, many more disorders are a result of depleted AA stores (as in Chronic Fatigue Syndrome, Crohn's Disease, Rheumatoid Arthritis, Lupus, and metal toxicity) and consequently the body fails to mount an appropriate immune response.

2. A second cause of mitochondrial energy disorder is inflammation associated with the release of excess nitric oxide as mentioned above. The Far Infrared Sauna, the herb Ginkgo Biloba, and DHEA selectively increase the release of nitric oxide synthase, the enzyme that reacts with arginine to produce nitric oxide (NO). It is reported that one week on this sauna showed a 40-fold increase of this enzyme in the endothelial cells of the aorta! This may be great for reducing blood pressure, but these should be avoided in this instance because excess NO can cause uncoupling of oxidative phosphorylation as well as inhibiting the Krebs cycle enzyme, aconitase. This will result in organic acidemias, and low mitochondrial energy production. Lactic acidosis and a carnitine deficiency in autistic patients suggest excessive nitric acid production in mitochondria (Lombard, 1998, Chigani, et al, 1999), and **mercury may be a participant**. Methyl mercury accumulates in the mitochondria, where it inhibits several mitochondrial enzymes, reduces ATP production and Ca2+ (calcium) buffering capacity, and disrupts mitochondrial respiration and oxidative phosphorylation (Atchison & Hare, 1994; Rajanna and Hobson, 1985; Faro et al., 1998). The behavior associated with excess NO production in the autist is maniacal laughter. NO is a gas that lasts only a few seconds. Thus, a large serving of Arginine tends to spike NO and shortly lose its effect. If Arginine is supplemented, use only the time-released type (Perfusia-SR by Thorne Research, Inc.) in order to maintain a more constant, low-level of NO.

Neurological problems are among the most common and serious of mercury poisoning, and include memory loss, moodiness, depression, anger and sudden bursts of anger/rage, self-effacement, suicidal thoughts, lack of strength/force to resolve doubts or resist obsessions or compulsions. Mercury causes decreased lithium levels, which is a factor in neurological diseases such as depression and Alzheimer's. Lithium protects brain cells against excess glutamate induced excitability and calcium influx, and low levels cause abnormal brain cell balance and neurological disturbances. Medical texts on neurology point out that chronic mercurialism is often misdiagnosed as dementia or neurosis or functional psychosis.

Mercury, at extremely low levels, interferes with formation of tubulin, producing neurofibrillary tangles in

the brain similar to those observed in Alzheimer's patients with high levels of mercury in the brain. Mercury and the induced neurofibrillary tangles appear to produce a functional zinc deficiency in the AD sufferers, as well as causing reduced lithium levels. Mercury binds to hemoglobin in the red blood cell, and will reduce the amount of oxygen that can be carried in the blood—a major cause of Fatigue. Mercury, at a level of 1 part per ten million, will actively destroy the membrane of red blood cells. Mercury binds with cell membranes interfering with sodium and potassium enzyme functions, causing excess membrane permeability, especially in terms of the blood-brain barrier. Less than 1 ppm mercury in the blood stream can impair the blood-brain barrier. Mercury also blocks the immune function of magnesium and zinc. Exposure to mercury vapor causes decreased zinc and methionine availability, depresses rates of methylation (a bodily process of converting inorganic forms to organic forms, part of the detoxifying process), and increases free radicals—all factors in increased susceptibility to chronic disease and to cancer. Mercury, especially organic mercury, causes accumulation of calcium into the cells, therefore, one does not want to take much calcium, and one wants to have a high ratio of magnesium to calcium, that is, keep magnesium up and calcium down to reduce the accumulative effects. Mercury also blocks the metabolic action of manganese, allowing an increased production of NO and the entry of calcium ions into cell. Mercury, then, is excitotoxic in its action.

Magnesium and manganese are the doorkeepers regulating the proper amount of calcium entering the cell. Mercury, if excreted in the urine, pulls out magnesium from the body, thus increasing the manganese relative to magnesium levels. Rarely is mercury excreted, and most commonly it migrates to the brain where it can drive both brain toxicity and increases in manganese. In either case, increases in manganese relative to magnesium may increase measles viral mutations. Shifts in magnesium to manganese cations in the body can significantly enhance viral mutation rates by 6-10-fold.

The significance of this in your child's life may be seen in the following: A group measured mercury levels in 15 preterm and 5 term infants before and after Hep B vaccination. According to the group, after-vaccination mercury levels in both preterm and term infants showed a significant increase. Mercury levels in the preterm infants were three times higher than in the term infants, and this was statistically significant, according to the team—Dr. Gregory V. Stajich from Mercer University, Atlanta, Georgia.

A recent study demonstrates that oral administration of N-acetylcysteine (NAC), a widely available and largely nontoxic amino acid derivative, produces a profound acceleration of urinary methyl mercury excretion in mice. Mice that received NAC in the drinking water (10 mg/ml) starting at 48 hr after methyl mercury administration excreted from 47 to 54% of the 203 Hg in urine over the subsequent 48 hr, as compared to 4-10% excretion in control animals. When NAC was given from the time of methyl mercury administration, it was even more effective at enhancing urinary methyl mercury excretion, and at lowering tissue mercury levels. In contrast, excretion of inorganic mercury was not affected by oral NAC administration. Three other nontoxic elements that readily bond to mercury rendering it less toxic and more easily excretable are Oxygen, Sulfur, and Selenium. When eating fish, take 50 mcg of selenium and a capsule of NAC and enjoy! Selenium binds strongly to Mercury, cadmium, and arsenic depleting the stores of this trace element that is needed for cellular health. Latest research shows a conclusive connection between reduced levels of selenium and increased risk of cancers.

A lack of selenium also adversely affects the conversion of T4 thyroid hormone to T3. Stress also reduces the conversion of T4 to the more active T3. Additionally, when the liver can no longer listen to insulin, conversion of T4 to T3 is hindered. However, it is the transformation within the cells that counts, and a lack of glutathione (universal in ASD, said to be at 1/3 normal) not only hinders the conversion, but also reduces uptake of T3 into cells. Researchers found that, in non-diabetic, non-fasting, healthy individuals, T4 to T3 conversion was 36%,

but in those fasting, this dropped to 18%. In diabetic, non-fasting individuals conversion of T4 to T3 was 12% (Nutrition and Healing, July 2004)! Both cadmium and mercury inhibit the conversion of thyroxine (T4) to active T3, but high arsenic (that binds selenium) or low copper enhances it (perhaps by increasing the above conversion rates), leading to high T3 readings. Those doing DMSA have confirmed this. When selenium was depleted, T3 increased. In people who are hyperinsulinemic with a thyroid hormone that comes back totally normal, it is important to measure their T3. Just as often as not, their free T3 will be low, but get their insulin down and it comes back up. Hyperinsulinemia also causes the excretion of calcium and magnesium in the urine. People with hyperinsulinemia (insulin resistance) can take all the calcium and magnesium they want by mouth, and it will largely go out in their urine. Magnesium chloride oil/gel are available to rub on (inquire), and Epsom salts baths can supply needed magnesium sulfate working around this problem.

Paradoxically, in a Chinese study, researchers found that selenium and vitamin E deficiency reduced blood levels of T3 by more than one-third! Vitamin E was thought to protect the T4/T3 conversion process. Nothing is simple when it comes to the hormonal system! All myelination is controlled by T3. Free T3 regulates serotonin and melatonin metabolism. T3 controls serotonin uptake, binding to its receptors, so if there are serotonin problems, look to the thyroid. Arsenic causes T4 to convert to too much T3, which can cause Edema of the Septum Pellucidum and ensuing aggression. Thus, when arsenic poisoned, one may have to watch selenium levels greatly. To efficiently convert T4 to the active form T3, you need a specific ratio of zinc to copper of about 8:1. If you have had hair analysis and or fecal testing or blood tests you may know what your ratio is. If not, I would suggest finding out. Zinc deficiency decreases concentrations of triiodothyronine (T3) and free thyroxine (fT4) in serum by approximately 30%. Most of the zinc is cellular with only a small amount in the blood plasma. Blood tests, therefore, are a poor indicator of systemic zinc status. Mercury (in amalgam, and thimerosal in vaccines) will also cause hypothyroidism by interfering with selenoenzymes (Watanabe et al, 1999), and mercury competes and really messes up zinc absorption/utilization creating all kinds of effects throughout the body.

3. Defects in respiratory chain enzymes produce mitochondrial energy disorders: Pyruvate Dehydrogenase or mitochondrial respiratory chain defects, that is, NAD, NADH, Coenzyme Q10, and cytochrome oxidase deficiency. Although we find a variety of autistic phenotypes to have associated mitochondrial abnormalities, the most common is nonspecific PDD, typically of a form that manifests language and cognitive regression or stagnation during the second year. Most surprising among multiplex families is that the biochemical and clinical markers of mitochondrial disease often segregate in an autosomal-dominant manner (that is, genetically induced). Although no molecular lesion has yet been found in the autosomal dominant families, the biochemical findings are most consistent with abnormal **mitochondrial Complex I activity (that is NAD/NADH activity—WSL).** Early and careful evaluation of autistic children for these more subtle mitochondrial disturbances may rescue them from more severe brain injury (Kelley, Richard, Kennedy Krieger Institute, Johns Hopkins University, Baltimore, MD). Note that the acetaldehyde toxin given off by Candida yeast inhibits the NAD/NADH exchange contributing to an excess of NADH that in turn upsets the delicate reduction/oxidation, or redox, balance in liver cells.

4. Excess glutamate exposure, a common and increasing source being MSG, flavor enhancers, and protein substitutes. Generally, autistic children show low glutamine, high glutamate readings. Plasma levels of glutamic acid and aspartic acid are elevated even as levels of glutamine and asparagine were low (Moreno-Fuenmayor et al, 1996). Mercury inhibits the uptake of glutamate, with consequent elevation of glutamate levels in the extracellular space (O'Carroll et al, 1995). Thimerosal enhances extracellular free arachidonate and reduces glutamate uptake (Volterra et al, 1992) causing an excitotoxic situation. Cells that are without oxygen may release excessive glutamate, exacerbating the situation. Low oxygen is common in autistics. Excessive glutamate is implicated in epileptiform activities (Scheyer, 1998; Chapman et al, 1996). Children's forming brains are four times more sensitive to neuro-excitotoxins. The lower the energy production of the cell, the more susceptible it is to excitotoxicity. Low magnesium levels (common in "our" children) can double free-

radical production and magnify their toxicity! The generation of increased levels of free radicals within the cell can activate the p53 tumor-suppressor gene triggering apoptosis (cell suicide). Excess glutamate can kill neurons by necrosis (by allowing excess calcium into the cells) as well. Magnesium is the calcium regulator. Elevated plasma glutamate lowers cellular GSH by inhibiting cystine uptake.

Additionally, high glutamate levels result in the depletion of glutathione. Streptococcal infection is also more likely to be an issue in individuals with high glutamate levels, as glutamate is related to virulence in streptococci. Streptococcus flourishes in a high glutamate, low glutathione environment. Thus, the combined effects of changes in gut flora and depleted glutathione lay the groundwork for leaky gut.

Additionally, high levels of insulin inhibit an enzyme in the cell wall responsible for helping to regulate proper intracellular calcium balance. Since the interstitial fluid outside the cell usually contains a thousand-times higher concentration of calcium than is normally present within the cell, this excess insulin response to our improper (high carbohydrate) diet simply opens the calcium floodgates into the cell by inhibiting this membrane enzyme. Mercury, and especially organic mercury, causes accumulation of calcium into the cells, therefore, one does not want to take much calcium, at least one wants to have a high ratio of Mg/Ca, that is, keep magnesium up and calcium down to reduce the accumulative effects—and supplement manganese. Otherwise, excessive calcium will enter the cells, impairing metabolism, producing cross-linkages and premature aging, and eventually producing dangerous arterial spasms. Manganese is a natural chelating agent when taken in the food supply or as a supplement. Manganese and magnesium will do everything a calcium channel blocker will do, but more naturally and effectively. There will be no excessive intracellular infiltration by calcium transporting through the cell membrane as long as manganese and magnesium, and possibly zinc, are present. Manganese works in a similar way to magnesium's characteristic of displacing calcium ions. One of the keys to mercury's effects on health may be its ability to block the functioning of manganese, a key mineral required for physiological reactions. Potassium helps restore electrical balance in heart cells while limiting the amount of calcium that can enter those cells. New studies in humans and in the laboratory show that PCBs and mercury interact to cause harm at lower thresholds than either substance acting alone.

Though forced to remove MSG, baby formula today frequently utilizes caseinate that contains a high enough level of glutamate to endanger a newborn's brain! These excitotoxic additives are hidden under the terms hydrolyzed vegetable protein, protein isolate, protein extracts, caseinate, and natural flavorings! Another damaging excitotoxin is Aspartame™ that has increased exponentially in all our foods. Some of the many aspartame toxicity symptoms reported include seizures, headaches, memory loss, tremors, convulsions, vision loss, nausea, dizziness, confusion, depression, irritability, anxiety attacks, personality changes, heart palpitations, chest pains, skin diseases, loss of blood sugar control, arthritic symptoms, weight gain (in some cases), fluid retention, and excessive thirst or urination. The phenylalanine in aspartame lowers the seizure threshold and depletes serotonin. Lowered serotonin triggers manic depression, panic attacks, anxiety, rage, mood swings, suicidal tendencies, etc. Clearly, regular exposure to a toxic substance such as formaldehyde may worsen, or in some cases contribute to the development of chronic diseases. Other excitotoxins include fluoride, aluminum, iron overload, and organophosphate pesticides and herbicides.

We have spoken of the need for supplemental iron, but we need to be aware of iron overload. Hemochromatosis is a disease in which the body absorbs too much iron from the normal diet or supplements. Over many years, the excess iron builds up in the joints, liver, pancreas, pituitary gland, heart, and other organs causing serious organ damage. It can cause a bronzing of the skin. Untreated, the disease can lead to arthritis, cirrhosis, diabetes, impotence, sterility, hypothyroidism, heart disease, or liver cancer. Hemochromatosis patients often have "sore tongues", and sore "swallowing mechanisms", which may explain food problems, speech problems, and the like.

About one in 200 Americans have hemochromatosis and one in 10 are carriers for the disease. Typically, symptoms first appear in men between the ages of 30 and 50 years and in women who are past menopause. "The most common symptoms are fatigue, abdominal pains (which may also indicate an iron deficiency—WSL) and joint pains," says Virgil Fairbanks, M.D. Iron overload as seen in hereditary hemochromatosis patients enhances suppressor T-cell (CD8) numbers and activity, decreases the proliferative capacity, numbers, and activity of helper T cells (CD4) with increases in CD8/CD4 ratios, impairs the generation of cytotoxic T cells, and alters immunoglobulin secretion when compared to treated hereditary hemochromatosis patients or controls. Its treatment is to avoid iron supplements and give blood regularly.

This same build up of excess iron may have nothing to do with genetic, excess absorption, but with mal-utilization of iron. When copper is deficient, the body can't use iron so it accumulates and causes free radical damage. The disease is also called siderosis, which is characterized by a gray pallor to the skin from iron accumulation in the tissue. One study concluded "The frequency of thyroid disorders in men with hemochromatosis is about 80 times that of men in the general population." What this likely means is that when men become copper deficient, they accumulate iron and become hyperthyroid. Iron, copper, manganese, and zinc work as a four-horse team. When one slacks the traces, it affects the pull of the others. Too much of one will deplete the others. So, when supplementing zinc, we have spoken of the need to balance with copper, but it is just as vital to supplement with iron, or at least keep track of iron stores. Manganese must be kept track of too. Anemia, possibly with high copper, is often the first sign of hypothyroidism.

It would appear that the pathology of autism is one of immune dysregulation, with associated food intolerance, and opportunistic infection that triggers excessive production of the inflammatory cytokines and nitric oxide leading eventually to neural mitochondrial inhibition. Dr. Rosemary Waring tells us that the excess cytokines reduces available sulfates also.

One of the better qualities of sulfur is its ability to be fairly well absorbed and utilized via oral administration. The safe administration of sulfur can be achieved orally with these sulfur-bearing substances: methylsufonylmethane (MSM), garlic, methionine, alpha lipoic acid, biotin, thiamin, bromelain, and in small doses, N-acetylcysteine. The problem is, these may not oxidize to sulfate. In that instance, one can supplement sulfates orally as glucosamine and chondroitin sulfate (these may be contraindicated where cholesterol levels are high—check with your doctor), and by Epsom salts baths. Sulfates are normally poorly absorbed orally (max 20%), but taking them with bromelain will enhance absorption significantly. One can also enhance absorption and speed effectiveness of glucosamine by 4 or 5 times by taking it with some essential fatty acids.

Remember that glucosamine is often manufactured from shellfish, so if sensitive to shellfish it could be a problem. Kirkman Labs offers a Magnesium sulfate cream for transdermal application. Before supplementing with sulfate, one should address the issues of dysbiosis and leaky gut in order to break the cycles of chronic inflammation. All of the aforementioned sulfur supplements are safe when used as directed on the product. Nevertheless, **long time use may suppress serum chloride** indicating that the child should be permitted to salt his foods to taste. MSM, Epsom salts baths, glucosamine and chondroitin sulfate, glutathione, Cysteine, Alpha lipoic acid, methionine, copper, and other forms of sulfur also deplete molybdenum, and it should be supplemented when using these nutrients. Molybdenum is an essential, trace element. It helps regulate iron stores in the body, and is a key component of at least three enzymes: xanthine oxidase, aldehyde oxidase, and sulfite oxidase. These enzymes are involved with carbohydrate metabolism, fat oxidation, urine metabolism, and toxic sulfite and aldehyde metabolism. Molybdenum deficiencies are associated with esophageal cancer, sexual impotence, and tooth decay. **"Garlic suppresses the enzyme cyclooxygenase needed for beta oxidation of Long-Chain Fatty Acids"—Patricia Kane. If your fatty acid test shows this to be a problem, eliminate garlic and garlic salt.**

Sulfate is a ubiquitous substance that has biochemical significance in every cell of the body. When its quantity, quality, or varieties were in any way compromised, the effects manifest in a pervasive manner in all systems of the body. Sulfate deficiencies, like no other single metabolic agent, has the potential to effect a degenerative cascade of dysfunction that significantly disrupts and alters digestive, immune, circulatory, detoxification, endocrine, and neurological functions. Sulfate deficiencies have been reported in people with migraine, rheumatoid arthritis, jaundice, and other allergic conditions all of which are anecdotally reported as common in the families of people with autism.

The satellite familial incidences and chromosomal loci proximities of Bi-polar and Unipolar Depression, Alzheimer's Disease, Parkinson's Disease, schizophrenia, Lou Gehrig's Disease, Down's Syndrome, Mental Retardation, Epilepsy, Homocystinuria, blood-sugar disorders, alcohol/chemical dependency, and Crohn's Disease/Ulcerative Colitis/Irritable Bowel in regards to Autism is pointing to some possible commonalties in etiology that cannot be ignored. The transport mechanism that should transfer iron into the blood is defective in persons with Crohn's Disease. The body's natural response to an inflammation/infection is decreasing the iron transport from the intestines into the blood. This is done because bacteria need iron for growth. However, when the inflammation is INSIDE the intestines, this defense mechanism works contra productive causing iron build-up in the intestines. This reactive iron can damage the intestine. Therapies that utilize sulfate have been very successful with many of these disorders and strongly suggest that it may play a pivotal role in the etiology of these disorders as well.

Additionally, TNF is an important part of the inflammation process that your body uses to attack foreign substances. What is really interesting is, it is a known fact that all Crohn's patients have a very high level of TNF. Actually, the most potent, recently-released, FDA-approved drug for Crohn's, Remicade™, eliminates TNF, and it has been shown to have a marked beneficial effect on Crohn's. See several, natural ways to eliminate excess TNF in the following pages and skip the side effects.

Elevated serotonin is found in: psychosis or schizophrenia, mood disorders, organic-brain disease, mental retardation, autism, and Alzheimer's; while low levels of the metabolism of serotonin (which also produces high serotonin) are found in those with depression, anxiety, suicide, violence, arson, substance abuse, insomnia, violent nightmares, impulsive behavior, reckless driving, exhibitionism, hostility, argumentative behavior, etc. Phenol-sulfotransferase (PST) liver enzymes (Phase II) metabolize serotonin. These require sulfate to perform their function.

Mitochondrial malfunction is widespread in Autism. Nutrients that may improve the mitochondrial function include magnesium, Coenzyme Q10, acetyl-L-carnitine, N-acetylcysteine, vitamins B_1, B_2, niacin/niacinamide, folic acid, NAD (Nicotinamide Adenine Dinucleotide) or NADH (ENADA™), alpha-ketoglutarate, and antioxidants such as vitamins E and C, alpha lipoic acid, manganese, and selenium. Supplementation of glutathione has improved skill with numbers and fine motor skills. Oral glutathione is significantly assimilated, and of benefit to the gut according to research found by Dr. McGinnis. Take it with some vitamin C that will improve its assimilation by up to 20%. Kirkman Labs has a lotion for transdermal application that may enhance the systemic levels significantly. Where possible, help the body produce its own supply by using supplements mentioned elsewhere in this paper. Supplementing glutathione, particularly with high-dose-IV Glutathione, depletes NADH, and it must be supplemented.

It should be noted that acetyl-L-carnitine provides an acetyl group to aid in formation of the neurotransmitter acetylcholine and, in fact, has neurotransmitter properties much like acetylcholine. Acetyl-L-0 is an antioxidant that increases mitochondrial energy production in the brain, stabilizes the cell membrane, increases cholinergic transmission in the brain (helps memory), and chelates iron. It is shown to reverse hippocampal and prefrontal loss of neurons associated with aging and significantly reduces Lipofuscin pigment accumulation in the brain. It reduces

receptor loss associated with aging and improves learning and memory in aged animals and humans. It is shown to defend brain cells against lipid peroxidation, and it increases both glutathione and CoQ10 concentrations. In addition, it can increase the inhibitory neurotransmitter GABA (Blaylock: Excitotoxins).

Solutions to the Problems

Olfactory and gustatory symptoms of psychiatric patients were ameliorated completely or partially by zinc supplementation, that is, their sense of smell and taste are improved so they tend to eat better. In a small study (Am J Clin Nutr 53:16, 1991), 30 mg zinc per day intake increased the short-term recall of visual images. Since it is known that essential-fatty-acid metabolites stimulate intestinal zinc, taking fatty acids with zinc supplements is clearly warranted. Zinc deficiency impairs vitamin A metabolism, and inhibits prostaglandin synthesis from essential-fatty acids, either by blocking linoleic acid (LA) desaturation to gamma linolenic acid (GLA), or by inhibiting the mobilization of dihomo-gamma-linolenic acid (DGLA) from the tissue membrane stores. Zinc and vitamins B_3, B_6, and C are necessary for the conversion of essential-fatty acids to PgE1 (prostaglandin E1), an anti-inflammatory that is protective from the excessive gastric secretion. Zinc is known to help in the healing of gastric and peptic ulcers. This is probably because zinc is required for the synthesis of gastric mucosa. Zinc controls over 200 enzymes, one of which is necessary for the stomach to produce hydrochloric acid. Note this quotation: "We took hair samples from 31 boys and 15 girls, and had them analyzed by Dr. P. J. Barrow of the Dept of Environmental Health, University of Aston, Birmingham. Twenty-four of the boys and seven of the girls had zinc values below the normal range" —from 1979 survey of hyperactive children belonging to the H.A.C.S.G. "Our May 1981 research paper: 'A Lack of Essential Fatty Acids as a Possible Cause of Hyperactivity in Children' was based on these findings."

>>>Dietary fat influences the effect of zinc deficiency on liver lipids and fatty acids in rats force-fed equal quantities of diet; Eder K, Kirchgessner M J Nutr 1994 Oct, 124:101917-26.

Abstract:
Previous studies showed that zinc deficiency influences the fatty acid composition of rat tissues, but the influence of dietary fat on the effects of zinc deficiency was not considered at that time. The present study was conducted to investigate the effect of zinc deficiency on lipid concentrations in the liver and on fatty acid composition of liver phospholipids in rats fed diets containing coconut oil or fish oil, using a bifactorial experimental design. To ensure an adequate food intake, all rats were force-fed. **The zinc-deficient rats fed the coconut oil diet developed fatty livers, whereas zinc-deficient animals fed the fish oil diet did not**. The zinc-deficient rats in both dietary-fat groups had lower levels of linoleic acid, arachidonic acid, and total n-6 (that is, Omega-6) fatty acids in the liver phospholipids, especially in the phosphatidylcholine, but greater concentrations of n-3 (that is, Omega-3) fatty acids compared with zinc-adequate controls. We conjecture that zinc deficiency influences incorporation of polyunsaturated fatty acids into phosphatidylcholine. The lower levels of arachidonic acid are replaced in the zinc-deficient animals fed a coconut oil diet by docosapentaenoic (DPA) and docosahexaenoic (DHA) acids (VLCFAs), and in the zinc-deficient animals fed a fish oil diet by eicosapentaenoic acid (EPA). The replacement of arachidonic acid by other fatty acids in the phospholipids is likely to have implications for prostaglandin synthesis. The study shows that the type of dietary fat influences the effects of zinc deficiency on fatty acid composition and especially on lipid concentrations in the liver. >>>

In zinc deficiency, one is more susceptible to toxin-producing bacteria or enteroviral pathogens that activate guanylate and adenylate cyclases, stimulating chloride secretion, producing diarrhea and diminishing absorption of nutrients, thus exacerbating an already compromised mineral status, lowering zinc levels still further. In addition, zinc deficiency may impair the absorption of water and electrolytes, delaying the termination of normally self-limiting gastrointestinal disease episodes. Diarrhea always brings the specter of dehydration that may be

recognized by sunken eyes, decreased skin turgor (dried out), or strong, body odor. One study showed zinc supplementation could reduce the duration of diarrhea by 20 to 30%, reduce incidence of diarrhea by 38%, and reduce acute, respiratory infections such as pneumonia up to 48%—American Journal of Clinical Nutrition, August 1998. Interestingly, sugar-free, shredded coconut will stop diarrhea, even coconut macaroons will!

Parasites are better able to survive in the zinc-deficient hosts than in well-nourished hosts. The production of interleukin-4 in the spleen of zinc-deficient mice is depressed, leading to depressed levels of IgE, IgG(1) and eosinophils; and the function of T-cells and antigen-presenting cells is impaired by zinc deficiency as well as by energy restriction. Thirty days of suboptimal intake of zinc can lead to 30-80% losses in defense capacity! Supplementation with zinc or iron, or both, improved indicators of vitamin A status. The results of this study agree with previous observations of a metabolic interaction between zinc and vitamin A, and suggest an interaction between iron and vitamin A metabolism. A big aid to controlling diarrhea, while working to alleviate the cause, is to feed one teaspoon of raw, carob powder two or three times a day. Bananas are helpful too, replacing lost potassium.

Children that are unsettled, frequently demanding attention, upset much of the time, and those whose sleep is regularly broken during the night can be very wearying on parents to say the least. Additionally, recent studies show that in sleep-deprived people the part of the brain responsible for language slowed down tremendously. Furthermore, after a sleepless night, a person will do only half as well on memory tests as when well rested (Students take note!). Sleep deprivation produces more insulin and cortisol, both damaging to health and well-being. Dr. Joseph T. Hart, a pediatrician of Portland, Oregon, has found that by supplementing zinc you may be able to eliminate the problem of sleeplessness. He has supplied zinc drops to hundreds of children, and in the majority of the cases, the chronic sleeplessness has disappeared! Additionally, copper, iron, and magnesium, as well as vitamin A deficiencies will adversely affect sleep. Dr. K. M. Hambridge of Denver, Colorado, observed that zinc-fed babies were much less irritable. Hart reports that zinc supplementation also produces improvement in appetite, and reduces daytime irritability, diarrhea, skin rashes, and pallor. In older children, whose wakefulness was followed by climbing out of bed and getting in with their parents, the habit was lost. This is understood when we realize the synthesis of serotonin involves vitamin B_6 and zinc enzymes, and since serotonin is necessary for melatonin synthesis, a zinc deficiency may result in low levels of both hormones. Unfortunately, zinc levels tend to be low when there is excess copper and cadmium. Moreover, high estrogen levels from soy and flax tend to cause increased absorption of copper and cadmium. Cadmium affects verbal ability more and lead affects performance measures more. The high estrogen can create anxiety in the child.

Many consider soy to be good food. Aside from considerations of genetic altering taking place, one study states that genetic activation of an enzyme (aromatase) involved in the conversion of testosterone into estrogens was increased by genistein and, to a lesser extent, diadzein. The soy extract stimulated one of the estrogen receptors (b receptor) greater than genistein and diadzen, although the latter two were stimulatory themselves. Genistein decreased receptors for testosterone-like molecules (androgens) significantly, while diadzein affected them only half as much. This, in effect, produces more estrogen from available testosterone making the woman more susceptible to breast cancer and less sexual, and it makes the man more feminine with less sexual drive! Prevention Magazine™ (September 2003) reported on a study that found that feeding genistein to pregnant and breastfeeding animals produced male offspring with lower testosterone levels and smaller sexual organs! Soy milk is not a suitable food for children or adults!

Zinc also helps get rid of the terrible two's. Within a week you can often see a definite settling down, and reduction of tantrums and of the terrorizing of the poor mother! Zinc is being successfully used for learning disabled children, for children with seizures, skin lesions, and histories of infections. Zinc is essential for new tissue formation. It is essential for white blood cell and antibody formation. It helps neutralize toxic minerals in the

body, such as lead, mercury, cadmium, and copper. It also seems to make other nutrients work better. High lead, copper, manganese, or mercury levels have been found to be associated with ADHD, impulsivity, and inability to inhibit inappropriate responding. New research from Israel and the UK indicates the hyperactivity of ADHD is linked to zinc deficiencies. Studies have also found evidence of a connection between low levels of zinc and three other common childhood diseases: treatment resistant depression, childhood-onset diabetes, and epilepsy. Zinc is an antagonist to toxic metals like cadmium, mercury, and arsenic, and adequate levels are required to balance the adverse effects of these toxic substances on cellular calcium and other enzymatic processes. Additionally, in one study, "…damage of liver cell, such as lobular necrosis and portal inflammation, were relieved. From these results, organic germanium is considered to have beneficial effect on the protection of liver from cadmium intoxication". No such protection against mercury was observed—Hyo Min Lee and Yong Chung, The Institute for Environmental Research, Yonsei University, Korea.

Nevertheless, it is interesting to note this: "With ADHD, once you make the necessary craniosacral correction, it's over—you don't have to worry about it anymore. The correction, when appropriate, usually involves resolving compression in the neck area (atlas occipital region) that occurs during the birth process. I estimate about 50% of individuals with ADHD fall into this category."—Dr. John Upledger. Many find craniosacral correction helpful to autism.

Violent behavior in young men appears to be linked to an imbalance in the relationship of copper and zinc, according to a study published in the Journal Physiology & Behavior. "Our preliminary findings show that young men who have varying levels of angry, violent behavior also have elevated copper and depressed zinc levels; the non-assaultive controls in our study did not", said William Walsh, Ph.D. Any white spots on finger or toe nails, face noticeably pale? Definitely supplement zinc. Don't let the doctor ignore a low Alkaline Phosphatase (alk phos) reading for a lack of this zinc dependent enzyme means you need zinc. The commercial zinc tablets (primarily sulfates) are particularly painful for many because free zinc binds to already damaged mucosal cells directly. The zinc drops are preferable. Consult with your medical professional about this possibility. In the case of pallor, check for anemia and low thyroid activity also. Anemia is often the first sign of hypothyroidism. When body temperatures are low, the marrow makes less red cells! Very important is the observation that anemia in hypothyroidism is often not diagnosed because hypothyroids have a lower volume of plasma which causes a false high estimation of the amount of hemoglobin in the blood. A strong desire to chew ice is a sure sign of iron deficiency anemia. Zinc and selenium along with vitamin A, glutathione, and vitamin B_6 are essential to formation of T3 thyroid hormone. Vitamin B_6 and magnesium deficiency predominates in hyperactive kids also.

Zinc is vital in another pervasive problem affecting autistic. Subnormal values for the essential amino acids Valine and Leucine are common. Leucine and isoleucine are commonly found to be deficient in the mentally and physically ill. RDA for Leucine is 16 mg per kg of body weight per day. Animal protein provides 70 mg per gram. RDA for isoleucine is 12 mg per kg of body weight. Animal protein supplies 42 mg per gram. MTBE, a gasoline additive that is contaminating drinking water, inhibits the amino acid cascade of valine; causing itching, skin difficulties, and occasionally hair loss**. MTBE also blocks the synthesis of glycine.** Glycine is required as a neuroinhibitor in the spinal cord, to regulate acetylcholine, the transmitter that powers muscle movement. Without enough glycine to modulate the acetylcholine, muscles can become chronically tense, and tend to cramp spontaneously. Valine and leucine are "branched-chain", essential, amino acids, and their digestion and uptake from food require proper peptidase function in the small intestine. This is why one should supplement a digestive enzyme containing peptidase (GI–Zyme™ - Mannatech™, SpectraZyme™, Peptizyde™, EnZym-Complete™). Leucine aminopeptidase is one such enzyme. To be active, it requires zinc and a gut pH between 6.5 and 8.5. Peptidase dysfunction and resulting, excess-peptide uptake is what much of autism is about. **Zinc deficiency can cause both peptidase dysfunction and growth failure.** As indicated, mercury also inhibits both zinc and the

peptidase enzymes.

The latest Government survey shows 81% of the kids are not getting the RDI of zinc! A high percentage of females with Anorexia Nervosa have low serum zinc. Incidentally, it has now been established that both plasma and serum zinc concentrations are subject to acute variations, being highest in the morning and falling after a meal. Stress alone can cause a rapid fall in plasma zinc values, as can certain steroid drugs such as oral contraceptives. Furthermore, all manner of infections tend to reduce both plasma and serum zinc levels in a way that is not necessarily related to primary nutritional zinc status. Only repeated low plasma zinc tests can provide grounds for suspecting zinc deficiency. The only true indicator is a Red Blood Cell Tissue test. How much is in the cell is all that counts. **Zinc is not stored in the fashion of some other minerals and must be supplied each day in adequate amounts.** It is also a water-soluble nutrient and easily lost from cooked foods. On the other hand, supplementing zinc in very high amounts over long term is dangerous. Excessive zinc intake will eventually affect the balance and proper ratios to numerous other important nutrients that may include iron, copper, manganese, calcium, selenium, nickel, phosphorus, as well as Vitamins A, B_1, C, and others. It may cause, or contribute to gastrointestinal problems, hair loss, anemia, loss of libido, impotence, prostatitis, ovarian cysts, menstrual problems, depressed immune functions, muscle spasms, sciatica, renal tubular necrosis/interstitial nephritis, dizziness, and vomiting, among others. Unless already in excess, a supplement of copper and manganese must be taken when supplementing zinc.

While the branched-chain aminos are usually deficient, Maple Sugar Urine Disease (MSUD) derives its name from the sweet, burnt sugar smell caused by an excess of these amino acids. The disorder affects the way the body metabolizes the three branch-chain amino-acids Leucine, Isoleucine, and Valine. These amino acids accumulate in the blood causing a toxic effect that interferes with brain function.

One type of phagocyte cell is the macrophage. In the brain, this is called myelinophage, in the liver, kupffer cells. The primary function of these cells is to break down and remove substances the immune system marks as 'non-self'. These pivotal cells in many immunologic functions are adversely affected by zinc deficiency, which can dysregulate intracellular killing, cytokine production, and phagocytosis. Dr. Woody McGinnis says zinc deficiency is involved in warts, acne, stretch marks, asthma, and frequent infections. One study of hyperactive kids showed almost 50% were deficient in stomach acid, most likely because of a zinc deficiency common to ADHD. Zinc citrate, the form in mothers' milk, is quite bioavailable in restoring zinc levels, but zinc picolinate, OptiZinc®, or liquid, ionic forms seem more certain of assimilation.

Several studies have found that most children with ADHD have deficiencies of certain minerals, such as magnesium and zinc that are commonly depleted by exposure to toxic metals, and most show significant improvement after supplementation with these minerals. Magnesium is the most common, significant, mineral deficiency among ADHD children, but zinc is commonly deficient among children with ADHD and disruptive behavior disorders.

Studies have found the level of free, fatty acids significantly lower in children with ADHD and autism. In 1981, Colquhoun and Bunday proposed that hypothesis based on a survey of hyperactive children. These children showed clinical signs consistent with a deficiency of essential, fatty acids: excessive thirst, frequent urination, dry skin and hair, brittle nails, and skin problems. Blood biochemical studies subsequently provided supporting evidence for the hypothesis. Peet and colleagues reported that a dietary analysis of 20 patients with schizophrenia yielded significant relationships between the status of dietary, Omega-3, fatty acids and the severity of both schizophrenia symptoms and tardive dyskinesia. A higher consumption of Omega-3, fatty acids correlated with less severe symptomatology. There is also a case report in the literature of a 77-year old patient with Alzheimer's dementia who improved clinically over several months when placed on a regimen of increased fish consumption. Symptom improvements

included regaining the ability to dress himself, decreased restless and destructive behavior, improved fine motor skills, and enhanced insight into his condition. An imbalance of fatty acids control the amino acid balance.

Clinical expression of fatty-acid deficiency is often seen in patients with candidiasis. Galland (1985) reported nearly 66% of candidiasis patients that he studied had two or more clinical signs of fatty-acid deficiency. Non-specific signs such as dry, stiff hair; dry, scaly skin; brittle nails, and follicular dermatitis where noted in many of these patients.

So, ensuring the presence of all the essential amino acids is another problem area. In order for the body to properly synthesize protein, all the essential amino acids must be present simultaneously, and in proper proportions. If one or more essential amino acids are missing or in poor supply, utilization of all amino acids is reduced in the same proportion as the one that is lowest or missing! Protein, in proper proportion for one's metabolic type, must be eaten with every meal. Amino acid assimilation and utilization are controlled by fatty acids (GLA/EPA) that must be in balance. High, dietary sugar and high-glycemic food intake causes release of high levels of insulin that disrupts fatty-acid balance**. Additionally, the essential branch-chain-amino acid (BCAA) levels are significantly decreased by insulin.**

Valine, one of the three essential BCAA, competes with tyrosine and tryptophan in crossing the blood-brain barrier. The higher the Valine level, the lower the brain levels of tyrosine and tryptophan, and there is a decreased production of serotonin and of the thyroid and catecholamine hormones. An excess of Valine may cause hallucinations and "crawling skin". Biotin is essential for metabolism of branched chain amino acids, and may be involved in copper metabolism. Walsh finds Biotin very useful in the "slender malabsorber group". Adults require 14 mg Valine per Kg of body weight per day. First-class protein provides 48 mg per gram. One of the implications of this competition is that tyrosine and tryptophan nutritional supplements need to be taken at least an hour before or after meals or supplements that are high in branched chain amino acids. Any acute, physical stress (including surgery, sepsis, fever, trauma, starvation) requires higher amounts of Valine, Leucine, and Isoleucine (the 3 essential BCAA) than any of the other amino acids. During periods of Valine deficiency, all of the other amino acids are less well absorbed by the GI tract. Valine is "useful in muscle, mental, and emotional upsets, and in insomnia and nervousness"—Borrman.

The well-documented phytates of cereal grains sequester many divalent ions including calcium, zinc, iron, and magnesium so as to impair bone growth and metabolism. Though magnesium is found in nuts, whole grains, legumes, and leafy green vegetables, these also contain phytates and fibers that bind magnesium and allow little absorption. **When eating legumes and green veggies, you may want to supplement with a product containing the plant enzyme, Cellulase, that breaks the bonds and releases vitamin B_{12}, magnesium, and other minerals for your body to use. Cellulase will also pull mercury out of the body and reduce the burden greatly, but without kidney function, only redistribution takes place. Further, there are antinutrients in cereal grains that directly impair vitamin D metabolism [Batchelor 1983; Clement 1987]; and rickets is routinely induced in animal models via consumption of high levels of cereal grains [Sly 1984].**

Less well appreciated is the ability of whole grains to impair biotin metabolism. High doses of Alpha Lipoic Acid can compete with biotin (a B-vitamin) and interfere with its activity in the body also. A supplement of biotin would be indicated. Watkins 1990, Blair 1989; Kopinksi 1989 have shown that biotin deficiencies can be induced in animal models by feeding them high levels of wheat, sorghum, and other cereal grains. Biotin-dependent carboxylases are important metabolic pathways of fatty-acid synthesis, and deficiencies severely inhibit the chain-elongation and desaturation of 18:2 n6 (linoleate) to 20:4 n6 (arachidonic acid). Human dietary supplementation trials with biotin have shown this vitamin to reduce fingernail brittleness and ridging that are associated with deficiencies of this vitamin [Hochman 1993].

Biotin, also known as vitamin H or Coenzyme R, is one of the twelve B vitamins. It is one of the best supplements to improve the appearance of hair, nails, and skin. It also increases metabolism of carbohydrates, fats, and proteins, and it is essential for the creation and utilization of fats and amino acids. Large quantities of biotin, far above dietary reference amounts, have been shown to be highly valuable for reducing blood glucose, increasing insulin sensitivity and general anti-glycation effects.

When yeast levels are high, there are high levels of arabinose. According to Dr. Shaw, this can cause a functional deficiency of B_6, lipoic acid, and biotin. A lack of biotin will cause hypoglycemia and excess ammonia. A biotin deficit can also lead to depression, muscle pain, fungal infections of the skin, rashes, nausea, sleepiness, acidosis, fine and brittle hair, dry skin, hair loss, seborrheic dermatitis, and a poor fatty acid profile due to interference with the Desaturase enzymes. It serves as a carrier of carbon dioxide. A deficit of biotin can be caused by prolonged antibiotic treatment, the frequent ingestion of raw egg whites sans the yellow, the regular use of more than a hundred milligrams of Alpha Lipoic Acid, or the use of certain anticonvulsant drugs, primarily Dilantin, primidone, and Tegretol™. (See this article by Dr. Sloan, http://author.emedicine.com/PED/topic238.htm.)

Those with multiple sclerosis or those who have antibodies to myelin protein (as found in many of the autistic) might also want to note that biotin is involved in the synthesis of fats in the nervous system, and so should probably be given special attention in the MS diet.

The amounts people are using to overcome this problem are rather high. A product called Biotin 5000 Yeast Free by Nutricology/Allergy Research Group has 5 mg of Biotin per capsule. Most Biotin supplements are measured in mcg, which is a much smaller measurement. Phone (800) 782-4274 or (510) 639-4572 or website www.nutricology.com. However, some caution must be exercised. Biotin must be balanced with inositol, another B-vitamin, to avoid fatty-liver damage.

A British allergist has found that adults taking 500 mg of the amino acid L-histidine, twice daily, improved gastric acid production in allergic patients. (Children should use one-half that amount.) If the allergies are severe, start with 2 to 3 grams per day and taper down to 1 gram as allergies improve. Improvements are because of increased histamine production. Actually, this can be a dangerous thing as histidine is a powerful chelator, and it can quickly drain the child of minerals already in short supply. Worse, histidine is a powerful carrier of copper. It transports copper from the intestinal milieu into the portal blood and from there to organs and tissues in the body. And don't think you can displace copper with zinc once the copper is on histidine - you cannot. Only glutathione, cysteine, and thionein can intercept this copper transport, but that's one of the big problems in autism, isn't it? These sulfur players have gone AWOL, and copper is excessive at the expense of zinc ; so, use this only under direction of a knowledgeable doctor. Having first been intrigued, Dr. Woody McGinnis declined to use it!

The amino acid L-glycine also increases gastric acid output. It may be used at 500 to 2000 mg daily in divided doses. This is often seen in its metabolite form Dimethyl (DMG) or Trimethyl (TMG) glycine. TMG (betaine) has been used for many years in the treatment of hyperactivity even though the mode of action has remained unclear. In giving up one methyl molecule, it becomes DMG, long used in autism (according to Mr. Dave Humphrey of Kirkman Labs, 1-500 mg tablet of Kirkman's N,N,N, Trimethylglycine supplies approximately 250 mg DMG). Betaine hydrochloride (600 mg supplying 485 mg Betaine and 115 mg hydrochloride) is Betaine stabilized with hydrochloride. It has the advantage of providing hydrochloric acid to aid digestion and activate Secretin, and at that time, it becomes the methyl donor, trimethylglycine (TMG). Incidentally, Glycine, in any form, aids in production of HCl. The overmethylated should likely not use TMG/DMG. While I believe the above is accurately presented. Some affirm that betaine HCl and TMG, though very similar, have very different actions.

SAM (SAMe) is the most important methyl-group donor in cellular metabolism. It is utilized in synthesis of

carnitine, CoQ10, creatine, methycobalamin (B_{12}), L-methylnicotinamide, N-methyltryptamine, phosphatidylcholine, and polyamines, and a number of other methyl reactions including Phase II liver detoxification. SAMe is an active, lipotrope form of Methionine, and it is a cofactor in a number of critical biochemical reactions, being found in almost every tissue of the body. SAMe has been used in clinical studies to treat depression, schizophrenia, demyelination diseases, liver disease, dementia, arthritis, peripheral neuropathy, and other conditions. Several studies have confirmed that SAMe is up to 15% more effective in the treatment of depression than traditional pharmaceutical antidepressants. SAMe improves and normalizes the liver function. SAMe is essential for the production of glutathione, a powerful antioxidant that protects the body from the damaging effects of free radicals. SAMe reduces the number of trigger points, reduces fatigue, reduces morning stiffness, and improves mood in fibromyalgia patients. SAMe improves the binding of neurotransmitters to their receptor sites in the brain. SAMe is essential for the regeneration of neuron axons following injury. SAMe is also essential for the formation of myelin sheaths that surround axons. In tests, SAMe has shown great promise in the treatment of Peripheral Neuropathy, and HIV related peripheral neuropathy. Alzheimer's and Parkinson's patients have very low levels of SAMe.

The synthesized SAM is expensive, but your body produces SAMe naturally by utilizing six specific nutritional supplements. The combining of ATP (the energy molecule) and magnesium with methionine produces SAMe. In this chain reaction, called the SAMe Cycle, the ATP/magnesium/methionine reaction produces SAMe, and when TMG donates a methyl group to the resulting homocysteine, dimethylglycine (DMG) remains, while the B_6, folic acid, and B_{12} convert the homocysteine into methionine and SAMe. These nutrients produce SAMe and DMG naturally at a fraction of the cost of the commercial pharmaceutical substitutes. Assuming normal methylation (there are over- and under-methylated states totaling about 70% of autistic children), the homocysteine is recycled to methionine and to SAM in this SAMe Cycle. This resulting SAMe is vital to countless metabolic reactions throughout the body, including the production of serotonin. A portion of homocysteine is metabolized to cysteine in what is called the Sulfation Pathway. When the pathways from cysteine to glutathione and taurine are blocked because of heavy metals toxicity or a lack of vitamins B_6 and C, zinc, selenium, and molybdenum, one will lack the glutathione and sulfates needed to detoxify the body, a condition called PST. It would appear that a supplement of vitamins B_2, B_6 (P5P), B_{12}, folic acid, magnesium, and niacin (NADH) would be very desirable to produce SAMe naturally rather than buying this very expensive supplement. Supplementation of methyl donors TMG or DMG, as indicated by ones methylation status, would also be valuable in speeding the SAMe Cycle. Ensuring adequate protein, and even supplementing a small amount of D-L-methionine and serine, would be logical. These added nutrients would tend to restore normalcy to the production and recycling of homocysteine, and to the production of SAMe, taurine, glutathione, and sulfates reducing the threat of cysteine toxicity. Those who have done this report cognitive and behavioral improvements.

Dr. Bill Walsh critiqued the above: "Your dialogue seems to focus on the toxic possibilities of the cystathionine pathway and cysteine itself. Actually, this is a vitally important pathway and cysteine is absolutely necessary for proper functioning. Most autism-spectrum patients are very depressed in cysteine, but may experience dramatic and disturbing symptoms after oral cysteine. Many have suggested that oral cysteine interacts with yeast overgrowth to provoke the symptoms. A more likely possibility is that oral cysteine promotes the PREMATURE synthesis of metallothionein that, in cases of zinc deficiency, can produce extraordinary (albeit temporary) zinc deficiency symptoms. We have learned that the best way to provide cysteine is using oral GSH that breaks down into cysteine and two other amino acids." This is true, but for the few, there is still a threat of excess cysteine that is exceedingly toxic.

"Using TMG is an attempt to force the methionine resynthesis pathway from homocysteine by an alternative pathway to the 5-methylfolate-B12-methionine synthase before Cystathionine Beta Synthase (CBS) can

convert homocysteine to cysteine. The byproduct is DMG. The purpose of this addition is to try to keep homocysteine in the form of methionine in order to rob CBS of substrate for overproduction of cysteine (which would be toxic—WSL). This is essentially a backup pathway, and is meant to complement the folate route for remethylation rather than supplant it. It does not interfere with the folate route"—David H. Swenson Ph.D. Disruption of the SAM cycle by excess cystathionine beta synthetase and methyl-tetra-hydrofolate (a metabolite of folic acid) results in an increased cysteine pool (possibly to toxic levels), and decreased methyl groups available for DNA methylation and for the normal formation of NADH.

It is of interest to note that Dr. Walsh of The Pfeiffer Treatment Center recently determined that more than 50% of children with autism were undermethylated with high histamine and need TMG; whereas 15% were overmethylated with low histamine, and do not do well on TMG**.** If TMG/DMG makes the child hyperactive, he needs folic acid to make up for the folate being excreted, or he needs to reduce or discontinue the TMG/DMG because it is overmethylating. Supplement glycine, vitamins B_6 and B_{12} instead. Calcium stimulates the mast cells to release histamine unless it is properly balanced with vitamin D3 and magnesium, a natural, "Calcium Channel Blocker". Expressed differently, undermethylated autistics thrive on magnesium, methionine, Vitamins C and D, DMG or TMG, tyrosine, tryptophan, phenylalanine, pantothenic acid, and inositol, but tend to get worse on calcium (unless adequate magnesium and vitamin D3 is supplied), DMAE, and choline.

When histamine is released from the mast cells excessively, it chelates trace minerals, particularly zinc and copper, and it will cause one or more of the following symptoms depending upon the degree of excess histamine: Eyes itch, burn, or become watery; nose itches, sneezes, and produces more mucus; skin itches and develop rashes or hives; sinuses become congested and cause headaches; lungs wheeze or have spasms; there are stomach cramps; and diarrhea.

The DMG, by a secondary pathway, with the help of vitamin B_2, produces serine, and if necessary enzymes and nutrients are available, cystathionine, cysteine, taurine, and the vital sulfates. The importance of the above process is seen by the fact that a build up of homocysteine not only tends to heart problems, but it negatively impacts the formation of vital sulfated sugars (GAGs) interfering, as it does, with the normal pathway to cysteine and the final sulfates needed for Phase II detoxification and GAG sulfation. Benefits of DMG are improved speech, better eye contact, reduced frustration, better sleep, better bile flow, increased levels of glutathione, and a significant boost to immune function. Use vitamins B_2 and B_6, magnesium, and DMG and its co-nutrient, vitamin B_{12}, before buying SAMe. To provide the necessary methionine, get some protein into the kid!

Use of betaine hydrochloride, as recommended herein, produces HCl to aid digestion, and the betaine released is TMG. Additional folic acid supplementation may be necessary because TMG, in reducing to DMG, causes an excretion of folate, and its deficiency causes hyperactivity. The piddling amounts of folic acid in some TMG formulations may not be adequate to avoid depletion of folate resulting in hyperactivity in the Subset that needs folate. Dr. Bernard Rimland's experience indicates a need of two, 800 mcg folic acid tablets with each 125 mg tablet of DMG to overcome this hyperactivity. F**or the overmethylated subset, TMG/DMG is contraindicated**. Use of TMG by the undermethylated subset does significantly reduce homocysteine by methyl donation in becoming DMG, but additional vitamins B_6 (200 to 500 mg) and B_{12} (500 to 1000 mcg, preferably as sublingual tablets) are probably needed to metabolize homocysteine.

"Some people take large doses of vitamin B_{12} in an effort to relieve stress, increase their energy level or cure pernicious anemia. But this practice may also deplete their melatonin supply. In a 1992 Japanese study, nine healthy men were given three daily doses of vitamin B_{12} for a total of 3 milligrams a day. Vitamin B_{12} caused a significant decrease in their average twenty-four-hour melatonin levels."— "Your Body's Natural Wonder Drug: Melatonin", by Russel J. Reiter, Ph.D., and Jo Robinson.

Folic acid deficiency can be caused by use of Depakote™, Tegretol™, aspirin, Pepcid®, methotrexate,

Dilantin™, Zantac®, oral contraceptives, and 21 other commonly used drugs. Genetically, some simply need more folate than others. Just as DMG/TMG consumes folic acid, and that causes hyperactivity, these drugs can do so also. Folic acid deficiency symptoms include: harm to DNA that causes abnormal cellular development, especially in those with the most rapid rates of turnover (red cells, leukocytes, and epithelial cells of the stomach and gut, vagina, and uterine cervix). There will be birth defects (Spina bifida, cleft lip and palate, small head, and possibly Down's), cervical dysplasia, elevated homocysteine leading to heart problems (and that affect the fetus and its future development), increased osteoporosis, headache, fatigue, hair loss, anorexia, insomnia, diarrhea, nausea, and increased infections. Studies have shown that taking a larger dose of folic acid (up to 4,000 micrograms) at least one month before and during the first trimester may be beneficial. Folic acid is necessary for the production of red blood cells, thus a deficiency can result in anemia leading to tiredness, weakness, diarrhea, and weight loss. In today's world, adults should consider supplementing 800 mcg of folic acid, but "supplementation of 800 mcg of folic acid will harm 15% of the population, and probably will result in increased incidence of anxiety disorders, OCD, eating disorders, and suicide"—Dr. Wm.Walsh. **These are natural sources of folic acid: green leafy vegetables, nuts, beans and citrus fruits. It's also found in many fortified breakfast cereals (watch serving sizes) and some vitamin supplements. These will not yield their treasures unless cooked with butter or served with olive oil!**

Pfeiffer Treatment Center found that more than 45% of children with autism are undermethylated with high histamine. An indeterminate percentage, with poor protein intake or malabsorption will have low levels of L-histidine and low histamine, yet are undermethylated, bringing that to well over 50% that are undermethylated. This is related to DPP-IV impairment and to disturbed sulfur metabolism. Increases in certain inflammatory markers, such as IL-6 and TNF(a), lead to decreases in methylation. Low levels of serotonin, dopamine, and norepinephrine, high, whole-blood histamine, and elevated, absolute basophils characterize this condition. This population has a high incidence of seasonal allergies, OCD tendencies, oppositional-defiant disorder, competitiveness, perfectionism, high libido, sparse body hair, seasonal depression, and several other characteristics. They have a genetic tendency to be very depressed in calcium, magnesium, methionine, and vitamin B_6 with excessive levels of folic acid. "Folate trapping" occurs when hydroxycobalamin (B_{12}) is deficient in the presence of adequate methyl-tetrahydrofolate. When this situation occurs, the methyl group on methyl-tetrahydrofolate is trapped because "it wants to leave (to become tetrahydrofolate) but can't get away". From then on, folate no longer is able to participate in its metabolic pathways, and megaloblastic anemia results. Large doses of supplemental folate can bypass the folate trap, and megaloblastic anemia will not occur. However, the neurologic/psychiatric abnormalities associated with B_{12} deficiency ensue progressively. In fact, folic acid administration may cause neuropathy in patients with latent or overt pernicious anemia if these patients are not receiving vitamin B_{12}. So, it would seem that the undermethylated would definitely need vitamin B_{12} to alleviate this condition. Of interest is that only 400 mcg to 800 mcg folic acid is necessary for adults to reduce homocysteine.

Additionally, a subacute degeneration of the brain and spinal cord can occur by the demyelination of nerve sheaths caused by a folic acid or vitamin B_{12} deficiency. In a study published in the Journal of Inherited Metabolic Diseases (1993;16(4):762-770), it was shown that some people have genetic defects that preclude them from naturally producing methylcobalamin (B_{12}). The scientists stated that a deficiency of methylcobalamin directly caused demyelination disease in people with this inborn defect. Since demyelination is one concern for a large segment of autism, it is probably wise to supplement vitamin B_{12} in the form methylcobalamin. Regular vitamin B_{12} will convert to Methycobalamin in presence of adequate SAMe. It should be noted that vitamin B_{12} is essential in synthesizing essential fatty acids needed in myelin. "Vitamin B_{12} deficiency is widespread—nearly 40% of the US population may be lacking. A vast majority of these people are completely unaware of their deficiency. Although age can have an effect, lifestyle choices are by far the biggest factor in this condition"—Dr. Joseph Mercola.

A correction: "My previous message was written hurriedly & contained TWO errors. The message should have stated: 'Our assessment of a patient's methylation status includes (1) analysis for whole blood histamine, (2) a special absolute basophil test, (3) review of symptoms and medical history, and (4) a physical exam. Overmethylated children react very badly to methylating agents. They generally exhibit LOW blood histamine and LOW basophils. Also, most exhibit distinctive symptoms associated with methylation disorders, and this greatly aids the diagnosis process. Classic symptoms of overmethylation include severe food/chemical sensitivities, anxiety, emotionalism, depression, hyperactivity, absence of seasonal allergies, etc.'"—Email 12/20/02 from Dr. Wm. Walsh. Many overmethylated patients have too much dopamine and serotonin activity. An overload of Fe+++ (iron) would be expected to aggravate this condition. Such patients thrive on folate/B_{12} therapy. Zinc deficiency results in impaired absorption of folic acid, so they will likely need a zinc supplement. Elevated copper/zinc ratios can be especially serious for persons with low blood histamine. This combination of imbalances has been associated with anxiety, panic disorders, paranoia, and (in severe cases) hallucinations.

Speaking of genetics, most think anything genetic is set in stone and bound to happen. The truth is, it is a tendency at best, and usually takes a trigger to cause it to manifest. Hudson Freeze, a professor of glycobiology (the study of glyconutrients) at the Burnham Institute in La Jolla, California is grappling with a different kind of childhood disease, even more rare than neuroblastoma but just as deadly. It takes at least 50 genes to make and tailor a typical sugar-protein chain (glycoprotein), Freeze notes. The failure of even a single gene to function properly can be problematic, even catastrophic. Resulting ailments include low blood sugar, blood-clotting problems, seizures, failure to thrive, gastrointestinal (vomiting, diarrhea), delayed psychomotor development, neurological dysfunction, and mental retardation. Additionally, it takes many different enzymes and ATP energy molecules to make those many steps successfully. Many things can intervene along the way. Marked changes in glycoprotein synthesis have been observed in vitamin-A deficiency.

Freeze keeps photos of his patients pinned to his computer and laboratory shelves. One shows a smiling, young-German boy suffering from a form of Carbohydrate-deficient Glycoprotein Syndrome (CDGS) that does not cause mental retardation. Doctors were flummoxed by the boy's symptoms: low blood sugar, protein loss through the intestines, and a general "failure to thrive". They stumbled upon a treatment when they prescribed adding a sugar called mannose to his diet. The boy's symptoms disappeared over the next few months. Addition of mannose to culture media containing fibroblasts from CDGS patients with mannose-deficient oligosaccharides resulted in correction of the deficiency in vitro, consistent with the direct utilization of mannose by fibroblasts for the synthesis of mannose-containing glycoproteins. Studies in humans have shown dietary mannose is preferentially utilized to synthesize glycoproteins. Radio labeled mannose is directly incorporated in serum glycoproteins in healthy, human subjects ingesting different dietary amounts of the sugars. Between 1 and 8 hours after ingestion, radiolabel mannose in glycoproteins increased 2- to 6-fold in liver, lungs, skeletal muscle, and heart—Berger V, Perier S, Pachiaudi C, et al.; Dietary specific sugars for serum protein enzymatic glycosylation in man. Metabolism 1998; 47(12):1499-1503.

> A healthy body can break down plant carbohydrates, restructure them into small sugars, and then use those sugars to build the glycoforms required for accurate cellular communication and resultant good health. Enzymes are the tools the body uses to build the "glyco" portion of glycoforms. These enzymatic conversions are complicated and require not only the presence of the needed enzymes, but specific vitamins and minerals as well. For example, fifteen enzymatic conversions are required to change galactose to fucose. Each enzymatic reaction requires ATP energy molecules that are often lacking in many chronic conditions, thus the conversion is not

made. Additionally, these five amino acids, threonine, asparagine, serine, glycine, and hydroxyproline, are needed to link with these carbohydrates to form glycoproteins that are necessary for immune function and blood globulin formation. (These amino acids are often deficient. Yet, as indicated, when dietary mannose was supplied, there was a 2-to-six fold increase in glycoproteins! WSL.)

Changes in carbohydrate structures on cell surfaces have been shown to be characteristic of many disease conditions. A 1998 review addressed the association of many cancers with changes in glycoconjugates. Cancers in which such changes have been noted include leukemia and intestinal, pancreatic, liver, ovarian, endometrial, prostate, urinary tract, lung, and breast cancers. Diseases that have been clearly related to deficiencies in the ability of cells to synthesize glycoproteins include leukocyte adhesion deficiency, hereditary erythroblastic multinuclearity with positive acidified serum lysis test, and carbohydrate-deficient glycoprotein syndrome. Cystic fibrosis and inflammatory diseases, such as rheumatoid arthritis, osteoarthritis, ulcerative colitis, and Crohn's disease all are associated with alterations in glycoforms. Some blood-related and vascular disorders, including many diseases of the cardiovascular system, exhibit abnormal glycoproteins.

Another 1998 paper looked at studies that attempted to correct faulty glycoconjugate metabolism by directly administering the necessary sugar through diet. This paper cites a case in which a patient was successfully treated with dietary supplement therapy of the sugar, mannose. The authors stated, ". . . the finding that mannose, but not glucose, corrected glycosylation. . . was surprising. . . Mannose offers an attractive therapy because it should be easy to administer and is nontoxic. . .There is scant information on the availability of mannose in food, but dietary mannose is probably insufficient to supply all glycosylation." The authors continued, "Human and animal ingestion studies show that mannose is readily absorbed, elevates blood mannose levels by 3- to-10-fold, and is cleared over several hours. Some of the mannose in the studies was incorporated into glycoproteins, especially those made by the liver and intestine, and mannose was also found on glycoproteins in the brain and in the fetus". The authors concluded: "It is likely that mannose is actively transported in the intestine and kidney".

We now know that carbohydrates are fundamental to health in far more important ways than simple energy production. Carbohydrates act as recognition determinants in cell-cell communication and, as such, they are vital to every aspect of human health. "Almost without exception, whenever two or more living cells interact in a specific way, cell-surface carbohydrates will be involved."

Glyconutritional supplements are designed to make the necessary sugars available to the cells more quickly and in greater quantity. The more substrate provided, the fewer steps the enzymatic conversion system has to take and the more the system functions at optimal capacity—Excerpts from Dr. Reg McDaniel's paper presented to an invitation only group at the U.S. Patent Agency. Complete paper available on request.

It is interesting to note that the essential sugar, galactose, removed from the diet when casein free, is recognized to increase the expression of the DPP-IV gene, and thus to increase the amount of DPP-IV in the mucosal membrane of the intestinal tract according to Dr. Mark Brudnak, Ph.D., N.D. This is the enzyme needed to break down casein and gluten, yet we reduce it when we remove milk! Galactose can be found in figs, grapes, peas, tomatoes, hazelnuts, beans, **and pectin supplements**. It is further interesting to note that

there are receptor sites for mannose throughout the body and brain, particularly lining the entire gastrointestinal tract. Among other things, mannose activates macrophages enabling them to more efficiently break down cell walls of invaders to better identify them and thus alert the immune system. These 10 vital sugars must be supplemented. The body cannot make enough for optimal health from glucose and galactose.

Mannatech™ has documented records of 45 genetic conditions whose symptoms of physical and mental malfunction have disappeared using the only patented combination of a stabilized, standardized form of mannose and other glyconutrients, including galactose. Genetics are not set in stone. Information is available on request to WillissL@aol.com.

The compounds benzoate and hippurate, as measured in urine, have been markers of intestinal bacterial overgrowth, but they can convey additional information. Using a major hepatic detoxification pathway, benzoate is conjugated with glycine to form hippurate. This detoxifies benzoic acid, but glycine also detoxifies phenols, and i**ndividuals with up-regulated hepatic detoxification pathways are frequently depleted in glycine. This situation will be reflected as an elevation of benzoate without concurrent elevation of hippurate.** Intestinal dysbiosis with weakened mucosal epithelium is a common reason for toxemia and the resulting up-regulation of the hepatic pathways (primarily Phase I). This loss of glycine would interfere with glutathione production (opioids have been shown to decrease hepatic glutathione also), down-regulating Phase II, and lead to an excess of cysteine probably. This lack of glutathione would tend to hypothyroidism among many other things. The upregulation of the detoxification pathways (especially Phase I) will deplete the body of many needed substances, and render many drugs ineffective. This is why one must be very careful about using such herbs as milk thistle, ginkgo biloba, angelica, coltsfoot, fo-ti, licorice, bistort, bupleurum capsicum, ginger, Pau D'Arco, royal jelly, and sheep sorrel, all of which up-regulate Phase I liver detoxification. Glycine supplementation, along with the B-complex vitamins, particularly vitamin B_6, can relieve the hepatic pathway demand for glycine, and probably enhance glutathione production—reducing cysteine levels and contributing to proper thyroid function. Some individuals have an inborn error of glycine metabolism, which means increased glycine intake can result in elevated glycine levels in the blood that manifest themselves as severe mental retardation in infants susceptible to this condition. This is a very rare, metabolic problem, but it should be evaluated in any individual who is going to be supplemented with glycine (DMG/TMG).

Histamine: Solution or Problem

Since the mid forties, we have been told we need an antihistamine for allergies. Before we were sold that bill of goods, Dr. Horton of Mayo Clinic had remarkable results against allergies, including MS and others suffering demyelination, by infusing histamine. So, I suggest that you allow the body to produce its histamine naturally by supplementing L-histidine (see warnings elsewhere in this paper). Take it with a supplement of vitamin C. Since autism is often thought to have much in common, it is of interest to note that high histamine levels define one type of schizophrenia (the histadelic, who is over stimulated), and low levels define another type (the histapenic, who is often suicidally depressed). Excess copper, common in autism, is a contributing cause of histapenia, and overloads of mercury, aluminum, lead, cadmium, and bismuth all contribute to histapenia. The amino acid methionine (along with calcium lactate, zinc, and manganese) detoxifies histamine, epinephrine, and nicotinic acid, and that would be helpful in regulating histamine in the histadelic. Water is the very best antihistamine known. Drink lots of water (1/2 your body weight in ounces), and take a small amount of salt on the tongue after each glass of water. Recent research shows that giving thanks for each glass of water changes its structore so it is better utilized and loses its negative signatures. Researchers at the Faculty of Pharmaceutical Sciences, Kumamoto University, Japan discovered that the sugar called n-acetyl-neuraminic (sialic) acid blocks the release of histamine in respiratory

allergic reactions.

Histamine acts on the H2 receptors of stomach cells increasing production of HCl. It also promotes production of the "intrinsic factor", allowing digestion and assimilation of vitamin B_{12}. However, excessive histamine, acting as a neurotransmitter, may have an inhibitory effect on the speech and social action centers of the brain; so, if there is regression in eye contact, social interaction, or speech, cut back or discontinue the L-histidine—or perhaps supplement GABA? In larger amounts (over 2 grams per day), histidine can reduce zinc levels and this is readily recognizable because the client develops a stuffy nose. A zinc lozenge or capsule quickly remedies the situation. Too much histidine will actually cause constipation, and this is overcome by taking zinc and GLA (in the form of Evening Primrose Oil). Histidine is an excellent chelator of copper and heavy metals as well, so when using this amino acid, you must supplement all the known minerals, particularly zinc and copper—unless suffering a high copper condition already. To reduce the excess copper, if not using histidine, supplement the diet with vitamin C, zinc, chromium, manganese, and molybdenum; however, this may make you feel worse, more depressed, as the copper is dumped from bone and tissue into the blood. Do not cease taking these supplements, but reduce the amount to slow the process of cleansing. When you begin to feel better, you can increase the amount again. About three months of supplementing will be necessary for maximum improvement. If you are severely depressed, this effort to lower copper levels should be attempted only under a doctor's care. It is vital that you have your doctor monitor the zinc-copper-iron ratios in particular.

The amino acid methionine serves to decrease histamine. It methylates, and thus detoxifies, histamine and many heavy metals. It should offer some of the same benefits as the H2 blockers. Therapeutic doses for adults run from 200 mg to 1000 mg per day. Methionine is a sulfur-bearing amino, and may be contraindicated for those unable to oxidize sulfur efficiently. In "The Chemistry of Success", Dr. Susan M. Lark writes: "Magnesium helps relax muscles and stabilize mast cells, preventing them from bursting and releasing a flood of histamine, thereby triggering an allergic reaction. In contrast, calcium stimulates mast cells to release histamines...in individuals with inflammatory conditions, the normal calcium to magnesium ratio of 2:1 can be modified to 1:1, or even 1:2." It should be noted that most antihistamines have a significant anticholinergic action (interferes with the action of the parasympathetic nervous system) which accounts for certain undesired side effects, but which can be used to advantage in a variety of conditions.

Antihistamines are, by the very nature of their pharmacological activity, immunosuppressant. An allergic reaction occurs when a foreign antigen activates T-cells passing through the site of the allergic response. These activated T-cells stimulate B-cells to produce high levels of IgE antibodies. At the same time, the T-cells release chemotactic factors that attract basophils into the affected tissue. The basophils bind with the newly produced IgE and, when these cells come in contact with the allergen, they release stores of histamine, heparin, and other mediators amplifying the allergic response. Antihistamines block the effects of histamine on blood vessels and smooth muscle, thus they help to suppress the body's reaction to a foreign antigen. The doctor prescribes epinephrine to curb the release of histamine from mast cells, but vitamin B_6 and magnesium work well without the side effects. Ascorbic acid has also been found to have the same kind of an antihistaminic effect. Lots of pure water is the best-known antihistamine! Drink more water, and increase intake of vitamins C and B_6, and zinc and magnesium.

High histamine levels can interfere with the proper functioning of the intestines, including arresting the small intestine's housekeeper wave. High intestinal histamine can be caused by a reaction to viruses or parasites, or by food that contains a lot of histamines, or by food that causes the body to release histamines. A reduction in the ability to remove histamine can also be the reason for high histamine levels and sensitivities. For example, the antibiotics *Augmentin* and *Doxycyline* and some other medications inhibit or deplete an enzyme that the body uses to remove histamine. A low histamine diet is one without aged cheeses, cured meat, yeast products, and fermented foods. Pre-packaged, prepared food should be avoided (check the espiration dates) because microbes may have created histamine and related amines in this older food. Fresh food should be emphasized. High histadine

containing foods, like spinach and tomatoes, need to be avoided. Citrus fruit and oxalates are avoided because these may cause the release of histamine.

A supplement of an enzyme called Diamine oxidase (DAO) might turn out to be useful in the treatment of autism's intestinal problems. This enzyme breaks down histamine found outside of cells in the intestines, nasal passages, and other parts of the body. There are several reasons to suspect that DAO is particularly important in autism. There is a genetic variation of the DAO gene associated with autism. Mercury can lower DAO levels. Histamine receptors are G-protein-coupled receptors. (G protein weaknesses are suspected as contributors to some cases of autism.)

Presently, Dirk Budka is conducting clinical trials of DAO's effectiveness in treating gastrointestinal problems. The medication he uses is called *Histrelief DAO*. It contains the enzyme DAO along with a little B_6 and quercetin. There is another DAO product available over-the-counter called *Histame*, but it is not as strong as *Histrelief*. Prudence is always warranted in the use of this enzyme or any other supplement. Dirk Budka measures levels of DAO before and after starting treatment. You don't want histamine levels to drop too low too quickly.

There is another enzyme used to control histamine levels, but this one works inside of cells. This method of getting rid of histamine requires methylation. William Walsh, PhD, suggests that certain methylating agents may help you feel better if you are a "high histamine" person. These are methionine, TMG, DMG, and SAMe.

Enzymes: The Fountain of Life

One should additionally supplement digestive enzymes (pancreatic enzymes). This seems particularly so for those suffering the PST/sulfate problem. This will often improve HCl production, and will improve digestion enabling a universal restoring of health, and of physical and mental function, as a result of improved nutrition. Lactase in the supplement would help digest milk products better, and would be beneficial to at least that 39% reported deficient. Cellulase is desirable to break down fibers, and supplementing peptidase would break down the peptides of casein and gluten, and reduce the problems attributed to them. Introduce enzymes gradually in the diet, with food; otherwise it may cause diarrhea, or even constipation—yet the use will often control chronic diarrhea or constipation. When ox bile is used, increase the amount until the fat is being digested. Papaya is a good source of the peptidase enzyme. Enteric-coated papaya tablets are available at the health food store.

SerenAid™, by Klaire Labs, 1-800-533-7255, $49.95 for 180 capsules (www.SerenAid.com), and EnzymAid™, a newer version from Kirkman's, are protease/peptidase supplements especially prepared for those sensitive to gluten and casein. These peptidase supplements are not to take the place of a Gf/Cf diet, but will give other benefits, such as when there is a slip-up on the diet, and in enhancing digestion and availability of branch-chained amino acids. They lack amylase, lipase, and cellulase, enzymes these children desperately need in my opinion; so, I recommend EnZym-Complete™ by Kirkman Labs. It contains everything except ox bile. If the stool is light or gray colored, frothy, floating, bulky, shiny, and foul smelling, one may choose a digestive enzyme with ox bile to help digest the fat, or supplement the amino acids taurine and glycine, and butyric acid to enhance bile function. The glycine will enhance HCl production too. One can use bile salts with the enzymes (ask your pharmacist).

Improved Nutrition Relieves Bowel and Infection

Improving nutrition by use of HCl and an enzyme supplement, and by judicious supplementation of amino acids and other nutrients, relieves bowel problems and overcomes infection. Taurine, like carnitine, is synthesized from methionine and cysteine. It, too, is found only in animal products. A deficiency in intake of these three amino acids, or a metabolic defect in metabolizing these sulfur-amino acids may lead to a deficiency of taurine creating numerous symptoms, including poor digestion of fat. Taurine deficiency is seen in Parkinson's Disease, anxiety, Candida, AIDS,

cardiac insufficiency, hypertension, impaired vision, cholesterol-gall stones, convulsions, depression, and kidney failure. Inborn errors of taurine metabolism have been described, with low-blood taurine resulting in early signs of depression, lethargy, fatigability, sleep disturbances, progressive weight loss, and depth perception impairment. Taurine is a major part of the GTF- Factor needed to process carbohydrates, it being a metabolite of cysteine. A lack of exposure to full-spectrum light of the sun may lead to a reduced concentration of the neurotransmitter taurine in the pineal and pituitary glands, and probably accounts for seasonal affective disorder (SAD). Vitamin A, D, and E deficiency and stress causes a spill of taurine into the urine. These kids are highly stressed, and are typically lacking these nutrients. Since many live without benefit of daily sun, this is a serious problem, compounding "autism" symptoms. SAD has been scientifically correlated to a lack of sunlight -- and decreased serotonin. (This is why modern antidepressant drugs called SSRIs -- like Prozac, Paxil and Zoloft – "selective serotonin reuptake inhibitors" are often prescribed.) A study published in the British Medical Journal Lancet in 2002 measured blood levels of serotonin, finding that production of serotonin by the brain was directly related to the duration of bright sunlight. Additionally, "Understanding how circadian rhythm works has many practical applications," said Sancar, a member of the UNC Lineberger Comprehensive Cancer Center. "First, individuals with a disease called seasonal affective disorder, or SAD, suffer serious depression during the winter months with short daylight. It may be that SAD patients have a defective gene that doesn't produce the (this newly discovered) pigment properly or simply suffer from a vitamin B_2 deficiency. Maybe we can treat some patients with vitamin B_2."

Characterized by feelings of sadness and depression, symptoms of these mood disorders also include irritability, fatigue, excessive eating, food cravings, oversleeping, social withdrawal, and loss of interest in sex. Symptoms of "winter blues" are milder than those of full-blown SAD; so, many people suffer from it and don't even realize it!

Dr. Martel references a large body of research evidence indicating that the cool-white fluorescent bulbs, (and incandescent are nearly as bad) found in virtually all classrooms, cause increased stress, hyperactivity, anxiety, fatigue, irritability, attention problems, and poor-learning performance. A part of this relates to the electro-magnetic frequencies (EMF) given off by the transformers, and the 60-cycle flickering of the lights. Demand full-spectrum lamps that correct these errors. Please insure your home and office are equipped with proper lighting. See www.Mercola.com.

The cellular-level, enzymatic effects of mercury binding with proteins include blockage of sulfur-oxidation processes, and a lack of several neurotransmitter amino acids which are significant factors in many autistics. A supplement of molybdenum enhances sulfite oxidase activity and helps convert potentially harmful sulfites into sulfates, but copper and sulfur suppress this action. For 36%, supplemental molybdenum reduced urinary sulfite loss and improved symptoms, one of which is wheezing. This improved enzyme activity enhances detoxification of the very-toxic, cyanide ions improving oxidative phosphorylation and cellular oxidation increasing ATP (energy molecule). By supplementing Moly and vitamin B_6 and avoiding sulphites one may become cough free, and asthma, irritable bowel, eczema, headaches, and behaviour problems all improve.

A deficiency of molybdenum would likely be associated with abnormally low levels of uric acid in the blood and excess sulfate in the urine. Supplementing molybdenum (which is depleted by supplemental sulfur) at 100 mcg three times a day for adults, or the amino acid L-taurine (500 mg daily, shortly reducing to 100 mg), will improve the function of the liver, producing better quality bile (darkening of the stool), protecting against gallstones, and improving the digestion of fats. Taurine is vital in preventing cataracts. It spares potassium, magnesium, and calcium in the heart, preventing arrhythmias, aids in detoxifying the body, and serves with GABA and glycine as inhibitory neurotransmitters in the brain. It promotes the proper regulation of blood sugar in those who may be insulin insufficient. Taurine is relatively inert, has a half-life of about 5 days, and can remain as a free amino acid. Vitamin B_6 is essential to its formation. It is considered to be conditionally essential for human infants and children. In other words, many don't have enough unless supplemented.

A deficiency of taurine or GABA in relation to serotonin and dopamine may lead to convulsions; so, in the nervous system, adequate presence of taurine stabilizes cell membranes, which raises the seizure threshold and helps treat epileptic seizures. Its anti-convulsant effect is long lasting, and can be confirmed both clinically and by repeat EEG's (electro-encephalograms). It strengthens neutrophils (white blood cells/part of immune system) in their ability to kill bacteria. I'll pick up the taurine thread eight paragraphs later.

Glycine is the major inhibitory neurotransmitter in the brain stem and spinal cord, where it participates in a variety of motor and sensory functions. Glycine is also present in the forebrain, where it has recently been shown to function as a co-agonist at the N-methyl-D-aspartate (NMDA) subtype of glutamate receptors (it stimulates their function). In the latter context, glycine promotes the actions of glutamate, the major excitatory neurotransmitter. Thus, glycine subserves both inhibitory and excitatory functions within the CNS. Blockage of the glutamate receptors could cause reduced pain, tunnel vision, inability to shift attention, auditory problems, repetitive behaviors, dilated pupils, and language problems. The reason is that it controls pruning of brain cells during development, modulates pain, and modulates dopamine and serotonin. Nevertheless, suppression of the NMDA by dissociative anesthetic has temporarily evoked speech and improved behavior in the Autistic (Stubbs at 1994 ASA Conference)

The NMDA receptor, when activated, opens the calcium channel and allows calcium and sodium into the cell, displacing potassium. This excites or fires the cell. It is activated mainly to amplify the effect of glutamate during periods of especially intense excitation. If this channel is not closed, it keeps firing, creating overactivity of that circuit and whatever it controls (cramps and spasms in muscles, stimming, etc.) even to destruction of the neuron. People of any age with depleted levels of reduced glutathione are especially vulnerable to the free-radical damage associated with glutamate excitotoxicity. Glutamate excitotoxicity damages or destroys some neurons, leading to deficiencies in memory and learning; on the other hand, excess of GABA can lead to lethargy. At the same time, excess ammonia, not detoxified through sufficient glutamine synthesis by the glia, leads to further neural damage. "There is evidence that depletion of reduced glutathione makes neurons more susceptible to excitotoxicity, and that intact mitochondrial function is essential for neuronal resistance to excitotoxic attack. It is believed, for example, that reduced levels of the energy currency of the cell (ATP) that accompanies loss of mitochondrial function causes depolarization of neuronal membrane, which exposes NMDA receptors to excessive levels of glutamate. The resulting neurohormonal cascade leads, in many cases, to the death of neurons in the brain, and in the central and peripheral nervous systems."—LEF Magazine, March 1996.

Most of the excitatory neurons of the cerebral cortex and hypothalamus have glutamate as their primary transmitter. One type of glutaminergic neuron accumulates zinc within vesicles at axon terminals and releases it into the synapse upon firing. The precise roles of zinc in synaptic function are not known, although its presence is certain, and there are zinc-binding sites on one subset of glutamate receptors called the NMDA (N-methyl-D-aspartate) receptor where it is said to lock the calcium channel tightly. Zinc, copper, and magnesium all appear to play important modulatory roles in controlling the NMDA receptor, which has been implicated in various forms of cortical plasticity, including learning. Zinc and magnesium are known to play a role in neuroprotection. It is possible, then, that decreased levels of some minerals in the brain may produce abnormal NMDA mediated plasticity and subsequent abnormalities in behavior. Since the blockade of NMDA receptors in the cerebral cortex enhances the release of dopamine from lower brain regions, reduced glutamate transmission could be the ultimate cause of excessive dopamine activity in the brains of both autistic and schizophrenic patients. Additionally, (according to Dr. Russell Blaylock, MD) magnesium deficiency doubles the production of free radicals in both epithelial cells and neurons dramatically increasing excitotoxicity! Low magnesium lowers cellular glutathione levels and increases excitotoxic, neuronal death. High glutamate levels have been shown to deplete cellular glutathione. Glutathione has been shown to down-regulate the excitotoxic NMDA receptor, thus blocking excitotoxicity.

Hypomagnesmia also inhibits GABA responses, which would increase cortical excitability. Though having adequate magnesium protects against excess calcium entering the cell, when there is a lack of ATP energy due to Krebs cycle (mitochondrial) problems, or simply a lack of glucose from hypoglycemia, the magnesium block is removed and calcium pours into the cell! Autistic children have a high incidence of hypoglycemia, which increases their risk of seizures and excitotoxicity.

High levels of another NMDA-receptor-blocking agent, kynurenic acid (a tryptophan metabolite that requires vitamin B_6 for its further metabolism), are found in the spinal fluid of patients with AIDS dementia, and are frequently seen in autism. The amino acid glycine indirectly activates NMDA receptors, and may reduce apathy, withdrawal, and cognitive impairment in schizophrenic patients. Strychnine poisoning results in muscular contractions and tetany as a result of glycinergic disinhibition and resulting overexcitation. Other a- and b-amino acids, including b-alanine and taurine, also activate glycine receptors, but with lower potency.

The enzyme kynureninase, which breaks down kynurenine, requires magnesium and pyridoxal phosphate (P5P), and its activity is decreased in a vitamin B_6 or magnesium deficiency (Shibata, 1991). Increased serum kynurenine has been found in Tourette's Syndrome (TS) (Dursun, 1994; Rickards, 1996). Kynurenine promotes vasoconstriction, reducing blood flow, via noradrenaline release (Rudzite, 1991). Anxiety can be produced by increased kynurenine (Orlikov, 1991), which can be related to magnesium deficiency (Shibata, 1991). An increased release of catecholamines is found in magnesium deficiency (Gunther, 1989). Enhanced stress responsivity of TS patients undergoing lumbar puncture was shown by their significantly high ACTH secretion and their significantly high norepinephrine excretion as compared to normal controls; and reported a higher level of anxiety before and during the procedure than the controls (Chappell, 1994). A heightened reactivity of the hypothalamic-pituitary-adrenal (HPA) axis and related noradrenergic sympathetic systems is suggested in TS (Chappell, 1994; Leckman, 1995).

Kynurenine markedly increases tics in animals when injected peripherally (Handley, 1977). L-Kynurenine interacts with GABA receptors in vitro, displacing GABA, and induces convulsions in vivo in rats (Pinelli, 1985). L-Kynurenine sulfate induces locomotor excitement (continuous rotation in rats around a longitudinal axis in one or another direction) and potentiates the convulsant effect of caffeine (Lapin, 1982). A lack of the neurotransmitter GABA has been implicated in a number of psychiatric and neurologic disorders (McGeer, 1989). The main support for GABA involvement in TS comes from drug studies that have shown in some patients the suppression of tics with the use of the GABA agonist clonazapam (Goetz, 1992; Hewlett, 1993). GABA modulates dopamine concentrations in the nucleus accumbens and corpus striatum (Dewey, 1997).

When the human brain becomes inflamed, cells called macrophages (glial cells) respond by releasing a neurotoxin called quinolinic acid, a metabolite of kynurenic acid. This toxin is also elevated in Parkinson's Disease, MS, ALS, and is responsible for the dementia that occurs in AIDS patients. What quinolinic acid does is stimulate neurons to repeatedly depolarize after the manner of glutamate. This eventually causes the neurons to demyelinate and die. People with elevated quinolinic acid have short-term memory problems. Lithium protects against neuronal injury when quinolinic acid is injected into the striatum, a process often used as an animal model of Huntington's disease.

If the stool is light tan or gray in color, taurine and/or glycine supplementation will restore normal bile and improve fat digestion. Taurine excess may be seen when vitamin B_6 or zinc is deficient in Rheumatoid Arthritis and liver disease. In fact, taurine in serum rises with low serum zinc, and results in low taurine levels in the brain, increasing the possibility of seizures. Taurine levels, whether high or low, indicate further lab work is needed. For

example, if Taurine levels are low, and the clinical picture is suggestive of candidiasis, one should test for Candida through comprehensive stool analysis and/or anti-Candida antibodies. **If Candida is found, supplement Taurine.** If Taurine levels are high, zinc and vitamin B_6 levels are probably low, and should be tested. P5P, the active form of vitamin B_6, is necessary for many amino acid reactions to take place.

Taurine's function and effectiveness are controlled by vitamin B_6 and zinc. Zinc and vitamin B_6 are almost universally deficient, and they are lost due to diarrhea. Considering the atrocious diet, and an inflamed gut, why wouldn't an autistic need to supplement vitamin B_6 and zinc, and possibly taurine? Always balance with copper in a 1-to-8, copper/zinc ratio, unless you know a high copper condition exists, or your child is hyper to copper, and monitor that ratio lest you create a copper anemia that will be made worse if you treat it with iron. An overactive thyroid can create a copper anemia also since copper gets used up in de-activating thyroid hormones.

Be careful with taurine for it tends to shut down the E1 Prostaglandins. Omega-6s (particularly GLA), when properly balanced with Omega 3s (particularly EPA), give rise to the E1 series of anti-inflammatory prostaglandins. When this balance is not present, arachidonic acid is produced excessively creating the inflammatory E2s. Elevated PgE2 suppresses immunity. The B-vitamins help convert essential fatty acids (EFA) into the prostaglandin (PG) tissue regulators. It turns out that, through hydrogenation, milling, and selection of w3-poor, Southern foods, we have also been systematically depleting, by as much as 90%, a newly discovered trace, Nordic EFA (w3) that is the sole precursor of the PG3 prostaglandins, of special importance to primates. This shortage of fatty acids has occurred even as a concurrent fiber deficiency increases body demand for EFAs. Since substrate EFA is processed by many B-vitamin catalysts, an EFA deficiency will mimic a panhypovitaminosis B, that is, a mixture of substrate beriberi and substrate pellagra resembling vitamin deficiency beriberi and pellagra but exhibiting as even more diverse endemic disease. Excess, unconverted Omega 6 tends to cancer, whereas adequate Omega 3 inhibits cancer. A good balance between Omega 6 and Omega 3 is being shown to be preventive of many forms of cancer. Supplementation with cod-liver oil for up to 12 weeks may be necessary to see this shift from PgE2 to PgE1, however, vitamin E in succinate form enhances both cellular and humoral immunities, and induces macrophages to produce elevated levels of IL-1 and/or to down-regulate PgE2 synthesis. It also shields the immune cells from the toxic effects of chemotherapy and radiation therapy. A small shot of insulin, according to recent research, makes chemotherapy more efficient at targeting cancer cells directly, and reduces side effects. These eicosanoids serve as a communication "wiring" for the body, communicating information from cellular DNA. Injections of succinate by doctors at University of California enabled the body to dispose of ammonia in the nerve tissue of multiple sclerosis victims. The vitamin E succinate may help with this. Supplementation with **creatine monohydrate reduces ammonia levels** of athletes after exercise. Further, the anti-inflammatory effects of digestive enzymes strip away the protein camouflage of cancer cells allowing the immune system to recognize and attack the aberrant cells (see "Enzymes, The Fountain of Life" by Lopez, Williams, and Miehlke). For this, I recommend Vitalzym™ or Wobenzym N available at most healthfood stores.. The amino acid, lysine has been shown to reduce tendency of cancer cells to metastasize.

Care and Feeding of the Bowel

Most of these children eat such a poor diet they suffer either diarrhea or constipation (sometimes producing the odd symptom of toe walking), perhaps alternating. One Mom reported that toe walking was stopped for her son by cranial-sacral therapy. One mother reports that what she thought to be a two-year-long bout of diarrhea was in fact constipation! Her son frequently screamed, rubbed or punched his stomach, and walked on his toes. Many doctors told her that this was merely self-stimulatory action (don't you believe it). He had an impacted bowel with a blockage as large as a small cantaloupe (a Bezoar)!

A Bezoar may be the result of pica, the eating of non-food substances. Most commonly, the diagnosis of pica is made after a patient is found to have iron deficiency anemia, lead poisoning, intestinal obstruction (Bezoar), or

another metabolic abnormality. Treating the patient diagnosed with pica is challenging. It normally indicates a mineral deficiency, frequently a need for iron (often indicated by an addiction to chewing ice). It can be from an addiction to phenol or another toxic substance. Management should include education about general nutrition and the PST syndrome, and may require iron therapy if a deficiency of this mineral is uncovered. Diagnosing and treating any underlying medical condition or complication such as lead poisoning is also important. It is vital to supplement with a good, digestive enzyme with a high amount of cellulase in it to digest the fibers that will otherwise block the gut with a Bezoar. Fortunately, in many cases pica will remit with time.

This is an increasing problem especially in those with poor digestion from a lack of HCl and enzymes such as the autistic, the aged, and the ones taking antacids and H2 blockers (Pepcid™, Zantac™). Foods are not being broken down, and the fibers, in particular, build up in a ball (Bezoar) in the stomach and migrate to the intestine. This can grow to such size that surgical removal is necessary! The use of soluble fiber: fructooligosaccharide, psyllium, oat, guar gum, pectin, or a combination of fibers; along with a probiotic (preferably goat yogurt, if not on casein free diet, or capsules of these beneficial bacteria), and the supplemental digestive enzymes with cellulase will work wonders to improve the bowel and the digestion. Where there is elevated HCl, the Lactobacillus Acidophilus may not survive, so to ensure they do, take the capsules on an empty stomach (three hours after eating) with some Alka-Seltzer Gold™ or with 1/4 teaspoon of bicarbonate of soda in a glass of water. Use of excessive bicarbonate of soda can disrupt potassium balance so the use of a small amount of Alka-Seltzer Gold™ may be preferred.

Felsenfeld, et al., found pancreatic enzymes useful in restoring proper intestinal flora, and in the nutritional management of gastrointestinal bacterial overgrowth problems that come from increases in bacteria such as Clostridia, Lactobacillae, Bifidobacteria, Bacteroides, Pseudomonceae, and the Enterobacteriaceae, such as E. Coli and Klebsiella. Many of these organisms can be recognized as those bacteria involved in protein putrefaction, and the so-called toxic bowel syndrome. Use of azeotropically (a method of extraction) processed pancreatin hastened the return of the altered intestinal flora to their pre-infection levels, and restored gastrointestinal ecology. Antibody production was increased by 250% over controls in Swiss white mice. Vitamin B_{12}, folic acid, and zinc absorption was enhanced. Conditions such as chronic and terminal illness, chemotherapy, physical and emotional trauma (surgery, car accident, etc.), prolonged and chronic pain, severe mental depression, and emotional stress may alter HCl secretions, largely from depletion of zinc supplies. This in turn, disrupts the flow and activation of pancreatic enzymes; hence, the malabsorption of food.

In such situations, hydrochloric acid supplementation may be warranted in addition to pancreatic enzymes and zinc. In a little heard of experiment at Rockefeller Foundation, researchers found "a host of diseases generally never associated with faulty diet were definitely connected with the type of food eaten by the individual man or animal." The parts of the body affected were the chest, ear, nose, upper respiratory passages, the eye, gastrointestinal and urinary tracts, the skin, blood, lymph glands, nerves, heart, and teeth. **Sinusitis, adenoids, infections of the middle ear, pneumonia, and bronchiectasis were some of the afflictions that the experimenters were able to reproduce in the animals at will by feeding them the diet that produced these diseases in man.**

Since these afflictions are usually regarded as infectious in nature, this is another proof that lowered resistance and impairments resulting from nutritional deficiencies rather than an invasion of microorganisms are the primary causative factors. **Only in a body that is depleted or weakened can a germ or virus gain a foothold.** All members of one viral type (there are five types) are usually almost identical in every way **except for the glycoprotein antigens on their protein coat**. It is this signal that can trigger an immune system response in a host. Without adequate glycoproteins in the host, the virus (or cancer cell) may not be recognized. Rebuild your immune function by correcting your dietary and by supplementing with Ambrotose AO™, Phyt•Aloe®, PLUS, and a good multivitamin/mineral, Catlyst™, by Mannatech™.

Additionally, many studies support the idea that the Coxsackie's virus, hepatitis B, and even HIV and other retroviruses are made more virulent by a selenium deficiency, and that supplementation with selenium significantly reduces incidence of these diseases. It has been shown that the relatively benign Coxsackie's virus in a selenium deficient mouse can mutate into a more virulent form that wrecks more damage, **and retains its virulence even when injected into those with adequate selenium**! —Dr. Ethan Will Taylor. Shifts in magnesium to manganese cations in the body can significantly enhance viral mutation rates by 6-10 fold! Scary. Ebola virus kills 4 out of 10 of its victims, however, in the presence of selenium supplementation the fatality rate drops by over 80 percent! That is a persuasive demonstration of the anti-viral power of this essential mineral. Considering that mercury depletes magnesium and selenium, poor diets lack magnesium and selenium, our kids universally lack magnesium and selenium, and that most of these kids harbor chronic viral infections, shouldn't you supplement magnesium and selenium? Use selenium at 5-mcg/kg body weight. Your doctor may wish to use more to overcome the chronic viral condition. A Brazil nut typically may contain 120-mcg selenium, and would be a good way to meet this need.

What one eats, or absorbs from what is eaten, also determines how the bowel functions, which in turn determines what one absorbs—whether nutrient or toxin. Diarrhea and constipation are both severe problems for most autistics. Diarrhea is the most debilitating due to loss of nutrients and necessary water, and must not be allowed to continue. Dehydration alone is a serious condition producing a multitude of symptoms. In this paper, I have mentioned a number of conditions contributing to diarrhea, but I summarize them here for ready reminder and as a checklist to pursue in elimination of this most serious condition:

1. A lack of symbiotic bacteria in the gut, creating a lack of butyric acid and nutrients.
2. Milk, either due to casein sensitivity, or to a lack of lactase to digest lactose.
3. Morning diarrhea due to lack of HCl.
4. Overgrowth of harmful bacteria, especially Candida, E. Coli, clostridium, and or giardia lamblia usually accompanied by a deficiency of B-cells. A T-cell problem may be present. An immune imbalance is indicated.
5. A deficiency of one or more nutrients: Vitamins A, B_1, D, K, pantothenic acid, niacin, folic acid, zinc, magnesium, potassium, MSM, fatty acids, and of protein. Supplementing these nutrients, especially vitamin A and zinc, and possibly glutamine, usually stops diarrhea, measles, malaria, and ear infections.
6. An excess of vitamin C, and of the B-complex. These should not be taken in high potency, single doses, but in three or four servings of lesser amounts. Look not only for loose stool as a sign of excess vitamin C, but also for too-rapid passage time. Check the time from eating a food to seeing it in the stool. Passage time should be a minimum of 18 hours—better 24 to 30 hours.
7. Rarely, a toxic build up of vitamins A, D, niacin, potassium, copper, phosphorus, zinc, or iron.
8. Use of the oxide and citrate forms of minerals, especially of magnesium. These are laxatives. Like vitamin C, more than 500 mg magnesium can be laxative. Look not only for loose stool, but also for too-rapid passage time. Reduce the amount used to allow normal passage time.
9. Too much fatty acid, or an imbalance between EPO and CLO. Too large a serving at the beginning in particular will affect the bowel, especially when vitamin B-complex is lacking and bile is not being formed adequately (stool is light colored, gray or yellow). In this case, a supplement of taurine, glycine, and niacinamide may darken the stool and improve digestion of fats.
10. Encephalitis will cause alternating diarrhea and constipation. This is a likely condition, especially early on in an adverse reaction to a vaccine.
11. Phenol toxicity, possibly from Clostridia overgrowth. This is prevalent in the PST condition. One must "unload the donkey".
12. An imbalance of acetylcholine/dopamine/norepinephrine, usually too much acetylcholine or too little dopamine or norepinephrine.

13. Antibiotic use causing destruction of symbiotic bacteria and a "Leaky Gut".
14. Use of fluoride. This is present in city water, juices, prepared cereals, soft drinks, toothpaste, and drugs. It's easy to get an overdose. Eliminate these and other sources.
15. Apple juice and other fruit juices, honey, and fructose sweetener, including high fructose corn syrup that is being added to everything these days. Fructose is a laxative to many.
16. Stress, emotional and otherwise, and these kids are under extreme stress.
17. Celiac disease, and lesser gluten/gliadin intolerance.
18. Dish soap not being rinsed from dishes adequately.
19. Mercury poisoning.
20. Systemic acidity as in diabetes and some epilepsy.
21. Excess insulin, as in a largely carbohydrate diet, or in soy formula/milk or a high intake of flax or other foods high in phytoestrogens.
22. A Bezoar, or a flaccid gut, or a lack of water causing impaction. This is actually constipation, but presents as diarrhea as the gut pours out water trying to flush the excess stool.
23. Excess histamine
24. Room fresheners cause headaches and depression in adults, diarrhea and earaches in children
25. Metallothionein deficiency
26. Cysteine toxicity, common in autistic and the mercury poisoned

Apple juice is often oversupplied to children, causing diarrhea. This juice is not readily absorbed, causing digestive distress. Additionally, doctors recruited 219 patients with unexplained upper GI symptoms—bloating, cramping, distension, diarrhea, and gas—, more than 80 percent of the participants met the diagnostic criteria for irritable bowel syndrome - and nearly 80 percent of the same participants tested positive for fructose allergy. Substitute white grape juice that is better tolerated. In any case, give only enough juice to keep the bowel regular and the stool soft–formed. More juice than this provides too much sugar leading to sugar-control problems, overweight, Candida, and other health concerns.

Diarrhea may improve with a diet high in fiber. Some leftovers from digestion, such as bile, produce diarrhea by irritating the intestine and acting as powerful laxatives. "Bile is an irritant to the large bowel, hence the importance of proper function of the ileocecal valve (ICV). If I recall my absorption mechanics correctly, the bile must be reabsorbed in the terminal ileum - if it "leaks" through a flaccid ICV the patient has irritable bowel symptoms. A green stool suggests a rapid transit and the presence of bile—D.H. Duffy, Sr., DC. Some fibers, such as pectin and gum (found in Ambrotose AO™ and Manna•Bears™), may help to bind these food residues and reduce diarrhea. If using a supplement of fiber, give a large glass of water, and do not use large amounts of fiber to begin. Care must be used not to block the intestine. Additionally, fiber inhibits the absorption of many, perhaps all, minerals. In one study, calcium, magnesium, zinc, and phosphorus absorption were decreased. The reduction of metal absorption was mainly due to its absorption in the non-digestive cellular fibers. In general, the more alkaline the lumen, the lower the rate of absorption of most minerals.

For those with irritable bowel, Colitis, Crohn's, Diverticulitis, and such irritations, four things will surely save the day. Take bromelain and aloe vera—preferably as found in Ambrotose AO™ by Mannatech, Inc. (Ambrotose® is a superior form, containing a patented, standardized extract of aloe called Manapol™, and the other vital saccharides, N-acetylneuraminic Acid, Galactose, Fucose, and N-acetylglucosamine found deficient in Crohn's)—and glutamine (amino acid, 500 mg, twice daily). When we are sick, the body fails to manufacture enough of this nonessential amino acid that is said to help intestinal cilia regain their ability to function. These three should relieve pain and diarrhea caused by inflammation and irritation of the bowel, and it could save your colon! The fourth is probiotic bacteria with some water-soluble fiber, preferably fructo-oligosaccharide (GI-Pro™ by Mannatech is a good one). Drs. Cooter and Schmtt suggest 300 micrograms of molybdenum per day (adults) in three divided doses, and further suggests staying

on it for at least four months. Dr. Atkins suggests 450 to 900 milligrams daily of Pantethine with an equal amount of Pantothenic Acid. Dr. Atkins concluded, based on his success with his patients, that Pantethine bypasses the block in converting vitamin B_5 (Pantothenic Acid) to Coenzyme A.

Some Additional Aids to Overcoming Diarrhea

1. Buttermilk and bananas: buttermilk stops diarrhea caused by certain harmful bacteria, and bananas alone are well proven to soothe the bowel and reduce diarrhea. One can give small babies nothing but mashed bananas. Give 2–3 ounce feedings, eight or ten times per day. The banana pulp may be incorporated with 1–1/2 ounces of buttermilk for each pound of body weight for the first 48 hours; afterward, the banana may be mixed with any accepted infant formula. The diarrhea should subside in about four days. Prevent the return by incorporating buttermilk and bananas into the youngster's diet.
2. Yogurt, unsweetened, non–pasteurized (use only that guaranteeing live bacteria), preferably from goat's milk. Yogurt is known to aid in controlling both constipation and diarrhea. It helps maintain a predominance of symbiotic bacteria in the gut. Yogurt is great for babies too. It is good to use a probiotic supplement too. Use one with Lactobacillus acidophilus and Bifidobacterium bifidum, as the later tends to diminish Candida albicans, Clostridia, and Streptococci populations, and is able to colonize the lower intestine more effectively than L-acidophilus. They are more resistant to antibiotics. Some supplements incorporate other types that are also helpful. The inclusion of fructooligosaccharide will ensure that the Bifido Bifidus have the advantage, and can squeeze out the harmful competition.
3. Whey concentrate: Whey promotes a healthful bacteria population in the gut. That is why methods 1 and 2 work. A recent method of concentrating the immunoglobulins in whey makes this help more readily available, and more effective. Use of it before traveling largely prevents "Traveler's Trots" caused mainly by E. Coli bacteria. It is effective also in eliminating the condition. It can be used to relieve diarrhea in babies. Ethical Nutrients® provides the Active Immunoglobulin Concentrate "Inner Strength™" for this purpose. It is also a nutritious protein supplement. One fighting mercury poisoning needs to remember that whey also supplies Cystine, a sulfur-bearing amino acid, which, with selenium, stimulates glutathione peroxidase production in the cells. Incidentally, to prevent E. Coli poisoning from hamburger meat, add a tablespoon of prune puree to a pound of meat (Dr. David Williams, MD).
4. Hydrochloric acid: E. Coli and other bacteria can't survive in a stomach with strong hydrochloric acid (HCl) present. To improve digestion and protect against the "Trots", take three or four tablets of HCl with each meal. See my ExeBook*, Self–help to Good Health,* 50 Chapters, over 1000 pages, $29.95US for more on HCl. A drink with a very strong mixture of lemon or limejuice will protect also. Make it as strong as you can tolerate to provide sufficient acidity to kill bacteria. A strong drink of apple cider vinegar will work too.
5. Garlic: Garlic is a most healthful food and superior treatment for everything from ulcers to gut inflammation of all descriptions It restores a balance of bacteria/fungi in the intestine, soothes the whole digestive tract, prevents formation and absorption of harmful toxins into the system, and stops diarrhea; even that from diphtheria, parasites, scarlet fever, and tuberculosis. Use a clove or two of fresh garlic a day, depending on severity of symptoms. Alternatively, use Kyolic Aged Garlic that is deodorized. For mild cases, take two capsules twice daily. For more severe problems, take two capsules three to five times daily. At these higher doses, you may begin to smell the garlic.

   Garlic aids in lowering blood pressure. It demonstrates antibiotic powers comparable to penicillin. Documented cures for tuberculosis have been reported. It is said to be a preventive of polio,

pneumonia, diphtheria, typhus, and tuberculosis. It is an expectorant, useful in all respiratory infections, especially those with a dry hacking cough, as in bronchitis, colds, and asthma. It is an excellent nerve tonic, and a destroyer of pin, round, and thread worms. Roundworms cause many attacks of asthma. Roundworms (hookworms, whipworms, pinworms); tapeworm (dipylidium caninum) can cause the child to vomit, throw up, regurgitate, and expel. In large quantities, garlic is antagonistic to vitamin E when taken at the same meal. Take the succinate (dry) form of vitamin E, or take the garlic at a different time. In some instances, you may need to discontinue the garlic to realize the full benefit of vitamin E (in control of angina pectoris). A good source of garlic and onion and other vine–ripened, phytochemical rich foods is Phyt•Aloe®, and for children, Manna•Bears™, by Mannatech™. Manna•Bears'™ gummy bear consistency is a pectin gel, a soluble fiber that binds strontium 90 (atomic fallout) and lead enabling their removal. Pectin is of great benefit in bowel problems as well.

6. Carob and Slippery Elm: Two tablespoons of 100%, raw, carob flour and a dash of the herb, Slippery Elm (both available at the health food store), stirred into a glass of milk, sweet or sour, provides a tasteful and nourishing way to control too–frequent bowel movements. Heat the milk to boiling before mixing if a greater effect is needed. To regulate the bowel, these should be taken daily until the bowel is normal, and then in reduced amount every other day or so. One can mix these with cereal and milk if desired. Slippery elm (available in capsule) is very effective alone. Carob at 5% total food intake (mixed with formula or cereal) has been twice as effective for children and infants as conventional medical treatment. Do not continue for too long; lest you constipate the child.
7. Bring a cup of milk to a boil and drink it warm. Add unsweetened cocoa if desired.

There are many reasons for constipation, but there are usually a few obvious ones that should be addressed at the first. The first signs may be quite subtle. Signs of constipation may be just gas, or commonly moodiness, nervousness, and ill temper. Gastritis, or indigestion, is defined as a vague abdominal discomfort, a bad taste in the mouth, ranging up to nausea, lack of appetite, headache, etc. This may be a manifestation of constipation. It is essential to resolve any constipation issues before beginning heavy metals detoxification. **You must insure 3-4 bowel movements a day before doing any chelation or detoxification program! Supplying adequate magnesium is an integral part of this effort.**

1. Destruction, or imbalance of intestinal flora. Yogurt often helps.
2. Lead poisoning.
3. Potassium deficiency (and laxatives deplete it the more).
4. Excess milk (due in part to a lack of bulk). In young children, chronic constipation can be a manifestation of intolerance of cow's milk (N Engl J Med 1998;339:1100-4).
5. Lack of Hydrochloric acid (necessary to digestion and assimilation).
6. Lack of digestive enzymes (poor pancreatic function, all foods cooked).
7. Protein deficiency.
8. Parasites.
9. Lack of fiber in diet.
10. Zinc deficiency.
11. Candida.
12. Inadequate water intake that can cause impaction.
13. Lack of B-complex vitamins, especially B_1, niacin, pantothenic acid.
14. Lack of bile (gallbladder removed or blockage of bile ducts).
15. Thyroid sluggish (hypothyroidism).

16. Excessively alkaline system (constipation promotes alkalinity and harmful flora that create an alkaline system).
17. Overuse of antacids (destroying necessary hydrochloric acid).
18. Excess vitamin D (hypercalcemia from excess vitamin D), this is highly unlikely.
19. Enzymatic damage to liver.
20. Side effects of some drugs (Dilantin™).
21. Prolonged use of SSRIs. (Prozac™).
22. Deficiency of arginine. Streptococcus fecalis in the gut will deplete arginine.
23. MSM deficiency.
24. Too much histidine
25. Poor smooth-muscle tone due to a lack of acetylcholine and Serotonin; it often causes an impaction, and presents itself as diarrhea.

Poor smooth muscle tone is a frequent cause of impaction that is unnoticed or ignored. Why would you wait while the system is poisoned by the reabsorption of toxins that should have been expelled? Why would you wait while all the organs are put under such pressure they cannot function rightly? Why would you allow the bowel to swell beyond its normal size and risk a torsion? Torsion of the bowel can twist and destroy a segment of the GI tract requiring emergency surgery.

Laxatives are sometimes necessary to overcome an acute condition, such as impaction. First, increase the child's intake of water. Use prune juice judiciously, for it can be harsh to a sensitive colon. The laxative of choice for low peristalsis is said to be cascara sagrada, said to actually improve muscle tone of the bowel. Cabbage juice is also an effective laxative for these children with low peristalsis. One mother said, "One natural remedy worth trying is kiwi fruit. Works on my kids and myself every time!" This could be an allergic reaction.

All these problem areas are discussed in detail elsewhere in this paper.

Cod-liver oil and Vitamin A

Among the number of causes that have been proposed in autism seemingly all have two common denominators, G-proteins and thyroid hormones. G-protein-coupled receptors and G-protein-mediated cell responses are of key importance in the processes of neurotransmission and intercellular signaling in the brain. Thyroid-stimulating hormone, thyrotrophin (TSH), stimulates the uptake of iodine into the thyroid, the conversion of diiodotyrosine to thyroxine (T4), and the secretion of thyroid hormones into the bloodstream. If not enough iodine is available in the diet, then not enough T4 will be made to shut off the release of TSH (high test numbers). Prolonged stimulation of the thyroid by TSH results in an abnormal enlargement of the gland, known as goiter. In normal circumstances, G-proteins are modulated by thyroid hormones. In the absence of TSH, the thyroid's G-protein is totally inactive. The binding of TSH to its receptor activates G-protein, which stimulates the effector systems and then quickly becomes inactive. The end result of this signal-transduction process in the thyroid gland is stimulation of thyroid hormone synthesis and thyroid growth (Utiger, 1995). G-proteins direct information transfer from outside the cell to inside the cell. HIV infection, electromagnetic signals, and growth factors all use G-proteins to transmit their signals. G-proteins are found in cells throughout the body.

Here is a part of Dr. Mary Megson statement to US Congress on April 6, 2000 about vitamin A deficiency in Autism (edited slightly for clarity):

> In the vast majority of these cases, one parent reports night blindness or other rare disorders that are

caused by a genetic defect in a G-protein, where they join cell membrane receptors that are activated by retinoids, neurotransmitters, hormones, Secretin, and other protein messengers. G-proteins are cellular proteins that upgrade or downgrade signals in sensory organs that regulate touch, taste, smell, hearing, and vision. They are found all over the body, in high concentration in the gut and the brain. They turn on or off multiple metabolic pathways including those for glucose, lipid, protein metabolism, and cell growth and survival. Close to the age of "autistic regression," we add the pertussis toxin that completely disrupts G-Alpha signals. The opposite G-proteins are now "on", without inhibition, leading to:

1. Glycogen breakdown or gluconeogenesis. Many of these children have elevated blood sugars. There is a sixty-eight percent incidence of diabetes in parents and grandparents of these children.
2. Lipid breakdown that increases blood fats that leads to hyperlipidemia. One-third of families have either a parent or grandparent who died from myocardial infarction at less than 55 years of age and was diagnosed with hyperlipidemia.
3. Cell-growth differentiation and survival that leads to uncontrolled cell growth. There are cases of malignancies associated with ras-oncogene in 60 families of these autistic children. The measles antibodies cross react with intermediate filaments that are the glue that holds cells together in the gut wall. **The loss of cell-to-cell connection interrupts apoptosis (the ability of neighboring cells to kill off abnormal cells).** The MMR vaccine at 15 months precedes the DPT at 18 months, which turns on uncontrolled cell-growth differentiation and survival.

Most families report cancer in the parents or grandparents, the most common being colon cancer. The genetic defect, found in 30-50% of adult cancers, is a cancer gene (ras-oncogene). **It is the same defect as that for congenital stationary night blindness.** (Of significance is a study from England that found a pregnant mother's allergies can be passed to her child, but that restricting her allergic reactions during pregnancy can help prevent this transfer—Dr. Jill Warner, Southhampton General Hospital. Dr. Rosemary Waring reports that the group with this hereditary background are the most likely to respond favorably to the gluten/casein free diet—WSL.)

G-protein defects cause severe loss of rod function in most autistic children. They lose night vision and light-to-dark shading on objects in the daylight. They sink into a "magic eye puzzle", seeing only color and shape in all of their visual field, except for a "box" in the middle, the only place they get the impression of the three dimensional nature of objects. Only when they look at television or a computer do they predictably hear the right language for what they see. They try to make sense of the world around them by lining up toys, sorting by color. They have to "see" objects by adding "boxes" together, thus "thinking in pictures". Their avoidance of eye contact is an attempt to get light to land off center in the retina where they have some rod function. Due to G-protein defects, mother's touch feels like sandpaper on their skin. Common sounds become like nails scraped on a blackboard. We think they cannot abstract, but we sink these children into an abstract painting at 18 months of age, and they are left to figure out if the language they are hearing is connected to what they are looking at, at the time.

The defect for congenital, stationary, night blindness on the short arm of the X chromosome affects cell-membrane, calcium channels that, if not functioning, block (the action of—WSL) NMDA/glutamate receptors (preventing calcium from entering the neurons to activate a signal—WSL) in the hippocampus where pathways connect the left and right brain with the frontal lobe.

Margaret Bauman has described a lack of cell growth and differentiation in the hippocampus seen on autopsy in autistic children. The frontal lobe is the seat of attention, inhibition of impulse, social judgment, and all executive function.

When stimulated, these NMDA receptors, through G-proteins, stimulate nuclear (of the nucleus) Vitamin A receptors discovered by Ron Evans, et al. Dec 1998. When blocked, in the animal model, mice are unable to learn and remember changes in their environment. They act as if they have significant visual perceptual problems and have spatial learning deficits.

Of concern is that the Hepatitis B virus protein sequence was originally isolated in the gene for a similar retinoid receptor (RAR beta) that is the critical receptor important for brain plasticity and retinoid signaling in the hippocampus.

I am using natural, lipid-soluble concentrated cis form of vitamin A in cod-liver oil (CLO now seems to be palmitate fortified – look for vitamin A from fish-liver oil - Willis) to bypass blocked G-protein pathways and turn on these central retinoid receptors. In a few days, most of these children regain eye contact, and some say their "box" of clear vision grows. After two months on Vitamin A treatment some of these children, when given a single dose of Bethanechol™ to stimulate pathways in the parasympathetic system in the gut, begin to focus, laugh, concentrate, show a sense of humor, and talk after 30 minutes as if reconnected.

This improves cognition, but they are still physically ill. When these children get the MMR vaccine, their vitamin A stores are depleted; they cannot compensate for blocked pathways. Lack of vitamin A, that has been called "the anti-infective agent," leaves them immuno-suppressed. They lack cell-mediated immunity. T-cell activation, important for long-term immune memory, requires 14-hydroxy retro-retinol. **Using cod-liver oil, the only natural source of this natural substance, the children get well**.

The parasympathetic nervous system is blocked by the second G-protein defect. These children are unable to relax, focus, and digest their food. Instead, they are in sympathetic overdrive with a constant outpouring of adrenaline and stress hormones. They are anxious, pace, have dilated pupils, high-blood pressure, and a high, heart rate. These and other symptoms of attention deficit hyperactivity disorder are part of this constant "fright or flight" response. These symptoms improve on vitamin A and Bethanechol™. (Magnesium in 500 mg or more, and similar amounts of potassium tend to balance these pathways, and should be used with the CLO. Additionally, bicarbonate shuts off the adrenal response—WSL).

I live in a small, middle-class neighborhood with twenty-three houses. I recently counted thirty children who live in this community who are on medication for ADHD. One week ago, my oldest son, who is gifted but dyslexic, had twelve neighborhood friends over for dinner. As I looked around the table, all of these children, but one, had dilated pupils. After two-and-one-half months of taking vitamin A and D in cod-liver oil, my son announced, "I can read now. The letters don't jump around on the page anymore." He is able to focus and his handwriting has improved dramatically. In his high school, for college-bound-dyslexic students, 68 of 70 teenagers report seeing headlights with starbursts, a symptom of congenital stationary night blindness!

Dr. Wm. D. Padula, OD, F A A O, Padula Institute of Vision Rehabilitation, Guilford, Connecticutt addresses the asocial, autistic behavior by construing a crucial connection between outward behavior and visual problems. There are two processes of vision: the focal and the ambient. The little understood ambient refers to the process

whereby the brain uses the peripheral vision to orient the body in space…a special awareness which provides information used for balance, movement, coordination, and posture. One common consequence of dysfunctional ambient vision is a visual midline shift. He corrects for this by special "prism" eyeglasses. He explains that by bringing the ambient system into improved spatial function, posture and balance can be affected. For further information see www.padulainstitute.com.

There's a nutritionist in Britain, Jacqueline Stordy, Ph.D., who examined dyslexics and realized that they were night blind, and when she treated them with fish oil, the night blindness went away. A study of dyslexic children with normal IQs found the dyslexic group had a cadmium, hair-level average of 2.6 PPM, 25 times that of the control group, exceeding the maximum of the normal, acceptable range. The dyslexic group also had somewhat higher aluminum and copper levels. This could all be from a zinc deficiency! Zinc controls how much vitamin A the liver will release and influences copper and other metals through its activities in Metallothionein.

Dr. Megson said, "These children are unable to relax, focus, and digest their food. Instead, they are in Sympathetic overdrive with a constant outpouring of adrenaline and stress hormones." It is vital that one eat according to one's metabolic function. If Sympathetic, then one must eat according to that type. Further, to shift to the more balanced state (moving back to a balance with Parasympathetic), it has been shown in many studies that magnesium suppresses Sympathetic function, while potassium stimulates Parasympathetic activity. Furthermore, a largely vegetarian diet tends to be very alkalinizing, and the neurophysiologic research documents that in an alkaline environment Sympathetic activity is reduced and Parasympathetic activity increased. So, if Sympathic, stressed-out kids will increase vegetable intake (or take "green drinks", or Phyt•Aloe™, a vegetable concentrate by Mannatech™) and supplement with zinc picolinate, magnesium, potassium, vitamins A and D (cod-liver oil), vitamin B_6, and lecithin, or any of a number of acetylcholine builders listed herein, they can achieve a more balanced state without Bethanechol™.

Dr. Megson also suggests letting autistics have salt. Dutch researchers have just found that high levels of blood calcium is linked to a faster decline in cognitive ability. If there is a G-protein defect, three of the channels that remove calcium from the cells are blocked. The only other major means of removing calcium is with salt. Salt will also support the overworked adrenals. Without enough salt, there is a danger that an autistic will calcify his or her brain cells. I suggest sea salt rather than the processed table salts available. Additionally, I suggest drinking more water, taking a bit of salt after each glass.

While much has been said about congenital, night blindness, there are three nutrient deficiencies that produce night blindness: Dark adaptation has been used as a tool for identifying patients with subclinical vitamin A deficiency. With this functional test, it was shown that tissue vitamin A deficiency occurs over a wide range of serum vitamin A concentrations. However, serum vitamin A concentrations >1.4 micromol/L predict normal dark adaptation 95% of the time. Other causes of abnormal dark adaptation include zinc and protein deficiencies.

Aside from its well-known role in facilitating vision, vitamin A is now recognized as an essential hormone for maintaining the structural and functional integrity of epithelial membranes, such as the cornea. It also has a role in inducing epithelial-cell differentiation in mucus-secreting cells. Besides night blindness, severe deficiency of this vitamin can cause keratinization of the corneal layer leading to permanent blindness (xerophthalmia). Other organ systems that would be susceptible to vitamin A deficiency include the respiratory (impaired breathing), gastrointestinal (indigestion and diarrhea) and genitourinary systems (calculi formation, impaired spermatogenesis and abortion). Deficiencies of this vitamin also result in increased susceptibility to carcinogenesis of epithelial tissues and to damage by the measles virus. I suspect Wakefield's measles-in-the-gut is found in severely, vitamin-A deficient kids.

It's significant to note that Secretin receptors, opioid receptors, oxytocin receptors, dopamine receptors, thyrotropin-releasing-hormone (TRH) receptors, thyroid-stimulating-hormone (TSH) receptors, stress inducers, etc., are all coupled to G-proteins. G-proteins function essentially as on-off switches for cellular signaling. They consist of three, non-identical, protein subunits (alpha, beta, and gamma) that are non-covalently associated. In the resting state, the nucleotide guanosine diphosphate (GDP) is tightly bound to the alpha subunit. This is the "off" position of the G-protein switch. When the binding of a hormone activates the membrane receptor—it interacts with the G-protein, causing GDP to dissociate from the alpha subunit. GDP is rapidly replaced by guanosine triphosphate (GTP), which activates the G-protein. This in turn, leads to its dissociation into alpha-subunit and beta-gamma-subunit complexes, either or both of which can activate effectors. The switch is now "on". Within a few seconds the alpha subunit, which is a guanosine triphosphatase (GTPase), hydrolyzes GTP to GDP. This inactivates the alpha subunit, allows it to reassociate with the beta-gamma subunit, and resets the switch to the "off" position. Many different G-proteins mediate diverse physiologic effects by this mechanism.

Bethanechol

Bethanechol is an oral, parasympathetic agonist, very similar to endogenous acetylcholine, in fact it mimics acetylcholine, but it is more resistant to inactivation by endogenous acetylcholinesterase, and therefore, it is much longer acting. "We have a pretty good idea from Stephen Davies' work, and by inference, that many of our kids are hypochlorhydric (not enough HCl), and this must diminish the secretion of pancreatic digestive enzymes and peptide messengers, like Secretin, with receptors outside the gut. Bethanechol is a strong pancreatic stimulant. It has a ubiquitous, positive effect on gastric acid secretion. Happily, this increased parietal-cell activity isn't usually associated with increased gastro-esophageal reflux. Relatively, there is a very long, clinical tradition using Bethanechol expressly for symptoms of G.E.-reflux.

> In healthy adult males, Bethanechol increased gastric-residence time by 64%, but did not affect mouth-to-cecum time. (Pharmacotherapy 9[4] 226-231, 1989). Increased volume of stomach acid and increased time of exposure to it in the stomach would seem beneficial to digestion and absorption. In spite of its parasympathetic qualities, Bethanechol does not appear to cause problems with hypermotility (sic), and my very first Bethanechol patient had his first-ever, formed stool the following day. Improved digestion, and more ordered peristalsis may explain the firmed stool.
>
> I have observed truly marked language and social gains within 40 minutes of the first dose of Bethanechol, as if a switch had been flipped. Bethanechol could have such an immediate effect either as a strong pancreatic stimulant physiologically upstream to Secretin, or through its own effect at numerous known CNS binding sites (Biochemical Pharmacology 38[5]: 837-50, 1989, Mar 1). My early impression, by the way, is that the children who have demonstrated a response to Secretin may fall within the group of likely Bethanechol-responders.
>
> The official literature suggests contraindication in asthma, seizures, hyperthyroidism, and peptic ulcer, though one clinician reports a definite pattern of improvement with Bethanechol in numerous patients with seizure activity, and I have used it effectively in one child with quiescent-reactive, airway disease. At the low doses being used, no significant abdominal pain or other clinical suggestion of ulcer activation is being seen. I strongly advise observation of the first dose in the office for one hour with injectable Atropine handy in the unlikely case of respiratory difficulties.
>
> I am very happy to add to this discussion some recent literature research from Teresa Binstock and Linda Carlton. Experimentally, Bethanechol stimulates secretion of numerous antimicrobial

peptides (defensins) by the small intestine (Infect Immunol 64[12]:5161-5 Dec 1996). These defensins may have a wide spectrum, including antiviral. One child with damaged intestinal ganglia and pseudo-obstruction associated with active Epstein Barr was treated successfully with Bethanechol (Am J Gastroenterol 95[1]:280-4 Jan 2000). Dysbiosis control could be an important mechanism.

The thin, scored 10 mg Bethanechol tablets are easily halved or quartered for starting doses of 2.5-5.0 mg. For the tablet-averse, Bethanechol has been shown stable in water solution for at least thirty days (Ann. of Pharmacotherapy 31 Mar p 294-6 1997). There may be a preference for the generic Bethanechol over the proprietary (Urecholine™) in order to avoid the dyes. It is inexpensive.

Some adults have been on Bethanechol for many years for heartburn or urinary retention, but we must advise parents that safety in children over long periods has not been established. If a significant part of its mechanism is improved digestion and assimilation of nutrients, then perhaps the need for the Bethanechol will lessen over time.

I would emphasize that we don't think that the Bethanechol is effective unless you prime for about two months prior with cod-liver oil. Kirkman Labs is the first supplier to tell me that their cod-liver oil is 100% natural, unspiked with any A-palmitate.

Protocol:

Pre-treat for a few days prior to cod-liver oil (and continue):
Use vitamin E 200-400 IU/day and vitamin C 250-1000 mg bid (twice daily).
Use Cod (Salmon) Liver Oil according to vitamin A content:
Less than 2 years of age--850 IU vitamin A
2-5 years--2500 IU vitamin A
5-10 years--3750 IU vitamin A
Older--5000 IU vitamin A

Minimize A-Palmitate (It blocks a Retinol G-Protein Signaling Protein). Try to keep total supplementation with preformed vitamin A (Carotene sources do not count towards this maximum) not greater than double the amount provided with the CLO over the long term to stay well below potential toxic doses of vitamin A.

Begin Bethanechol after child has been on CLO for 2 months, continuing the CLO:

Less than 5 years of age--start with 2.5 mg of Bethanechol PO (by mouth)
5-8 years--start 5.0-7.5 mg
Older--start 10 mg

Adjust dosages upward to observe effect (arbitrary current maximum is 12.5 mg). A second dose in the afternoon is often desirable.

Pupillary size (gets smaller) may help guide dosing (anyone else seeing a tendency to relatively dilated pupils in our kids, by the way?)—Dr. Woody McGinnis, MD.

Dr. Amy Holmes, after supplementing 3500 units of vitamin A from cod-liver oil for three months found Mike's (age

5) vitamin A level was still only 19 ("normal" being listed as 25-90). She is now giving significantly more vitamin A from cod-liver oil. My personal opinion is that Dr. Megson and Dr. McGinnis are recommending far too little cod-liver oil. Vitamin A in amounts up to 20,000 units (about 4 teaspoons) has been used with no evidence of toxicity in adults. This amount is needed for its EPA input as well. Dr. Robert Atkins, MD, recommends up to 50,000 IU (adults) at the beginning of any infection, reducing to 10,000 IU once symptoms have subsided. Three teaspoons of cod-liver oil approximates 6 oz of oily fish. **The marker to reduce the amount is the clearing of the "Chicken-skin" bumps on shoulders, elbows, thighs, and calves. As Dr. McGinnis indicates, pupil size will decrease (normalize) as vitamin A stores are replaced and activated with Bethanechol.** One can increase acetylcholine production, and better utilize the vitamin A, by supplementing one or more of these: lecithin granules, phosphatidylcholine, acetyl-L-carnitine, DMAE, TMG, or Coenzyme A as well as by using Bethanechol. This increase of acetylcholine will restore muscle tone to the intestines preventing impaction that often accompanies a lack of muscle tone exemplified by dilated eyes. It is reported that not all autistic children do well on choline, but this group should.

It should be noted that mainly Italian researchers have evaluated Acetyl-L-carnitine, but many other European and American doctors are not convinced of its benefits. Side effects can include nausea, stomach upset, dizziness, and headache. The side effects become less troublesome when using a lower dose of the preparation, but long-term effects are not clear. I experienced the stomach upset on 500 mg daily. It was the burning we often call "overacid stomach". This could be a problem with children who cannot communicate. It stopped as soon as I discontinued.

Now, if one is going to resort to drugs to control reflux or to encourage speech, wouldn't it be much better to use Bethanechol that supports digestion rather than Pepcid™, or other H2 blockers, that stops digestion of meats and proteins, and interferes with utilization of many vital nutrients? Additionally, the herb ginger is reported to tighten the sphincter muscles, and thus prevent reflux. It also controls heartburn after eating. It should be used with awareness that it enhances Phase I liver function, and could deplete several body elements and reduce the effectiveness of certain drugs. For this reason, peppermint tea or lozenge may be better for occasional heartburn. Additionally, ginger (and other herbs that enhance Phase I liver enzyme activity) and H2 blockers can diminish the effectiveness of many other drugs. In some cases, they can render them completely ineffective.

Phase I activity is often desynchronized from Phase II activity resulting in high-level production of highly-reactive, oxidized metabolites which outstrips the neutralizing capacity of the Phase II system. These patients exhibit strong reactivity to a wide-range of environmental chemicals and medications and require heavy antioxidant and Phase II support whilst avoiding interventions that upregulate Phase I activity. Children with PST problems should avoid ginger, milk thistle, and other herbs that selectively stimulate the Phase I enzymes unless testing shows this to be desirable. This induction of enzymes involved in detoxification may be caused by substances that selectively upregulate a Phase I enzyme without co-induction of the corresponding Phase II enzyme. This leads to a higher level of the reactive (harmful), intermediate compounds that can cause damage to DNA, RNA, and proteins. Examples include the polycyclic hydrocarbons from cigarette smoke, aryl amines from charbroiled meats, and prolonged intake of the antiepileptic medication, phenobarbital.

Dr. McGinnis offers these further observations about Bethanechol based on continuing experience:

> This is looking oh-so muscarinic (producing direct stimulation of smooth muscles, though in this usage he means the opposite—WSL)—big pupils (we are measuring them now—its easy with the graded circles, which can be drawn by hand in mm diameters, and held right alongside the eye), poor vision, bowel dysmotility with constipation and large-bore stools (diarrhea can stem from dysmotility, too, and of course even if they have a muscarinic block, the overgrowths

and malabsorption may manifest as diarrhea), decreased sweating, and pallor. **All this is consistent with low, muscarinic tone.** There will be subgroups, but many of these autistic kids are looking clinically like muscarinic wipeout. Our assumption is that the CLO is building receptors, or otherwise favoring transmission so the Bethanechol can work.

These kids really turn around like nothing I've ever seen or heard before, especially as a single intervention. They are fun, connected, social, "with-it" kids, with many waking-up age appropriate. First changes are sometimes immediate, sometimes a little later. Bowels improve. Appetite improves. There is cumulative improvement in gaze, speech, sociability, and language. We expect urinary organic acids and intestinal permeability will improve if the Cod-liver Oil and Bethanechol are restoring the gut as expected.

More than ever, I'm realizing that the visual problem these kids have is in many ways worse than total blindness. It is more confusing, harder to integrate with the other senses. Dilated pupils and poor ciliary function from the muscarinic failure means fuzzy vision. Absent or poor rod function (we have all those long-ignored ERGs) means poor shading. The poor shading and edge definition cripple depth perception. We have a flat canvas with poor focus, and changing, fuzzy masses of color. A swing moving back and forth toward you would be a growing and shrinking colored mass. He sees body and head shapes by color, but no facial features. Spooky. It's no wonder these kids start running around hugging everybody after the Bethanechol.

One might worry about damaging receptors by over-stimulation with long-term use of a messenger like Bethanechol, but I found two children who was improving on this cholinergic for several months, and then they started acting over-stimulated, hyperactive, and driven. With lower doses, this stopped right away, and behavior continues to improve. I find this comforting, and hope it is a real trend, that the taper will continue. There is no suggestion of tolerance so far.

No serious adverse reactions yet, even in quiescent reactive airway. We have a report of a seventy-pound child having really excessive lacrimation with a 25 mg initial dose of oral Bethanechol, prompting immediate dose lowering. There was no suggestion of excessive bronchial secretion, or of a need for atropine in this case, but one should be ready.

Chronic low-level insecticide exposure is known to decimate muscarinic receptor populations in animals. Some of the insecticides hang around for an awfully long time. Mercury is awfully rough on muscarinic receptors, too.

Typical signs of excess Bethanechol commonly include sweating, salivation, flushing, lowered blood pressure, nausea, abdominal cramps/diarrhea, and even bronchospasm, and would indicate a reduced dosage. Excessive saliva production is also a symptom of poisoning from particular chemicals, such as anticholinesterases (insect poison, mercury, aluminum, fluoride, sage, Aricept™, Huperzine A™), and a shortage of salt.

Most popular insecticides kill insects by inhibiting the cholinesterase enzyme in the insect nervous system. Unfortunately, humans rely on the same neurotransmitter and will experience the same breakdown of the nervous system. An alternative insecticide blocks the insect neurotransmitter octopamine. Mammals, birds, and fish do not have octopamine in their nervous systems. This alternative insecticide is derived from plant and tree essential oils. It is manufactured by Ecosmart Technologies (Franklin, Tennessee) for the professional & agricultural market, and Biorganic for the domestic market. You should be able to find Biorganic products at Wal-Mart™, Lowe's™, Home Depot™, and other distributors.

In those who show the dilated eyes, and other signs of loss of smooth muscle tone, avoid these foods, herbs, and drugs that relax smooth muscles: Most increase nitric oxide (NO)—the gas that relaxes the smooth muscles in blood vessels contributing to better blood flow. The results are essentially the same as for calcium and beta channel blockers (prescription drugs) that should be avoided also. A supplement of manganese will likely help to degrade arginine, preventing excessive levels, and zinc inhibits nitric-oxide formation. Be aware that stress increases nitric oxide production, and that excess NO inhibits the mitochondrial function, especially in Complexes I to III, and it depletes intracellular glutathione. The detriment can be reversed by high intensity light or by replenishment of intracellular reduced glutathione.

Oleuropein (Olive Leaf Extract) .....
Garlic (allicin).....
Arginine (amino acid), and high arginine foods. Increases growth hormone and NO.
Choline.....
Ginger .....
Nitroglycerine, increases NO. .....
Nitrates increase NO.
Viagra™ increases NO (should not be used with these other nitric oxide donors.) .....
Sumatripan (antimigraine drug).....
Aspirin/salicylate/Cox Inhibitors enhances NO synthase (NOS-1) increases NO. .....

Hawthorne
Niacin
Ginkgo Biloba, increases blood flow to brain, increasing oxygen and increasing nutrients to the brain. Increases nitric oxide synthase & increases NO. It has other negative effects on Phase I liver detox pathways that contraindicate its use.
Inositol
Yohimbine increases NO
Fluvastatin (cholesterol lowering drug),
Noni Juice increases NO.
Chocolate
Forskolin
Ginseng, increases NO by blocking Cyclic GMP (Chen 1995). Hypoglycemic persons should not use it.
Schizandra, increases NO.

Additionally, organic solvents and pesticides, whose exposure is reported to precede and presumably induce multiple-chemical sensitivities, are also reported to induce excessive, nitric-oxide synthesis. Such chemicals are also reported to induce increased synthesis of inflammatory cytokines (growth hormones) that, in turn, increases the inducible nitric oxide synthase (leading to increased synthesis of nitric oxide). All excitotoxin damage (primarily glutamate and MSG) generates high levels of nitric oxide that has been shown to inhibit sulfation of GAGS. A recent study of Fibromyalgia implicates elevated nitric oxide, and also elevated NMDA stimulation, which stimulation (primarily by glutamate) is known to increase nitric oxide synthesis. Infection and other stresses that often precede CFS may produce CFS. The theory predicts that each of these can lead into this mechanism by inducing excessive nitric oxide. Infection is not the only stress that may be involved in this way; both physical trauma and severe psychological trauma can produce excessive nitric oxide synthesis. In addition, tissue hypoxia may induce this cycle by increasing levels of superoxide (present in Down's) (the other precursor of peroxynitrite).

In animal models of MCS, there is convincing evidence for an essential role for both excessive NMDA activity (where such activity is known to induce excessive nitric oxide) and for excessive nitric oxide synthesis itself. If one blocks the excessive, nitric-oxide synthesis in these animal models, the characteristic biological response is also blocked.

An increased production of nitric oxide and of various inflammatory peptides—such as substance P (a neurotransmitter that transmits pain and modulates inflammation), CGRP (calcitonin-gene related peptide), and VIP (Vasoactive Intestinal Peptide); and Secretin (a 27 amino acid peptide, one of a family

of neuropeptides that include VIP and glucagon)—is observed in magnesium deficient rats, so I suggest that a high intake of vitamin B_6 and magnesium (5-10 mg/kg/day) and an equal amount of calcium can benefit these low-muscle-tone kids, including, of course, the ones with weak peristalsis. (A distinct, new family of G-protein-coupled receptors includes VIP, PACAP, glucagon, parathyroid hormone, and calcitonin.) VIP seems to play a modulating role (with a bias toward inhibition) in the inflammatory process in these diseases, as does Substance P and CGRP.

Dopamine, a neurotransmitter, and the amino acid tyramine (formed from tyrosine metabolism that produces dopamine) are phenolic compounds that are strongly vasodilative, and they lower the pressure (in the gut) at which peristalsis begins. It seems then that a supplement of tyrosine would help with these kids with poor peristalsis. Furthermore, since serotonin induces a stronger peristalsis, a cautious use of 5-HTP should benefit the low, smooth-muscle-tone condition.

One can increase acetylcholine production and enhance the tone of skeletal muscles by supplementing one or more of these: Bethanechol, melatonin, acetyl-L-carnitine (or L-carnitine), CDP Choline, MSM, SAMe, DMAE, TMG, manganese, Coenzyme A, lecithin granules (choline), or phosphatidylcholine. The effectiveness of these will be enhanced by a supplement of pantothenic acid (vitamin B_5). It is reported that not all autistic children do well on choline, but this group should. Loss of gut mucosal integrity (common in ASD) would decrease by 85% gut absorption of CoA (the critical enzyme when choline is converted to acetylcholine), shunting choline into homocysteine production that SAMe, folic acid, vitamin B_6, and B_{12} metabolize back into usable aminos. TMG helps make SAM. I think that in building acetylcholine, one should supplement the TMG, folic acid, vitamin B_6 and B_{12}, and possibly SAMe, to protect against a build up of homocysteine. There is probably a need to detoxify mercury, PCBs, and Candida for all depress acetylcholine production. **There may be a real need for serotonin. Serotonin stimulates the peristalsis of the bowel. So, I suggest the supplementing of vitamin B_6 and magnesium to conserve serotonin, and, unless the child is strongly PST, of TMG, SAMe, and/or 5-HTP to create more serotonin. See cautions in using 5-HTP elsewhere in this paper.** The laxative of choice for low peristalsis is cascara sagrada, said to actually improve muscle tone of the bowel. Cabbage juice is also an effective laxative for these children with low peristalsis.

Acetylcholinesterase is an enzyme in the blood and tissues that hydrolyses spent acetylcholine in the fashion that MAO-B catabolizes serotonin/dopamine. An excess of Acetylcholinesterase inhibitors such as Aricept™, Huperzine™, Meshinon™, Galantamine, insecticides, mercury, aluminum, fluoride, sage, and a shortage of salt can produce aggression and violence by keeping acetylcholine on the receptors, revved up and firing. This will make the child truly unable to sit or stand still! Everything is getting the signal to go-go. These do not increase acetylcholine stores, as sometimes suggested, but simply keep acetylcholine in the synapse longer. In small amounts, use of these inhibitors can sometimes make do with less acetylcholine or be beneficial when receptors are diminished or insensitive. In larger amounts, it can kill by paralysis of vital organs. Low cholinesterase levels (an enzyme present largely in the brain) induce a vitamin B_1 deficiency that lowers dopamine levels, and thus Epinephrine and Norepinephrine levels. Where possible, it is better to produce more acetylcholine, as indicated above, rather than mess with these enzymes.

As stated, dopamine and the amino acid tyramine are strongly vasodilative, and they lower the pressure (in the gut) at which peristalsis begins. A reduction of norepinephrine (NE) and/or dopamine, or too much acetylcholine activity causes diarrhea, irritable bowel syndrome, cramps, nervous stomach, increased saliva, raised insulin levels, and airways and cerebral blood vessels constrict. A lack of dopamine is a problem in some patients with chronic anxiety.

It has been shown that a deficiency of vitamin A, the amino acid cysteine, the minerals zinc, iodine, iron, and selenium, tyrosine, and of the antioxidant glutathione (which requires cysteine), and an excess of copper will adversely slow the thyroid function creating low muscle tone. White sugar also paralyzes the intestinal peristalsis, and leads to immune system failure. Copper slows the thyroid while zinc increases thyroid action.

What? Rickets?

There is also a condition growing quite common: children with unrecognized, subclinical rickets. If your child has a sweaty head when asleep, coupled with sensitive scalp that makes it a struggle to comb the hair, and when walking, the child keeps calling, "Mommy, pick me up", the child needs two teaspoons of cod-liver oil each day to avoid full-blown rickets. Fish oil and flax oil can inhibit the action of the staphylococcal, membrane-damaging toxins also. Rickets may also present a bulging forehead and a sunken chest. Get the kid in sun! He needs the vitamin D, and the sun will convert trans vitamin A (palmitate) to the cis form. Vitamin D–deficient, IL-10 KO mice bred to develop irritable bowel syndrome, rapidly developed diarrhea and a wasting disease, which induced mortality. In contrast, vitamin D–sufficient, IL-10 KO mice did not develop diarrhea, waste, or die—College of Health and Human Development, The Pennsylvania State University. **Vitamin D deficiencies include**: irritability, tensions, diarrhea, insomnia, myopia, convulsions, soft teeth, diabetes, and rickets in children, and brittle bones (osteoporosis), shorter telomeres (amounting to something like eight-years shorter life), cancer, and heart disease in older folk. It includes those symptoms listed as calcium and phosphorus deficiencies also. **Large amounts of vitamin A deplete vitamin D, so get the kid in the sun or give additional (1200 IU) vitamin D to avoid rickets and brittle bones.** Patients with higher levels of vitamin D in their blood performed significantly better on two of the most common tests for lung function.

Children with rickets have reduced numbers of circulating CD8 killer T-cells. As these cells are involved in ridding the body of virus-infected cells, this may be a reflection of reduced antiviral immunity. On the other hand, B-cells, which are the cells that make antibodies, are increased in the circulation of these patients. There have been no recent studies, however, to determine whether these B-cells have normal function. Nevertheless, the child is Th2 dominant and needs to rebalance his immune function with an adequate intake of vitamin D.

Gregory A. Plotnikoff, MD, of the University of Minnesota Medical School found a much higher incidence of vitamin D deficiency in patients with unexplained muscle and skeletal pain than expected, regardless of their ages. All African Americans, East Africans, Hispanics, and Native Americans who participated in the study were vitamin D deficient, as were all of the patients under the age of 30. The researcher says it was a big surprise that the worst vitamin D deficiencies ccurred in young people -- especially women of childbearing age (frightening prospects for any children. Almost half of new mothers and one-third of their babies suffer from vitamin D deficiency, according to new Canadian research). "The message here is that unexplained pain may very well be linked to a vitamin D deficiency," says Plotnikoff. "My hope is that patients with unexplained pain will be tested for vitamin D status, and treated, if necessary."

My friend, Dr. Daniel Duffy, adds this: "The quadricep muscle is related to the small intestine function and vitamin D, and the relationship can be demonstrated especially in people with knee pain due to quadricep weakness. In the winter, people are sunlight deficient and suffer a lot of knee pain and small intestine connected problems due to the lack of sunlight. One thirty-second dose of ultaviolet from my lamp usually eliminates the knee pain at least momentarily by turning on the quadricep muscle. Administration of vitamin D helps resolve the cases." Additionally, "Low intakes of vitamin D and certain flavonoids emerged as the sole predictors of acute myocardial infarction (AMI) and stroke. In biochemical analyses, on the other hand, these disorders were

predicted only by low levels of 1,25-dihydroxy-vitamin D and iron in the serum." - Marniemi and colleagues published their study in Nutrition Metabolism and Cardiovascular Diseases.

Other than the sun, you can find high amounts of vitamin D in these foods: fatty fish (e.g. mackerel, salmon, tuna, halibut and cod), shrimp, liver, eggs, enriched milk & dairy products, fortified breakfast cereal and bread. Nevertheless, it will likely be wise to supplement vitamin D3 as discussed elsewhere herein.

Managing Fatty Acids

Autistic children typically have a gross deficiency in almost all nutrients, but the nature of the condition is to throw things out of balance. This is true of fatty acids. These kids have a problem with fatty acids, including an accumulation of too many very-long-chain-fatty acids (VLCFA). Proper fatty acid intake and balance are necessary to protein metabolism. This paper will help you understand more about this subject, and give a few suggestions of possible help. Physical symptoms signaling an Omega-6 fatty acid deficiency in children are the appearance of small bumps on the skin, particularly the shoulders and upper arms (often called "chicken skin"- a vitamin A deficiency), excessive dryness of hair and skin, brittle nails, excessive thirst and urination, bed wetting, eczema, hives, seborrhea (dandruff), hyperactivity, frequent or excessive temper tantrums, asthma, hay fever, and a frequently stuffy, runny, itchy nose (this can be zinc deficiency too).

Researchers evaluated 96 people between 10 and 60 years old with moderate eczema. Participants received either 400 IU of natural vitamin E per day or a placebo for eight months. Those who received the vitamin E had significantly greater improvement compared with those who took the placebo. In the vitamin E group, 60% reported "great improvement" or near remission of their eczema, while only 2% of those taking a placebo reported similar improvement. **Blood levels of immunoglobulin E (IgE), a measure of immune-system stimulation, also decreased in those taking vitamin E (less allergies)**, whereas no change in IgE levels was found in the placebo group.

Our ancestor's main sources of fat were lean, wild animals, fish, and nuts. Currently, the American diet contains similar amounts of fat (35-40%), but the amounts of the various types of fats are very different. The main fat types eaten today are saturated fat from fatty, red meats and dairy products, transfatty acids from margarine, peanut butter, and processed baked goods, and an excess of Omega 6 unsaturated oils. Omega-3 fats are almost nonexistent in the diet. This is due to two factors, we have largely ceased to eat fish, and our beef is no longer grass fed. According to a study at Iowa State University in 2001, the omega-3-to-omega-6 ratio of grass-fed, organic beef could be as high as 1-to-0.16 (6.25:1). That's 2.5 times better than wild salmon (3:1)! This overabundance of Omega-6 EFAs, the introduction of an entirely new-fat type (transfatty acids that deplete selenium stores and interfere with conversion of Omega 6 to GLA), the elimination of good quality, saturated fats (butter and coconut oils), and a major deficiency in Omega-3 EFAs have resulted in major health problems. These include heart disease, stroke, hypertension, cancer, and chronic degenerative diseases, and this contributes to other chronic conditions such as autism. Another adverse effect of trans-fats in the diet is an enhancement of the body's pro-inflammatory hormones (prostaglandin E2) and inhibition of the anti-inflammatory types (prostaglandin E1 and E3). In recent tests by Brandeis University reported by Dr. Jonathan Wright, MD, both transfats and **interesterified** fats (stearic-acid rich fats that are largely replacing transfats in processed foods) raised both blood sugar level and LDL/HDL ratio. Fasting sugar level raised almost 20%! This is far more than an oral antidiabetic drug can lower it! Read the labels and reject all such unnatural fats.

This undesirable influence on prostaglandin balance will render you more vulnerable to inflammatory conditions that don't want to heal! The part of the brain that Omega-3 deficiency affects is the learning ability, anxiety/depression, and auditory and visual perception. The Omega-3 fats also aid in balancing the

autoimmune system. A growing number of children have autoimmune allergies, colic, and skin problems that are often shared by the parents. "At Framingham, we found that the people who ate the most saturated fat, the most cholesterol, and the most calories weighed the least, were more physically active, and had the lowest serum cholesterol levels."—William Castelli, M.D., **Director of the Framingham Study**. Reported in The Archives of Internal Medicine, Vol. 152, pages 1371-72, July 1992. This was not reported in the media!

"After all the polyunsaturated-fat hype and hoopla, and all the saturated fat fear and loathing for the last 10 years, that quote is a shocking eye-opener. If nothing else, you at least know not to blindly accept everything modern medicine has to tell you. That alone just gave you a huge chance to improve your health the next time you're given the latest, wonder drug and told not to worry, 'it's FDA approved.' Even more important than that, however, should be the realization that things are not as they should be. The 'mistake' above shouldn't have been made by intelligent professionals (or by anyone else, for that matter), so there's a very real possibility that it wasn't a mistake."—Allan N. Spreen, MD.

In a recent correspondence, Dr. Spreen made some comments that will illustrate his specific position in this dietary debate. Dr. Spreen said: "The purpose of the low-fat fad of the 90's was to sell cholesterol-lowering drugs (which it did wonderfully). You're seeing the effects of that propaganda two ways: 1) We are FAR fatter than we ever were in 1990 (on far less fat intake), and 2) Dr. Atkins (the low-carb guru) is getting more and more press, as the truth just can't be held down forever. My best results in my practice, far and away, were achieved using low-carb diets. Remember: low fat by definition is high carbohydrate." High carbohydrate means high insulin levels and that messes up the fatty acids!

There are eight, essential fatty acids divided into two classes: Omega-3 and Omega 6. Since we have quit saturated (solid) fats, and begun to use oils, we are getting too much Omega-6 fatty acid. The typical American diet is overbalanced to Omega-6/Omega-3 about 24 to 1. On the face of it, this would justify reducing polyunsaturated oils (avoid Canola™) and supplementing Omega-3 for the general population to restore balance. For most, however, in particular the autistic, the enzyme Delta-6 Desaturase needed to convert the long-chain, linoleic acid (LA) into gamma linolenic acid (GLA) is severely inhibited creating a marked deficiency of GLA. The resultant build up of unconverted Omega-6, and the overbalance of Omega-6 to Omega-3 tends to produce arachidonic acid and the inflammatory PgE2 that promotes inflammatory conditions throughout the body and tends to cancer. PgE2 is often elevated in angina, arthritis, Crohn's Disease, diabetes, depression, food allergies, dysmenorrhea, multiple sclerosis, thrombosis, and schizophrenia. In humans with neuropathy or impairment of the immune system, significant deficits of Omega 3 EFAs have been measured. This detrimental effect can be offset by feeding more Omega-3, by supplementing antioxidants, and by managing the fatty acid pathway as outlined herein. Although there is usually a greater need for the Omega-6s than the Omega-3s, the farther north one goes, the greater the need for the Omega-3s that are more polyunsaturated. In the artic, the ratio of Omega-6 to Omega-3 is 1:1, below the artic circle, about 2.5:1, in temperate zones 4:1, in the tropics (desert) 10:1. In addition, low magnesium levels have been shown to enhance release of inflammatory cytokines and to increase excitotoxicity. Much of the injury to dendrites, synapses, and neurons, by both cytokines and excitotoxicity, is caused by free radicals, necessitating an antioxidant supplement.

A recent study found that women whose white blood cell counts were in the top one-fourth of participants had twice the risk of death from cardiovascular disease as women whose counts were in the lowest quarter. Women in the top fourth also had a 40% greater risk of nonfatal myocardial infarction, a 46% increased risk of stroke, and a 50% greater risk of dying of any cause. The white blood cell count is a widely available and inexpensive measure of inflammation.

Eicosanoids are a class of super-hormones that control all the body's hormone systems, and virtually every vital

physiological function. Those made from Omega-3 are rather neutral. Production of the "good" and "bad" eicosanoids begins within the cell with the Omega-6, essential fatty acid, linoleic acid, at least some of which has been delivered there by the amino acid carnitine. The enzyme, Delta 6 Desaturase, converts linoleic acid to gamma linolenic acid (GLA) without which no eicosanoids can be produced. For the first six months, GLA must be supplied by mother's milk, since the child cannot produce it yet. Most "formula" or cow's milk provides virtually none (and no DHA needed for brain development either, though in 2002, Efamil Lipil is the first to include DHA). Children with eczema and asthma usually have a weakness in this enzyme, and supplementing GLA (Evening Primrose Oil) has produced significant improvement in their condition. After age thirty, the ability to produce GLA slows due to loss of Delta 6 Desaturase enzyme activity, and at 65, production is probably reduced to 1/3 what it was at age 25. Furthermore, any intake of transfatty acids, lack of good, saturated fats, excess salicylates, excess alpha linolenic acid (ALA—an Omega-3 fatty acid, precursor to EPA/DHA, found in high amounts in flax seed, flax seed oil, and walnuts), high carbohydrate meals, acetaldehydes (from Candida and alcohol), viral infection (commonly present in ASD), hypothyroidism, diabetes, and stress all interfere with Delta 6 Desaturase, as does a deficiency of vitamins B_6 and B_{12}, biotin, niacin, magnesium, and zinc. The worst of all is the transfatty acids from hydrogenated oils and processed foods and excess carbohydrate-to-protein in a meal (raising insulin). Avoid these like the plague. This interference with Delta 6 Desaturase hinders conversion of ALA to EPA/DHA making flax oil a very poor choice for Omega 3 benefits. I suggest cod-liver oil that contains large amounts of EPA/DHA.

A zinc deficiency, that may be exacerbated by a vitamin B_6 deficiency, leads to an inhibition of prostaglandin synthesis from essential fatty acids, either by blocking linoleic acid desaturation to gamma linolenic acid, or by inhibiting the mobilization of dihomo-gamma-linolenic acid (DGLA) from the tissue membrane stores. It also leads to an impairment of vitamin A metabolism. Disease, especially viral infections (chronic measles, herpes, and Epstein Barr Virus?), along with stress-produced hormones (adrenaline and cortisol, which increases insulin), acetaldehyde (a neurotoxin produced by Candida, auto exhaust, alcohol, and cigarette smoke), hypothyroidism (often induced or made worse by fluoride in drinking and bath water), a high-carbohydrate diet (that increases insulin), transfatty acid intake, a lack of good-quality, saturated fats, excess salicylates (aspirin), a niacin or biotin deficiency, and a magnesium deficiency all interfere with this Delta 6 Desaturase, therefore, almost everyone can be benefited by supplementing GLA.

Herbs that excrete fatty acids (through enhanced cytochrome p450 liver enzyme activity) such as Angelica, Licorice, turmeric, Ginger, Milk Thistle, Pau D'Arco, Royal Jelly, Sheep Sorrel, carrageenans, and Ginkgo Biloba can reduce these vital substrates. The herbs reduce GLA and EPA leading to health problems, especially asthma, eczema, rosacea, and dry skin and hair. (See Dr. Darryl See's report for a list of herbs adversely affecting these enzymes.)

Incidentally, Curcumin, the major component (40%) in Turmeric, is a good antioxidant, but when taking too much, like some other antioxidants, it becomes a pro-oxidant. It causes free radicals! Not more than 500 mg should be taken unless under medical supervision. Two hundred would be safer. Unlike some of the above herbs, turmeric and watercress are said to enhance both Phase I and Phase II liver enzymes, making one of them a good choice when there is a need to enhance systemic detoxification. Including them in the dietary is a good choice.

The several things listed that hinder Delta-6 Desaturase and the use of these herbs by many result in virtually everyone lacking GLA and DGLA. This will lead to weight problems, muscle loss, energy loss, suppressed immune function, and to a generally less healthy state. GLA deficiency tends to seizures. Those showing any sign of seizure activity should have a fatty acid analysis before supplementing fatty acids. Since one of the many functions of Omega-6 is to regulate water loss, dry skin and hair, brittle nails, dandruff, eczema, excessive thirst and urination, and rough skin often indicate a deficiency in GLA.

Another common reason for dry skin is "subclinical" hypothyroidism that hinders metabolism of fatty acids. This is "subclinical' only because of unreliable TSH tests and inaccurate "normal" ranges. Careful check of symptoms will be sufficient to make a test prescription of Natural Thyroid. The proof of hypothyroidism is in the improved condition of the patient! The largest of several studies (Colorado Thyroid Disease Prevalence Study studied 225,000 residents) showing significant debilitating conditions found these common symptoms: dry skin, (28%), poor memory (24%), slow thinking (22%), muscle weakness (22%), muscle cramps (17%), fatigue (18%), cold intolerance (15%), constipation (8%), and hoarseness (7%). Incidentally, tests in rats showed that no single T4 or T3 medication normalized thyroid hormone concentrations in all tissues. It was only through the administration of both T4 and T3 that tissue concentrations of thyroid hormones were normalized. Doctors would be well advised that the thyroid produces 20% of the T3, and that this affects the moods rather than the body responses. In any case, doctors who take this approach believe as many as 10% of the general population and up to 25% of the elderly are affected by undiagnosed hypothyroidism. A much higher percentage of autistic children and their Mothers are affected! Mom, do the iodine and the Barnes Morning Temperature test described later, and support the thyroid.

Once GLA is available, it converts to Dihomo Gamma Linolenic Acid (DGLA), and the enzyme delta 5 Desaturase enters the picture. It is made overactive by a high-carbohydrate, low-fat diet, by stress-induced cortisol (both raise insulin levels), and by a magnesium deficiency all of which enhance production of arachidonic acid and prostaglandin E2 that causes inflammatory conditions. It is mandatory to avoid a high-carbohydrate diet when attempting to balance fatty acids. Delta 5 desaturase is inhibited by glucagon (the hormonal counterbalance to insulin that opens fat stores for energy supply), and by most flavons, especially Quercetin, and by EPA/DHA. These favor production of good eicosanoids, especially PgE1. PgE1 stimulates the manufacture and secretion of vital hormones in the thyroid, adrenal, and pituitary glands, including human growth hormone. PgE1 controls the neurotransmitters, the nervous system's chemical messengers, and suppresses insulin release.

There is a close correlation between insulin, excitotoxins, free radicals, and eicosanoid production. Glutamate primarily acts by opening the calcium channel into cells. An excess allows calcium to pour into the cell's interior causing overexcitation and contraction. In skeletal muscles, this leads to cramps and spasms. Intracellular calcium in high concentrations initiates the enzymatic release of arachidonic acid from the cell membrane, where it is then attacked by two enzyme systems, the cyclooxygenase system and the lipooxgenase system. These in turn produce a series of compounds that can damage cell membranes, proteins, and DNA, primarily by free radical production, but also directly by the "harmful eicosanoids". Magnesium and manganese, and to a lesser extent zinc, counter this undesirable flood of calcium into cells.

Biochemically, we know that high-glycemic, high-carbohydrate diets that stimulate the release of excess insulin can trigger the production of "harmful eicosanoids". We should also recognize that simple sugars are not the only substances that can trigger the release of insulin. One of the more powerful triggers involves the amino acids leucine, alanine, and taurine. Glutamine, while not acting as an insulin trigger itself, markedly potentiates insulin release by leucine. This is why, except under certain situations, individual "free" amino acids should be avoided. Interestingly, insulin increases toxic sensitivity to other excitotoxins as well. Of particular interest is the finding that most of the flavonoids, especially Quercetin, are potent and selective inhibitors of delta 5-lipooxygenase enzymes that initiates the production of "bad" eicosanoids. Flavones are also potent and selective inhibitors of the enzyme cyclooxygenase (COX) that is responsible for the production of thromboxane A2, one of the "harmful eicosanoids". The COX-2 enzymes are associated only with excitatory type neurons in the brain, and appear to play a major role in neurodegeneration. One of the critical steps in the production of eicosanoids is the liberation of arachidonic acid from the cell membrane by phospholipase A2. Flavonones such as naringenin (from grapefruit) and hesperetin (citrus fruits) produce a dose related inhibition of phospholipase A2 (80% inhibition), thereby inhibiting the release of arachidonic acid. The flavons can thus be somewhat helpful in inhibiting production of arachidonic acid and its

harmful, inflammatory eicosanoids. The non-steroidal, anti-inflammatory drugs act similarly to block the production of inflammatory eicosanoids. **Unfortunately, flavons, especially Quercetin, also inhibit Phase I liver enzymes.**

One paper has reported that there is an essential requirement for reduced glutathione (GSH) for the anti-oxidant effect of quercetin. N-acetylcysteine increases the supplies of intracellular cysteine needed to maintain high levels of reduced glutathione. Hence, inclusion of NAC in combination with quercetin should help prevent any possible pro-oxidant effects of quercetin. Moreover, another paper reported that quercetin (as well as onion extract, which is rich in quercetin) increased intracellular glutathione concentration in cell culture by about 50%. The mechanism for the latter effect was an increased expression of gamma-glutamylcysteine synthetase, the rate-limiting enzyme in the synthesis of reduced glutathione.

Eating the proper ratio of carbohydrate to protein (that stimulates glucagon) for your metabolic type enables the delta 6 desaturase to produce the necessary GLA, and by eating fish or supplementing fish oil, the resulting glucagon and EPA (eicosapentaenoic acid) prevents the delta-5 desaturase enzyme from forming excessive arachidonic acid. Where an overabundance of arachidonic acids exists, as it does for many, that imbalance can be helped by eating fatty fish (salmon [not farmed], sardines, mackerel, or tuna) two or three times a week—or using cod-liver oil (1 to 2 tablespoons several times a week for adults), and cooking with olive oil. This, along with adequate B-vitamins, vitamin C, magnesium, and zinc, will divert the DGLA into the desirable pathway to produce the anti-inflammatory prostaglandin PgE1. **If your metabolic type is unknown, use a 40-30-30 ratio of carbohydrate, protein, and fat, and avoid all sources of transfatty acids (primarily hydrogenated oils and commercial baked goods).**

Although Arachidonic acid (AA) has been given a negative association, it is the most prominent essential fatty acid in the red cell and comprises 12% of the total brain and 15.5% of the body lipid content. If AA is depleted by overdosing with marine or flax oil, or by pyrroluria, the competitive inhibition between the omega 3s and 6s will make the establishing of a balance of the EFAs difficult. Often, both prostaglandin one and two series are compromised when flax and marine oils are overdosed or fat intake is insufficient. When AA, the lead eicosanoid of the body, is suppressed due to excess intake of marine oils, the balance of eicosanoid control circuitry of the body is impaired as is clearly seen in the patient's presentation. Arachidonic acid is preferentially wasted in states of heavy metal toxicity (Tiin and Lin, 1998), and is sharply suppressed in RBC lipid analysis in states of heavy metal toxicity (Kane, clinical observation 1997-2002). Additionally, it is usually suppressed in Pyrroluria, hypothyroidism, and underactive Phase I Liver enzymes. This is particularly significant in that arachidonic acid supports acetylcholine secretion, enhancing cognitive abilities. Selection of high AA-content foods (farmed salmon, organ meats, turkey, fat pork, and eggs) can be most helpful in this instance.

For the autistic, the odds favor best results if you supplement Evening Primrose oil to restore levels of GLA. First, supplement vitamin C (250-1000 mg, divided into three servings) and E (200-400 IU) with selenium (100 to 200 mcg) for a week. If this is not done, in susceptible children, an asthma attack or a seizure may be triggered by the free radicals generated by the EPO or by the increase in inflammatory prostaglandins being generated due to stress and a high-carbohydrate diet that is producing high insulin levels. In supplementing EPO, adjust the carbohydrate/protein ratios to fit the metabolic type, serving protein with every meal and major snack. Additionally, support fat digestion by a good digestive enzyme with lipase and ensure adequate bile production by supplementing taurine (excess taurine can be inflammatory) and glycine if necessary. Continue supplementing the antioxidants, and add one 500 mg capsule of EPO. Increase to 2500 mg as it is tolerated. This can be in two 1300 mg capsules (260 mg GLA). Evening Primrose Oil, one gram/day, improved 53 of 79 hyperactive children selected as a subgroup on the basis of mood swings. The most striking improvement was noted in children with sleep disorders, crying spells,

and a family history of alcohol or bipolar. (Muriel Blackburn, Crawley Hospital, Sussex, U.K.). **Ensure that the proper ratio of protein to carbohydrate is maintained.** When beneficial results in energy, weight gain (where needed), or reduction in the symptoms of fatty acid deficiency are seen, or after at least six weeks, reduce the Evening Primrose Oil to one 500 mg capsule, and add two to three teaspoons of cod-liver oil (based on the child's size—2 tablespoons for adults). To supply additional EPA if needed, add one tablespoon of salmon oil that has no vitamin A and D, or choose Nordic Naturals CLO and use 5 teaspoons (it has less vitamin A in it). (See Patricia Kane's recommendations just below).

Dr. Juan Alvarez and Dr. Steven Freedman of Beth Israel Deaconess Medical Center in Boston, who worked with mice genetically altered to mimic cystic fibrosis, showed the significance of excess arachidonic acid and the lack of the Omega-3 fatty acid (DHA). They found the altered mice had abnormally high levels of one fatty acid (arachidonic acid), and abnormally low levels of another (docosahexaenoic acid, or DHA). The imbalance was limited to the organs most affected by cystic fibrosis, including the lungs, pancreas, and intestines. When the altered mice were fed large doses of DHA for one week, the researchers reported, not only was that imbalance corrected—the signs of cystic fibrosis also were reversed! If you want to really understand many of these 0implications, read *Enter The Zone*, by Barry Sears, Ph.D and *Win the War Within,* by Floyd H. Chilton, Ph. D.

Drs. Sears and Chilton cast much light on arachidonic and other fatty acids. First, animal protein sources like steak and eggs, farmed salmon, organ meats, and fatty red meats are considered high in arachidonic acid. Unless the child is known to be high in AA, I would not restrict anything but the farmed salmon. Getting too much or too little of these fatty acids in a meal can throw you out of the "Zone". The effect of the dietary ratio of protein-to-carbohydrate, in each meal eaten, upon the Omega-6 fatty acids and their conversion to GLA will determine if you ever enter the Zone of optimal health. That is the reason for the eating according to your metabolic type suggested below. You must balance your protein/carbohydrate intake with each meal. This is to maintain a favorable balance of eicosanoids—there are "good" ones and "bad" ones. Prostaglandins are a subgroup, and there are "good" and "bad" prostaglandins. All eicosanoids are produced from essential fatty acids, primarily Omega-6. A high insulin hormone level produced by a low-fat, high-carbohydrate diet creates "bad" eicosanoids; high glucagon hormone levels produce "good" eicosanoids. This is determined by dietary balance between carbohydrates and protein in each meal, by supplementing of the B-vitamins, vitamins C and E, and the minerals zinc, selenium, magnesium, and manganese, and by the eating of fish or fish oil.

As a result of these influences, Americans are universally deficient in GLA in spite of an overbalance of Omega-6 to Omega-3 fatty acids in the diet that some judge to be 24 to 1. Many chronic diseases are associated with this decline in production of GLA and/or the imbalance created in the production of eicosanoids. One sure way to reduce the Delta 6 Desaturase enzyme activity, and the production of GLA, is to eat a low-fat, high-carbohydrate diet (that we are urged by the government sanctioned "pyramid" eating plan to do. This eating plan has been widely accepted, and accounts for most obesity and overweight as well as the chronic inflammatory diseases.). All this reduces production of "good" eicosanoids, and increases the production of inflammatory "bad" eicosanoids.

So, if unhindered, linoleic acid is metabolized to GLA, and GLA is converted to Dihomo Gamma Linolenic acid (DGLA). From here, there are two branches to good/bad eicosanoids—controlled by an enzyme that is itself controlled by two hormones: insulin and glucagon. When this enzyme, Delta 5 Desaturase, is inhibited by glucagon being predominant, PgE1 (a non–inflammatory prostaglandin), and other Prostaglandins that reduce the manufacture of cholesterol in the liver are produced. When insulin predominates due to excessive carbohydrates, the enzyme is activated and produces arachidonic acid. Excess arachidonic acid to DGLA is your worst biological nightmare for from it comes Thromboxane A2 (which causes platelet clumping), PgE2 (which promotes inflammation and pain and depresses the immune system), and leukotrienes (which promote allergies and skin disorders). Maintaining the proper ratio of DGLA to arachidonic acid is the key to good health and proper body

function.

There is one more important ingredient to add to this long list of fatty acids, that is eicosapentaenoic acid (EPA), a member of the Omega–3 family of fatty acids. Like all Omega–3 fatty acids, EPA is a regulator of the enzymes that control the flow of Omega-6 fatty acids as they progress toward production of good/bad eicosanoids. Its major importance is that it inhibits the activity of the enzyme that makes arachidonic acid (Delta 5 Desaturase). To control arachidonic acid, and the harmful eicosanoids it produces, supplement GLA. [Evening Primrose oil is the best choice. Black currant oil, black walnut oil, and flax oil have too much Alpha Linolenic Acid (and only 3-15% converts to EPA, if any, and several studies have linked it to increased risk of prostate cancer), and Borage oil may promote seizures]. To eliminate this added source of alpha linolenic acid, you may do better with the GLA supplements that are now available. Furthermore, control stress, eliminate excess carbohydrates (especially eliminate the high-glycemic types), eliminate all hydrogenated fats with their transfatty acids, and because of their long-chain, fatty acids, reduce intake of Omega–6 oils. Avoid Canola, Safflower, cottonseed, corn, and peanut oils, peanut butter (especially the hydrogenated), and mustard. Substitute olive oil and coconut oil for cooking (not all saturated fat is bad, only an overabundance). Nevertheless, olive oil gives pause to the PST child or the one suffering Multiple Chemical Sensitivities: "After one week, blood samples showed higher levels of antioxidants such as vitamin E and phenols"—Cholesterol reduction Source: Eur I Clin Nutr, 2002 February, 56(2):114-20. Phenols are only a minor component in olive oil, but it raises the level of phenols, presumably thru interference with the phenol-sulphotransferase enzymes by the olive oil. Finally, eat fatty fish: salmon (never eat farmed salmon as it is very high in AA), sardines, herring, Greenland halibut, king crab, blue crab, shrimp, oysters (wild), mussels, sea bass, squid, and mackerel, and roe or caviar, three times a week, or take cod-liver oil.

Some autistic children cannot handle cod-liver oil. Because of faulty metabolism or a lack of GLA, they often have accumulated an excess of Omega-3 oil, and the very-long-chain-fatty acids, particularly DHA. These VLCFA suppress the immune function and increase free radicals in the bile, irritating the intestines. This is likely due to depressed Phase I liver enzymes and reduced thyroid function, but the typical medical test will not detect hypothyroidism. Supporting the thyroid will burn off these excess and harmful VLCFA. Excessive thirst, excessive urination, dry skin and hair, dandruff, eczema, brittle nails, and rough skin will identify these children who are deficient of GLA. If you give them cod-liver oil they become exceedingly thirsty, and their behavior may be upset by it. In that case, discontinue the CLO and supplement Evening Primrose oil (or GLA supplement) to restore the fatty acid balance. Having met the need for GLA, the best oil for these children is cod-liver oil supplying as it does a much-needed dose of vitamins A and D with the EPA/DHA fatty acids. In introducing these oils, follow the procedure outlined above. Two to three teaspoons (depending on the child's size—2 tablespoons for adults) of CLO will supply needed vitamin A and D, but may not supply the desired amounts of EPA/DHA. To do that, supplement another tablespoon of salmon oil that does not contain vitamins A and D. Remember, it takes sufficient zinc to release the vitamin A. Having ensured that, if after a few months, the rough skin on shoulders, thighs, and calves has not diminished or disappeared, replace the salmon oil with additional Cod-liver oil. When the rough skin becomes smooth, then reduce to the two or three teaspoons of CLO. If you ensure adequate zinc, one cannot be vitamin A toxic as long as this sign of vitamin A deficiency is still with you.

There are varying opinions concerning Borage oil. Borage oil contains VLCFAs, and should be restricted for most autistics, who tend to store them. It is said to be excitatory to those prone to seizures, and that it is not as efficient in producing beneficial prostaglandins as is Evening Primrose oil (Dr. Richard Hubbard, Loma Linda University). Use Evening Primrose oil for a while, and then introduce the cod-liver oil as I have outlined above. Primrose oil will not supply the desired vitamins A and D, but it will supply the needed GLA fatty acids. EPO is said to be contraindicated in Temporal Lobe Epilepsy.

So, to control the bad and ensure the production of the good eicosanoids, take cod-liver oil for adequate EPA, and

eat a proper ratio of low-glycemic carbohydrate to protein to fit your metabolic type. For determining your metabolic type and the ratio for you, email Willis for details. The proper control of this ratio of protein to carbohydrate may be more important to attaining the optimum-health zone than the supplementing of the fatty acids, though both are highly desirable. Controlling the protein-carbohydrate ratio controls both the Delta-5 and the Delta-6 Desaturase enzymes. Floyd Chilton suggests supplementing high amounts of GLA (450-550 mg day divided into two servings for adults), probably because most won't control their diets and because he discovered that macrophages and other immune cells will gobble this "excess" of GLA and produce DGLA that does not produce AA, but rather produces the good prostaglandins (PgE1).

Since most won't control their carbohydrate/protein ratio, and because of other things interfering with normal production of GLA, one must supplement GLA (Evening Primrose oil or a GLA supplement), and balance it by supplementing EPA. The typical 1,300 mg capsule of Evening Primrose oil provides 117-130 mg GLA requiring more than four tablespoons of cod-liver to balance the GLA/EPA ratios. This seems to be overkill. The 500 mg capsules supply approximately 45 mg of GLA. That would require 2250 mg of EPA (5 teaspoons of cod-liver oil) supplying 23,000 units of vitamin A. This is why I recommend both the cod-liver oil and the fish oil sans vitamin A, except when you choose Nordic Naturals CLO. Five teaspoons of Nordic Naturals will supply 10,000 IU of vitamin A, 3375 mg EPA and 2225 mg DHA. This is a very high EPA level and may suppress AA excessively, for many of the kids are pyrroluric. That causes a deficiency of zinc and vitamin B6, and a low level of Arachidonic Acid (AA). Chilton recommends 300-360 mg EPA for adults and 40% that amount for children.

EPA suppresses production of AA by hindering Delta-5 Desaturase enzymes. Normally, this is good and desirable, but in Pyrroluria, it could further reduce vital AA. Secondly, this large amount DHA and other Very-Long-Chain Fatty Acids (VLCFA) can possibly be a problem for those many children (and Moms) who are hypothyroid and who do not beta-oxidize VLCFAs well. This can cause an overload of the peroxisomes of the cell and generate problems. Additionally, pyrroluria suppresses Cytochrome p450 (Phase I) liver enzymes, leading to a build up of toxins within the body. There are ways to enhance this pathway discussed herein. Be sure to choose fish oil that has undergone molecular distillation to remove the environmental contaminants of mercury and PCBs. I recommend you use the bulk oil, not capsules, for there is evidence the protein of the capsules prevents the oil (vitamin A) from being fully effective. Often, these capsules are actually concentrated vitamin A, and they do not supply the fatty acids of the bulk oil. Dale Alexander™ Brand (Twin Labs™) pure Norwegian oil is unmodified (sic)—just pure oil bottled under stringent Norwegian law. Kirkman supplies an oil that has not been fortified by palmitate. The Primrose oil will be more effective if taken with a sulfur-containing protein such as low fat cottage cheese, meat, or eggs. The cod-liver oil works best on an empty stomach. Fish oil supplements can cause diarrhea and gas.

Nordic Naturals™ Brand CLO has not been standardized to 4600-5000 IU of vitamin A as has Twin Labs™ and Kirkman's. It contains only 1915 units of vitamin A per teaspoon. This enables you to use 5 full teaspoons of CLO from Nordic Naturals™ with less than 10,000 units of vitamin A.

Even breast-fed babies may need the extra DHA of fish oil—depending on the mother's diet. One study found that the milk of well-fed, Nigerian women, whose diet was rich in nuts, had five to ten times the Omega-3 content of the average mother in this country. These findings are indicative of just how pitiful the standard American diet (SAD) has become. A low DHA level is said to be a marker for low serotonin, a vital neurotransmitter affecting behavior. Dr. Horrobin, MD, has noted that high eicosapentaenoic acid (EPA)–low docosahexaenoic acid (DHA) fish oils like Kirunal™ have been the most effective in ADHD.

Patricia Kane says the enzyme Nitric Oxide Synthase (NOS) and Nitric Oxide (NO) formation is augmented by supplementation of DHA (now commercially available derived from algae) and marine oils. The

autoimmune presentation of Autism may initially respond negatively to marine oils, DHA, or flax oil due to both the competitive inhibition of Omega-3s and Omega-6s (Prostaglandin-1 series appears to be suppressed in children with ASD), and the stimulation of NOS/NO towards the autoimmune process.

Kane says that elevation of EPA/DHA is characteristic in disturbances involving dysfunction (inhibition) of cytochrome p450 enzymes, NOS, and peroxisomals (detoxification/Prostaglandin synthesis in the cell). She says Omega-6 essential fatty acids (GLA, the precursor to the "good" PgE-1, as Evening Primrose oil) must be repleted and stabilized before Omega-3 supplementation commences. She says, "Consider carefully that the synthesis of prostaglandins is an oxidative process, therefore loading with antioxidants or the incorrect sequence of EFA repletion may impede progress in ASD presentation." (Nevertheless, when supplementing with fatty acids, one must supplement with antioxidants, there being two aspects of oxidation—WSL.) As a result, Dr. Patricia Kane recommends six 500 mg capsules of Efamol™ Evening Primrose oil, and a few teaspoons of freshly ground flaxseed. After about six weeks, add one capsule of Efamol™ Omega Combination, or 2 to 4 capsules of Nordic Naturals DHA JR™ (contains 30 mg DHA, 20 mg EPA, and 20 mg other Omega 3 fatty acids with 210 IU vitamin A and 21 IU vitamin D per gelcap. Its gelatin content may make it undesirable to those on Gf/Cf diets.). For many this may not be enough. DHA Jr. contains full-bodied fish oil that can be chewed. It tastes like strawberries, with a fishy aftertaste that most kids tolerate.

If you have high EPA/DHA, this is indicative of inhibited Phase I liver enzymes and a sluggish thyroid. The use of flax or flax oil, as Kane recommends, may not be as effective as cod-liver oil as a source of Omega-3, and the high ALA content of flax oil will hinder production of GLA. Additionally, the child needs the vitamin A and D of CLO. Furthermore, flax contains phytoestrogens that, like those of soy, can upset the hormone system, and in PST kids, cause phenol toxicity. Salicylates suppress P-form phenol-sulfotransferase, and so does the phytoestrogen, genistein, found in soy. These common foods inhibit PST-P: Apples and their juice, elderberries, red grapes, catechins (tea and chocolate), Vanillin, and the synthetic dyes: carmoisine, amaranth, and erythrosine, which are red, sunset yellow, and green. Some popular herbs found to impair PST activity listed in order by the potency of their inhibition: Green tea extract>>>banaba extract>>peanut-seed-coat extract>gymnema sylvestre>St. John's wort>Grape seed extract> Gingko biloba>milk thistle. Another study found this inhibition in black tea. The effect is to make drugs more potent and to build toxic levels of phenols and amines. Therefore, eliminating yeast and these inhibitors and avoiding the phenols, salicylates, and phytoestrogens in food may help balance the fatty acids. **As you can see, balancing fatty acids is not a simple thing and you should probably have a lipid panel test done.** Once essential fatty acids are restored, Kane says that 25 mgs pregnenolone may be administered to an autistic child (do not give to a child under age five unless prescribed by your doctor). Results have been remarkable in some instances, with children starting to talk.

This could be, as several studies show, because pregnenolone overcomes the memory impairment caused by addictive substances and certain anti-anxiety drugs, or because it enhances production of acetylcholine, a vital neurotransmitter necessary to memory and learning. Not only that, pregnenolone is involved in controlling sleep cycles, especially the phase that is associated with memory (called the random-eye movement phase). Studies show that it dramatically increases memory–enhancing sleep. It is interesting to note that administering pregnenolone to aged rats reversed their age-related memory deficits! It has also been shown that a lack of pregnenolone tends to a high level of anxiety, likely caused by overstimulation of NMDA receptors. Pregnenolone also increases the overall p450 enzyme detoxifying power by conserving the existing enzymes, promoting Phase I body-detoxification processes.

These herbs also enhance the Phase I detoxification function: Angelica, Licorice, Turmeric, Ginger, Milk Thistle, Pau D'Arco, Royal Jelly, Sheep Sorrel, carrageenans, and Ginkgo Biloba. Where the Phase I function is suppressed by mercury and cadmium, and excesses of VLCFAs are present, these can, as she says, be most

beneficial, however, where Phase I is of normal function, the use of these can be very detrimental to PST children who have a reduced Phase II function. The exception being Turmeric that also enhances Phase II enzyme action. Angelica, Licorice, Turmeric, and Pau D' Arco are potentially toxic to the liver and Peripheral Blood Mononuclear Cells (immune cells) and should only be used short term. Unfortunately, in many patients who have been exposed to diesel fumes, paint solvents, or trichloroethylene, pancreatitis can be associated with upregulation of the Phase I cytochrome P450 enzymes. Your medical professional should carefully monitor the use of these herbs in children.

Additionally, corticosteroids, specifically the adrenal hormone, hydrocortisone, with the thyroid hormone T3, increase PST enzyme expression three- to five-fold, specifically 75% with hydrocortisone (20 nM) and T3 (10 nM) invitro. This is because it prevents normal decay of these enzymes (half life is 43 hours)—Regulation of Phenol Sulfotransferase Expression in Cultured Bovine Bronchial Epithelial Cells by Hydrocortisone, Joe D. Beckmann, Mary Illig, and Ronald Bartzatt, University of Nebraska Medical Center. This explains why Kane suggests pregnenolone. I urge first a support of the burned-out adrenals and the thyroid as outlined elsewhere in this paper.

These same researchers found that Pyridoxal-5-Phosphate (P5P) reduced activity of PST enzymes by 50%! Conversation with Professor Bartzatt indicated he was unsure what this would mean when supplementing P5P, but I think it worth noting, and would urge that P5P not be used in high amounts with PST affected children. It is said to equal 3 to 10 times the activity of Pyridoxine (vitamin B_6), so we don't need large amounts. With PST affected children, I would suggest 25 mg twice a day in addition to your usual vitamin B_6 intake. Subsequently, Dr. Rosemary Waring has indicated this negative aspect of P5P is offset by adequate magnesium.

A study revealed that boys have a three-times higher need for essential fatty acids than girls. This might be one explanation for the larger number of boys experiencing difficulties in various areas of learning and behavior. "Boys with lower levels of Omega 3 fatty acids in their blood scored higher in frequency of behavior problems," including hyperactivity, impulsivity, anxiety, temper tantrums, and sleep problems according to research done at Purdue University. Leo Galland, a pediatrician who was the director of the well-known Gesell Institute of Human Development in Connecticut, has used essential, fatty-acid supplementation to treat children with learning struggles, speech delays, attention and behavior problems for years with good success. Correction of fatty acid imbalances, largely by supplying Omega-3, has been successful in greater ease in reading and learning, improved motor skills and coordination, and reduced behavioral problems according to Dr. Galland. It also boosts the immune function and reduced inflammation. Authorities recommend that 2% of daily calories be composed of Omega-3 fatty acids. The vitamins A and D from Cod-liver oil corrects night blindness, eliminates symptoms of rickets, and enhances the immune function preventing ear infections. This is all the more effective when zinc is supplied with these oils.

Many ask about Efalex™. It doesn't meet the usual needs of these children for there is no EPA, there is a high amount of arachidonic acid, it contains gelatin, and there are no vitamins A and D. Nevertheless, it would be good for any showing symptoms of Pyrroluria.

Essential Fatty Acids are the building blocks of the membranes (gate keepers) of every cell in the body, with the brain containing the most fats. The brain is 60% fat, and 30% of that is in the form of the long-chain-fatty acids, especially DHA. Brain synapses require long-chain-fatty acids to be efficient. The forebrain (the part used the most for sustained attention) has the highest concentration of DHA. DHA, along with vitamin A, is needed by the "rods" in the retina of the eye for normal dark adaptation (seeing well in the dark, and adapting to bright lights). It is required for proper fetal and infant brain development, and has greatly benefited Cystic Fibrosis patients and chronic obstructive pulmonary disease (COPD). It also helps lower high-blood pressure and heart rate. Baby formulas usually do not include DHA, yet even breast fed children may lack this essential brain food, depending on their mother's dietary intake. Infants given a formula fortified with DHA showed significantly higher problem-

solving ability indicating a higher IQ (Lancet 98;352:688-91). Adequate mineral content has a profound effect on a child's IQ. Those given enriched formula had IQ readings 14 points higher than those on standard formula, and showed a lower incidence of cerebral palsy (BMJ 98;317:1981-1987). Adequate vitamin A beforehand will prevent damage from the MMR vaccine that has now been shown to infect the gut of at least 1/3 of the children with autism: Kawashima H, Mori T, Kashiwagi Y, Takekuma K, Hoshika A, Wakefield A Department of Paediatrics, Tokyo Medical University, Japan. Nevertheless, DHA now being added to baby formulas is derived from algae. Without EPA, DHA can be toxic. Some babies on DHA-enriched formulas have developed intestinal gangrene. Low DHA is a marker for low serotonin.

Due to damage done by the MMR and DPT vaccine, these children need natural, unsaturated cis-forms of vitamin A found in cold-water fish like cod, and in liver, kidney, and milk fat, but they are not getting this in the modern diet. Instead, they are dependent on vitamin A Palmitate, found in commercial infant formula and low fat milk. Unfortunately, absorption of vitamin A. Palmitate requires an intact gut mucosal microvilli surface at the right pH, in the presence of bile for metabolism. Many of these children already have damaged mucosal surfaces due to unrecognized wheat allergy or intolerances, and many lack bile and necessary pH, and so cannot assimilate this vitamin A. Palmitate (a saturated fat) induces Insulin Resistance, which is reversed by the monounsaturated fat, Oleate: A new study reports a protective effect of oleic acid, a monounsaturated fatty acid, against negative effects of palmitic acid, the most common dietary saturated fatty acid (and the form used in vitamin A supplements), in mouse skeletal muscle cells. Exposure of cells to palmitate caused insulin resistance and inflammation, increasing levels of the inflammatory cytokine IL-6 and downregulating the expression of genes that control the oxidative capacity of skeletal muscles. Exposure to oleate did not cause any of these effects. In fact, when cells were exposed to both palmitate and oleate, it reversed both inflammation and insulin signaling impairments by causing palmitate to be used in the production of triglycerides (rather than in an inflammation-producing pathway) and upregulating genes that regulate mitochondrial beta-oxidation (metabolism of fats for energy). This evidence is consistent with human studies that have shown, for example, that elevated IL-6 levels correlate most strongly with insulin resistance and human type II diabetes. It is also known that saturated fatty acids decrease insulin sensitivity in diabetic patients and healthy subjects, whereas monounsaturated fatty acids increase it. A good source of oleic acid is olive oil (with about 65% oleate).

Furthermore, this toxin (DPT) separates the G-alpha protein from retinoid receptors (Megson). According to Dr. Megson, if artificial vitamin A Palmitate binds the now free G-alpha protein, it deactivates by 90% the "off switch" for multiple metabolic pathways, involved in vision and cell growth, and disrupts hormonal regulation and metabolism of lipids, protein, and glycogen. Avoid the palmitate form of vitamin A. Additionally, most milk being bought is reduced fat, and then packaged in clear plastic bottles that have allowed the light to destroy from 40% to 90% of the vitamin A that was present! Buy your milk, if any, with full fat, and in cartons. Additionally, if on a milk-free diet, there is little vitamin D. In Northern Climes, or if not allowed in the sun, this major source for vitamin D is removed, leading to the very real possibility of rickets due to failure to absorb calcium. You must supplement vitamin D, and cod-liver oil provides that.

As far as DPT and other vaccinations are concerned, a review of literature produced a plethora of additional information relative to the known childhood reactions. These symptoms are also common with encephalitis: vomiting, flatulence, gastroenteritis, stomach aches, enuresis, constipation, loss of sphincter control, back-arching, dilation of pupils, lack of appetite, disturbances of sleep rhythm, severe headache, bulging of the skull, night terrors and chronic, sleep disturbances, violent respiration, breath holding (apnea), cyanosis, convulsions, development of autistic symptoms, profuse, soapy, yellow-green diarrhea, dry cough, crossing of the eyes, loss of coordination, severe stuttering and stammering, inability to swallow food, otitis with consequent hearing loss, dyslexia, dysgraphia, reading difficulties, inability to deal with abstractions, facial palsy, hypersalivation, involuntary grunting, changed sensitivity to pain, unusual sensitivity to heat, hyperacute hearing, flaccidity, severe one-sided paralysis, paraplegia, quadriplegia, arrested mental development, spasticities, clumsiness,

deafness, unexplained seizures, development of Parkinson's Disease later in life, intellectual and physical regression, development of left-handedness or ambidexterity, development of long-term effects in the absence of acute reaction, pronouncement of the Moro Reflex, unexplained changes in muscle tone, stiffness of the neck, sudden lapse into unconsciousness, unusual difficulty in arousal, and sudden death. The initial symptoms of post-vaccination encephalitis may be minimal, but this does not prevent other effects from manifesting later on, or mean that minimal brain damage has not occurred.

Medium Chain Triglycerides

Medium-chain Triglyceride (MCT) oils are made of triglycerides with medium-chain fatty acids (MCFAs) having 8 and 10 carbons in their chains. MCFAs are naturally found in coconut oil, palm kernel oil, and milk fat. It is comprised of primarily caprylic (C8:0) and capric (C10:0) acids with a very small percentage of caproic (C6:0) and lauric (C12:0) acids, which are esterified to a glycerol backbone. This fat is metabolized differently than long-chain triglycerides (LCT). Complete hydrolysis to MCFAs and small amounts of monoglycerides occurs in the stomach with very little secretion of pancreatic lipase or bile acids. After MCFAs are absorbed into the intestinal mucosal cells, they are not resynthesized into triglycerides and incorporated into chylomicrons, as are long-chain fatty acids. MCFAs bypass the lymphatic system, and are carried by the portal vein directly to the liver, where they are metabolized to produce carbon dioxide, ketones, and acetate. They are readily converted to energy and unlikely to be stored as fat.

MCT oil can be used to add calories to a formula or diet in the case of malabsorption syndromes, due to a more rapid digestion and absorption. Since it requires lower concentrations of bile or pancreatic lipase for digestion and absorption, patients producing too little bile acid and pancreatic lipase benefit from adding this fat source to the diet. MCTs comprise the lipid component in many infant formulas because infants rely on lingual lipase for lipid digestion when pancreatic function is not fully developed. It may be worth noting that lauric acid delayed the onset of clonic convulsions in mice in a dose dependent manner.

MCTs rev up the body's sluggish metabolism increasing body temperature and promoting weight loss in those with Hypothyroidism, but they are contraindicated for people with diabetes due to the risk of hyperketonemia. They are generally not recommended for people who have compromised hepatic function because a diseased liver does not have the ability to clear the increased levels of MCFAs. Additionally, those who are zinc deficient should limit MCTs due to possible contribution to a fatty liver. Essential fatty acids and fat-soluble vitamins must be added to MCT oil if it is a significant source of fat in the diet.

For Moms with sluggish thyroids looking to lose fat consider also Tamarind root, which has been used in the East for centuries to increase energy. The dried rind of the tamarind root stops excess sugar from being converted into fat. In one study, participants lost an average of 11 pounds over 8 weeks. (Patrick Holford, UK Nutritionist.)

MCT oil may cause diarrhea when it is consumed in large amounts (small amounts throughout the day promote greater tolerance). The most important MCT, lauric acid (12 carbons), is not found in the commercial MCT oils, from which lauric acid has been extracted for special use by the soap, cosmetic, and pharmaceutical industries. It is only found in the natural oils such as coconut oil and palm kernel oils, butter (all at about 50%), and Roquefort cheese. The desired MCTs (in coconut oil) are saturated. In other oils, they may not be; so, one must be careful when buying MCT oil. Coconut oil also contains lauric acid (at 50%), that is said to convert in the intestines to an antiviral substance, monolaurin, but monolaurin is not formed in the body unless there is a source of lauric acid in the diet. Dr. Darryl See, immunological researcher, found no antiviral activity indicated for monolaurin against one representative-type virus (Coxsackie virus B4, strain E2),\; however, he did establish that it is not toxic to the

liver or Peripheral Blood Mononuclear Cells, and does not affect Phase I liver enzymes.

It seems, however, that it is effective against envelope bacteria and viral infections like Klebsiella, herpes simplex, Cytomegalovirus, measles, mumps, influenza A, hepatitis C, Hemophilus influenza, Staphylococcus epidermidis and aureus, Group B gram positive Streptococcus, Streptococcus agalactiae, gram-positive organisms, and some gram-negative organisms, (vibrio parahaemolyticus and Helicobacter pylori), Listeria monocytogenes, and HIV-1. The Chlamydia trachomatis, herpes virus, and the Cytomegalovirus are inhibited by the antimicrobial lipid monolaurin as is sexually transmitted viruses such as HSV-2 and bacteria such as Neisseria gonorrhea. A number of fungi (several species of ringworm), yeast (Candida albicans) and protozoa (Giardia lamblia) are inactivated or killed by monolaurin. Monolaurin appears not to be effective against Polio, Coxsackie, Rhinovirus, and Rotavirus. One mother's son tested "zero" on lauric acid. When she gave Monolaurin, he began to speak in complex sentences for the first time in his 18-year life! Dr. Robert Atkins recommends that for treating cold and the flu one should use 1,800-3,600 mg for four or five days, then taper the dosage to 600-1,200 mg daily. "Lauricidin® is the only monolaurin clinically tested. "The dosage is somewhat critical, and this is where I can help based on our initial discovery of monolaurin and our 30 years of experience with this interesting material. Please write jonkab@aol.com, or call me at (815) 777-1887 for information and a supply of monolaurin (Lauricidin®) from Med-Chem Labs"—Dr. Jon J. Kabara.

Dr. Kabara recommends these lower servings be used regularly as preventive. These reports inform us about these vital oils: Kabara (1978), and others have reported that certain fatty acids (e.g., Medium-Chain Saturates) and their derivatives (e.g., Monoglycerides) can have adverse effects on various microorganisms. Those inactivated include bacteria, yeast, fungi, Mycoplasma, and enveloped viruses. The medium-chain saturated fatty acids and their derivatives act by disrupting the lipid membranes of these organisms (Isaacs and Thormar 1991) (Isaacs et al. 1992). In particular, enveloped viruses are inactivated in both human and bovine milk by added fatty acids and monoglycerides (Isaacs et al. 1991) as well as by those that are endogenous (Isaacs et al. 1986, 1990, 1991, 1992; Thormar et al. 1987).

Sadeghi, et al., has demonstrated that coconut oil in combination with fish oil decreases levels of pro-inflammatory cytokines such as Tumor Necrosis Factor (TNF (a)) and Interleukin-6 (IL-6) while stimulating production of anti-inflammatory cytokines such as Interleukin-10 (IL-10). So, to control Tumor Necrosis Factor and other cytokines and improve the sulfation pathway, to generate IgA and IgG, to protect myelin, to relieve depression, to reduce anemia, and to balance the Immune Function get adequate sleep and supplement Ambrotose AO™ (vital sugars, vitamin C, and antioxidants), Bromelain, ginger, garlic, magnesium, selenium, chromium (not picolinate), melatonin, cod-liver oil (vitamins A and D and fatty acids EPA/DHA), glycine, vitamins B-complex and K, coconut oil, and possibly colostrum, butyrate, and probiotics (acidophilus, bifidus, and S. boulardii - a yeast that eats yeast and controls gut denizens).

All three monoesters of lauric acid are shown to be active antimicrobials. Additionally, it is reported that the antimicrobial effects of the fatty acids and monoglycerides are additive, and total concentration is critical for inactivating viruses (Isaacs and Thormar 1990). In other words, use enough to do the job. Preliminary results on a small trial with adults indicated that when using 3-4 tablespoons of coconut oil in their daily diet to yield 25 grams of lauric acid per day, greater than 50% of the patients had a reduced viral load and one-third of the patients had a favorable increase in their CD4/CD8 ratios. For Children, Dr. Waring speaks of 1/3 tablespoon twice a day. Dr. Kabara recommends that you start on low dose and build the amount slowly until benefit is seen. There may be die-off reactions,.and too large an intake of Coconut oil at the first may cause diarrhea. Some may never tolerate the larger amount.

The properties that determine the anti-infective action of lipids are related to their structure (e.g., the monoglycerides are active, diglycerides and triglycerides are inactive). Of the saturated fatty acids, lauric acid has

greater antiviral activity than either caprylic acid (C-10) or myristic acid (C-14), but caprylic acid is more effective against Candida, killing both the yeast and fungal forms while not affecting the "good guys" of the gut.

The action attributed to monolaurin is that of solubilizing the lipids and phospholipids in the envelope of the virus causing the disintegration of the virus envelope. In effect, it is reported that the fatty acids and monoglycerides produce their killing/inactivating effect by lysing the lipid bilayer plasma membrane. However, there is evidence from recent studies that one antimicrobial effect is related to its interference with signal transduction (Projan et al. 1994).

Marvelous news is reported by Dr. Julian Whitaker in relation to Alzheimer's and other neurological disorders:

> Six years ago, Steve Newport, a 59-year-old accountant and bookkeeper, began having problems at work. As the months went by, he became increasingly disorganized, error prone, frustrated, and depressed. He eventually consulted a neurologist and was told he had early dementia.
>
> Over the next few years, Steve's dementia rapidly progressed. He was diagnosed with probable Alzheimer's disease and was started on Aricept, the first of several drugs he would eventually take. By the time an MRI revealed evidence of brain atrophy and confirmed that he had Alzheimer's, he was unable to do simple math, type, or use a calculator. He even had to be reminded to eat and take his medications. Well aware of Steve's dire prognosis, his wife, Mary Newport, MD, was constantly on the lookout for new therapies that might help.
>
> Last spring, she came across a recruitment notice for a clinical trial evaluating a new Alzheimer's drug. She learned that about half of the patients who had taken the medication in a 90-day pilot study had remarkable improvements, and the other half held steady compared to a placebo group that continued to decline. Intrigued, she searched the Internet and discovered that the drug's active ingredient was medium-chain triglycerides (MCTs), natural fatty acids that are abundant in coconut oil.
>
> Steve didn't qualify for the clinical trial, but Dr. Newport was undeterred. She went to her health food store, purchased some coconut oil, and began giving it to her husband. After the very first dose, "a light switch came on." As Steve continued to take the oil over the next two months, he became more alert and talkative, and his sense of humor slowly returned. His attention and ability to stay on task improved, and at a family reunion, he remembered the names of relatives he couldn't recognize the year before.
>
> Today, a year and a half after beginning treatment, Steve volunteers in a hospital warehouse and enjoys his job and coworkers. His previously impaired gait has normalized, and he is able to run-something he couldn't do for well over a year. He can read again, with decent comprehension, and his short-term memory is gradually getting better. His conversational skills continue to improve, and he's no longer depressed. In short, he feels as if he "got his life back."
>
> How in the world could an inexpensive oil facilitate such a turnaround? It's all about ketones. Medium-chain triglycerides don't behave like the more common long-chain fats. Thanks to their shorter, chemical structure, they are easily absorbed and rapidly metabolized in the liver. And, rather than being stored as fat, they are converted into ketones.
>
> Ketones are your body's alternative energy source. When glucose stores are exhausted, ketones are synthesized from (body) fats (through the action of the hormone, glucagon) and

delivered to the cells, where they're burned for energy. But, because glucose is the preferred fuel, ketones are produced only as a backup - when you're fasting, for example, or eating a very-low carbohydrate diet (there must be little or no insulin present - this is the principle behind the Atkins' weight-loss program.)

Unfortunately, in Alzheimer's and other neurodegenerative diseases, neurons lose their ability to properly use glucose. Inefficient glucose metabolism in specific areas of the brain is an early feature of these disorders, present long before symptoms appear. Many experts believe this is due to insulin resistance - Alzheimer's is sometimes referred to as "type 3 diabetes." Neurons deprived of energy obviously cannot function normally and they eventually die, contributing to the degenerative process.

Affected neurons can, however, use ketones for energy, and when they're made available, starving brain cells perk right up. When this fuel source is supplied on a consistent basis, remarkable things can happen - as evidenced by Steve's initial and ongoing progress.

Actually, the therapeutic effects of ketones for the brain are old news. Ketogenic diets have been used since the 1920s to effectively prevent or reduce seizures in patients with epilepsy, and **a handful of studies suggest that such a diet would also improve other neurodegenerative conditions.** The ketogenic diet, however, is hard to swallow. It requires eating lots of fat and almost no carbohydrates, and it's difficult to stick with over the long term.

That's the beauty of MCTs and coconut oil. When you supplement with these oils, they are converted into ketones, even if you don't change your diet. In other words, you can have your carbs and ketones, too.

When Dr. Newport first began giving Steve this therapy, she didn't realize that refined MCT oil was available, so she gave him non-hydrogenated, coconut oil instead (note the caveat above about commercial MCT lacking Lauric acid). Coconut oil is about 60 percent MCTs by weight, so she figured that to get the dose of MCTs used in the drug trials (20 g), he'd have to take 35 g of coconut oil (7 teaspoons).

She's since learned that ketone blood levels peak about three hours after taking coconut oil and are out of the system within eight hours. She also discovered that MCT oil is available, and it produces a peak, blood level at 90 minutes that clears within three hours. Now, Steve takes 4 teaspoons of MCT oil and 3 teaspoons of coconut oil three times a day with meals to ensure that his brain has access to a more or less constant source of energy. When he misses a dose, he may develop a transient tremor or feel temporarily "dazed and confused"; but once he makes it up, he's back to "normal."

Now, everyone "knows" that saturated oil raises cholesterol; but if you add just a little EFAs, it doesn't work like that. If you use the natural coconut oil, then it will raise low cholesterol, but lower high cholesterol. Additionally, saturated fat reduces children's allergies while trans-fats increase them, according to a team of researchers from Finland. The body needs saturated fats in order to properly utilize essential fatty acids. Saturated fats also lower the blood levels of the artery-damaging lipoprotein (a) [Lp(a)], whereas trans-fatty acids consistently increase Lp(a). Recent research has found that N-acetylcysteine (NAC) is the most effective nutrient known to lower Lp(a) levels. NAC reduces Lp(a) by almost 70%. Vitamin C replaces LP(a) in the vessel wall preventing Atherosclerosis (Matthias Rath)! CoQ10 – 200 mg.day- helps maintain normal levels of LP(a) according to Dr. Julian Whitaker. Niacin, or inositol hexanicotinate, is beneficial in lowering LP(a) as well. High doses of vitamin C, and the amino acids lysine (that converts to carnitine), and proline also aid in the control of LP(a). Lp(a) and ascorbate deficiency are involved in cancer, inflammatory disease, cardiovascular, and other diseases, including the process of

aging.

Other factors influence cognitive disorders: "Alzheimer's disease was more than twice as common among the women with the highest levels of homocysteine than among those with the lowest, and the risk for any kind of dementia was 70 per cent higher," revealed Dr Zylberstein. "These days, we in our clinical practice use homocysteine analyses mainly for assessment of vitamin status. However, our results mean that we could use the very same analysis for assessment of individual's risk profile for dementia development." Supplementing vitamins B_6, B_{12}, and folic acid normalize Homocysteine.

And another: Alzheimer's-diseased (AD) mice found substantial benefit in high doses of a common nutrient in the vitamin B family, nicotinamide (niacinamide), a form of vitamin B_3. So startling were the results—memory loss was restored in the AD mice—that the researchers are now conducting a clinical trial to determine if it can help to keep memory normal in humans. At the end of the trial, the AD mice performed as well in memory testing as healthy mice, a remarkable result strongly suggesting that nicotinamide had protected their brains from memory loss, and restored memory that would have been lost. "Cognitively, they were cured," first author of the study, Dr. Kim Green said.

And finally: Vitamin B_{12} deficiency, also called cobalamin deficiency, becomes more and more common as people get old. Yet because few clinicians are trained to look for its symptoms, many elderly who SHOULD be screened for this simple vitamin deficiency are, instead, diagnosed with `incurable` neurologic diseases. These mental changes from vitamin B_{12} deficiency were first described as far back as 1902, with much research having been done since that time. Many times, lesions and degeneration of the brain and spinal cord accompany these changes, as shown on medical imaging that doctors use as evidence of the Irreversible nature of this disease. Astoundingly, when these degenerative changes are caused by vitamin B_{12} Deficiency, they are actually REVERSIBLE if high dose therapy is started soon after diagnosis! "Fortunately, dementia secondary to B_{12} deficiency is eminently reversible if the etiology of the dementia is recognized early and therapy instituted promptly and vigorously." - Dementia and vitamin B_{12} deficiency

Hypercoagulability (Sludged Blood): Chronic illnesses have a demonstrable basis in the blood coagulation system. Hypercoagulation reduces blood flow to certain parts of the brain, especially the speech centers, causing many of the problems of autism. This study was published in the international journal Blood Coagulation & Fibrinolysis, 1999, 10:435-438. The blood is not only sludged, but the vessels become coated with fibrin. Fortunately, there are supplements that can unsludge the blood, dissolve free fibrin, and clean fibrin off artery walls. One can lower blood viscosity and remove fibrin with vitamin C and enzymes such as Bromelain, Vitalzym™, and Wobenzym N™. Nimotop™ or Trental ™ are not required! (Nimotop™ is a calcium channel blocker. Magnesium and manganese are Nature's calcium channel blockers! Use them.)

To prevent platelet clumping and thus prevent stroke or heart attack use 400 I.U., or more, of vitamin E. Vitamin E, ginger, bromelain, and a citrus bioflavonoid supplement are most effective in preventing platelet clumping. Use of niacin, vitamin E, bromelain, and ginger (in cooking, or by drinking ginger tea) would certainly be wise if you have suffered "mini–strokes". Vitamin E greatly aids those with circulatory problems. Patients receiving vitamin E required far fewer amputations than those receiving other blood thinners. It may take a while to see results. Unhealing ulcers account for gangrene and amputation and can be healed by sprinkling pure sugar into the wound and bandaging it there. This kills all bacteria. This should work on bedsores also.

Blood grows thick when there is a lack of water. A lack of water in the upper stomach is a frequent cause of reflux also. Many of these children are dehydrated; so, drinking more water will have immediate results! According to a study of 34,000 Seventh Day Adventists, those who drank a minimum of five glasses of water a day had half the risk of heart attack and stroke as those who drank only two glasses daily! The researchers reported that adequate hydration decreased the viscosity, or stickiness, of the blood and improved blood flow. The anionic substances with

higher valence, like 1:2 and 1:3, have a greater dispersing effect. So, if one were to take a proper amount of something like potassium citrate which is a 1:3 electrolyte and mix it in pure distilled or reverse osmosis water and drink it up, that would act like a dispersing agent for the blood stream.

Citrate forms of nutrients metabolize to their bicarbonate forms and thus become pH buffers, tending to alkalize an over-acid body. These may not be the best forms to give a child already overly alkaline. Additionally, citrate forms of certain minerals are laxative. Potassium and magnesium citrates are particularly laxative. This knowledge can be used to meet your child's needs for bowel control and for pH control.

The introduction of any bacteria or bacterial filtrate, alive or dead (vaccine), causes a reaction of the body that results in blood clots from intense microbial action. These clots may be small adhesions that attach to the blood vessels or organs impairing their function or complete obstructions resulting in organ death. They are particularly common in kidney, lung, liver, and brain. This intravascular coagulation from vaccines is readily apparent in an examination of the blood vessels in the sclera (whites) of the eyes. This is known as the Sarannelli/Schwartzman phenomena. There are several hundred references to its occurrence in the National Library of Medicine. Dr. Robert Rowan, MD, says that Fibromyalgia is caused by a minor clotting disorder that impedes circulation. Probably, the most effective clot buster and preventive is Nattokinase, an extract of fermented soybeans. It will dissolve blood clots, and it remains active for a remarkable 2 to 8 hours. This, and adequate intake of water, can solve many health problems relating to "sludged" blood.

Much fear and anguish is being caused by West Nile virus and "Flesh-eating bacteria" (Streptococci), Staphylococci, and Lyme disease, and these are fearful, but what is lacking is good information about prevention. There are a number of ways to protect against mosquitoes and ticks that I will not discuss, but I wish to warn against use of Deet™ on children. It is very detrimental to children with damaged detoxification systems; so under no circumstances put it on a child. Instead, take a look at "Bite Barrier!" a product with a barely noticeable odor developed by Nature's Balance and Chisolm Biological Laboratory (www.bitebarrier.com, 800-858-5198). Tests showed "zero bites" in Louisiana swamps, and it protects against ticks, fleas, mites, bed bugs, flies, chiggers, fire ants, and a host of other insects as well as mosquitoes. Additionally, the only real protection one can count on to protect from Staph or Strep or West Nile infections is one's own immune function. Take careful note of the many things that balance and strengthen the immune function outlined herein, and use them to not only protect, but to recover your child. Very large amounts of glyconutrients administered into the feeding tube of dying patients have restored life functions overcoming hypercoagulation and toxemia, even restoring consciousness to those in long-time coma.

Inflammation is the major cause of hypercoagulation and poor blood flow to all parts of body and brain. C-Reactive Protein (CRP) is a marker for systemic inflammation. CRP levels indicate chronic, low-grade inflammation, with linkage to blood vessel damage and vascular disease (Pasceri et al. 2000). It is now recognized to be a more accurate risk assessment for heart attack than elevated LDL cholesterol levels. Previous studies have shown that inflammation may be an aggravating factor in creating the blood clots that commonly lead to cardiovascular events. Subjects with the highest CRP levels were more than twice as likely to experience an adverse cardiovascular event than those with the lowest levels of CRP. A report at http://jama.ama-assn.org indicated a 65% increase in age-related, macular degeneration for those with the highest CRP! These high levels are related to high cytokine levels (Tumor Necrosis Factor and others).

Chronic inflammation is caused by a number of factors common to today's diets and lifestyles: a diet lacking Omega-3 fats coupled with an overabundance of Omega-6 fatty acids and transfatty acids, environmental toxins, medications such as synthetic hormone replacement and birth control-pills, chlorinated/fluoridated water, a chronic load of viruses and bacteria, and stress. Perhaps the worst contributor is the high-carbohydrate, grain diet (the Pyramid) foisted upon us that produces a chronic,

high-insulin level, with resultant insulin resistance, leading to overweight and diabetes. A recent study showed that normal weight individuals showed elevated CRP levels in 25%, while those overweight and obese showed greatly elevated levels in 51% and 75% respectively. Fat cells produce CRP! This can all be controlled by lifestyle changes that lower insulin levels and reduce fat cells.

Researchers at the University of Parma in Italy found that the total antioxidant capacity of the diet was significantly higher in those who had low plasma C-reactive protein levels than in those whose CRP levels were considered high at 4.2 milligrams per liter and higher. Individuals whose CRP levels were high had increased levels of white blood cells, greater weight and waist circumferences, less insulin sensitivity, lower levels of HDL and beta-carotene, and were more likely to have hypertension than those whose CRP levels were low and antioxidant levels were high.

An editorial in the New England Journal of Medicine by Lori Mosca, M.D., states that CRP has been associated with obesity and insulin resistance. She said that an intake of omega-3 fatty acids (preferably from eating more fish or taking cod-liver oil, a proven reducer of inflammation) (and plant sterols - WSL) has been associated with lower levels of CRP. Studies have shown that a high fiber intake reduces CRP levels by 41%, mixed tocopherals lower CRP by 50%, CoQ10 by 20%, (1000 mg a day of vitamin C by 34% - WSL), and functional foods, such as almonds, by 25%! A Comprehensive Cardiovascular Report (CCR) is available from Great Smokies Diagnostic Laboratories (GSDL). Eating tomatoes or watermelon (lycopene) several times a week is reported to reduce CRP also. Ensure that there is a generous intake of antioxidants and anti-inflammatory nutrients (Ambrotose AO™ by Mannatech™ is an outstanding source of antioxidants and glyconutrients).

Additionally, saturated fats are needed for proper calcium utilization in the bones. Saturated fats stimulate the immune system and are the preferred food for the heart and other vital organs; and, along with cholesterol, add structural stability to the cell and intestinal wall. They are excellent for cooking, as they are chemically stable and do not break down under heat. If you try the coconut oil, start with a very small amount—one teaspoon per day for an adult. Four tablespoons per day is a therapeutic amount for an adult. Increased intake of oils requires increased intake of antioxidants, particularly vitamins C and E and Selenium.

To utilize these MCT oils requires coenzyme B_6 (Pyridoxal 5' Phosphate, often referred to as P5P), and magnesium. Some might have essential fatty-acid deficit symptoms, but the problem could really be a lack of vitamin B_6 and magnesium. You must supplement vitamin B_6, zinc, and magnesium, especially when using coconut oil. Remember, that a zinc deficiency adversely influences coconut oils tending to a fatty liver. P5P is apt to be more effective because a large majority of "healthy" people do not convert the regular vitamin B_6 to its metabolite form. One study showed 19% were deficient in one or more B-vitamins, but 62% were deficient in the necessary metabolites. Zinc deficiency can also look like a fatty acid deficiency, and children with milk intolerance have been shown to be deficient in EFAs. I suggest that you supplement magnesium, zinc, and P5P before doing the essential fatty acids. Be aware that many P5P preparations contain supplemental copper to prevent pyridoxal retinopathy in copper-deficient people. The maximum of vitamin B_6 supplemented should be 500 mg Pyridoxine or 100 mg P5P.

Unsaturated fatty acids are subject to rapid oxidation forming great amounts of free radicals. So, when supplementing them, you must supplement Ambrotose AO and selenium, or vitamins E, C, and selenium, preferably before beginning to use the oils. This is necessary to avoid an increase in the risk of cancer and other cellular damage by countering this new source of free radicals that is being added to those already produced by these over-stressed bodies. A failure to supply these needed antioxidants will deplete your antioxidant levels, especially selenium.

Fatty acids have been used to control asthma, yet some fear to use Evening Primrose Oil. It is probably the lack of antioxidants or an excess of GLA that caused the reported seizures. You can precipitate an asthma attack or seizure in those susceptible by giving high EPO intake when GLA levels are already high. Usually, one 500 mg capsule of EPO is safe for children. You need the EPAs of cod-liver oil to help get the inflammation down, but you don't want to overdo these either. You must seek to balance the GLA/EPA.

In addition to the fatty acids to control asthma, we need to note that vitamin C, zinc, garlic, half one's body weight in ounces of pure water with a dash of salt on the tongue after each glass of water, all have relieved asthma as has a sugarless, low carbohydrate, high-protein diet supported by desiccated adrenal glandulars. Conversely, excess GLA or GLA without sufficient antioxidants, environmental toxins, especially the high levels found in the home, fluoride, and Candida all tend to asthma. One in five children now have either asthma or eczema in childhood. Many babies today seem to be born with eczema or asthma, or to develop it within a few days of birth. Asthma and eczema are known clinical reactions to latex allergy, but it is possible that other allergic diseases might be traced to the same source. Remarkable restoration of respiratory function is had with glyconutrients and phytonutrients. Use them for three months at retail price, and I will refund your full purchase price if you are not satisfied!

If the stool is light in color, shiny, unformed, frothy, floats, and is foul smelling you must supplement a digestive enzyme containing lipase and ox bile to digest the fats and these oils. Consider a small supplemental intake of the amino acids taurine and glycine to improve bile formation in the liver.

Three Metabolic Types

It is important that a person eat according to his metabolic type. Please go to www.mannapages.com/Willis (at the opening page, choose your country, then answer the referral question to access my site)) and do the 50 Questions on the Dietary Needs Assessment Survey (scroll midway on right hand menu). (If you have a problem, contact me at WillissL@aol.com, and I will supply the information.) Then check the Dietary Needs Assessment Survey Results and Recommendations. It gives the meal ratios to serve for each of three types. The fat, carbohydrate, and protein must always be served in balance for best energy and health. **There must be protein in every meal.** Think of your body as a fireplace. It must be stoked with light, intermediate, and heavy fuel or you will never get it to burn and heat properly. What ratios are needed, however, depends on how the draft is set. Are you a fast or a slow metabolizer? For those who eat mainly carbohydrates, you must quit feeding on high glycemic foods, and use only low and moderate glycemic ones. I will supply a "Glycemic Index of Common Foods" on request to WillissL@aol.com.

Tums™ Anyone?

Many medical men, who should know better, recommend Tums™ as a source of calcium. While the calcium in Tums™ will neutralize acid, the carbonate form used will not be assimilated and utilized in any meaningful amount (3%), so it cannot be effectively used as a source of calcium supplementation and the carbonate forms tend to make the system acid!

A deficiency of HCl sometimes manifests as "stomach problems"—bloating, fullness, burping, heartburn, and reflux. Most people grab a Tums™, or Pepcid AC™, or Tagamet™. That makes digestion and utilization worse, and reduces bile production, even though it may relieve the symptoms. What is probably needed is more acid not less! The symptoms are the same! Tagamet™ is a dangerous drug in combination with anticoagulants and theophylline (asthma drugs), anticonvulsants, antifungals, and heart drugs such as calcium antagonists and

quinidines. Both Tagamet™ and Prilosec™ reduce effectiveness of antifungal drugs such as Nizoral™. Tagamet also is said to inhibit cytochrome P-450 pathways. In fact, all these HCl inhibitors encourage Candida and bacterial overgrowth by reducing HCl. Amazingly; Tagamet™ is now being touted as an immune booster for killing Candida!

Researchers from McGill University in Montreal found that people who take heartburn drugs like Prilosec™, Prevacid™, and Nexium™ may be trading heartburn for a potentially dangerous diarrhea caused by Clostridium difficile. "C-diff" causes severe diarrhea and the intestinal inflammation, colitis. Its toxins cause many other systemic conditions often seen in children with autism. The number of "C-diff" cases has been increasing, from less than one case per 100,000 people in 1994, to 22 per 100,000 in 2004! Patients taking heartburn drugs have a much higher risk than those who do not because the drugs reduce levels of gastric acid that control "C-diff" bacteria. Patients taking proton pump inhibitors (Prilosec™ and Prevacid™) were almost three times more likely to have a "C-diff" infection than non-users. Those taking H2-receptor antagonists (Pepcid™ and Zantac™) were twice as likely to have a "C-diff" infection. Antibiotics and hospitalization also increase the risks of C.diff.

Two new studies with laboratory mice, conducted by Howard Hughes Medical Institute scientists at the University of Michigan Medical School, indicate that while cooling the burning pain of gastritis (an inflamed stomach lining) by reducing the amount of acid in the stomach may seem like a good idea; it could be exactly the wrong thing to do. University of Michigan scientists found that antibiotics were the best way to kill the bacteria that cause gastritis and to eliminate stomach inflammation in their experimental mice. Mice treated with prescription drugs called proton pump inhibitors or PPIs, like Prilosec and Prevacid, acquired more bacteria and developed more inflammatory changes in their stomach linings than untreated mice!

These animal studies indicate that it is the inflammatory response - triggering the overproduction of hydrochloric acid that is the stomach's primary response to bacterial colonization. Inflammation of the stomach lining coincides with production of peptides called cytokines, which stimulate production of a hormone called gastrin. Gastrin triggers parietal cells in the stomach lining to produce more hydrochloric acid, which kills off most invading microbes. If you inhibit gastric acid production, you interfere with the stomach's natural defense mechanism." Studies show that makes you four times more susceptible to pneumonia, Histamine blockers increase the risk of Clostridia infection twofold and proton pump inhibitors increase the risk threefold.

Many are now being told that Pepcid™ is helping the autistic. Pepcid™, Tagamet™, and other H2 blockers do not diminish histamine; rather, they block the action of histamine on H2 receptors. In 40 mg to 100 mg doses in adults, Pepcid™ has improved eye contact, reduced social withdrawal, and improved speech in schizophrenics. Children may metabolize these drugs more quickly than adults, and need a higher dose per body weight noted Dr. L. A. Linday, MD, and Pediatrician. Dr. Linday postulates that the similarity between schizophrenia and autism indicates Pepcid™ may benefit some autistic in the manner it does schizophrenics. She says histamine as a neurotransmitter is inhibitory in its action, and inhibits the social and speech areas of the brain. Using Pepcid™ "Frees Up" these areas, and enables restoring of speech and social skills. The dose she uses is quite high, and it should not be attempted except under close supervision of your doctor. Because they are "antihistamines", they would probably have some beneficial effect on some symptoms, possibly by making more histamine available to H1 receptors. Others say that histamine receptor stimulation in the brain facilitates the release of excitatory neurotransmitters like norepinephrine and glutamate. This effect is seen more from stimulation of H1 receptors, not H2 receptors, which are the receptors Pepcid™ blocks. It has been reported that Tagamet, Zantac, and Pepcid all caused hallucinations and confusion in an elderly man.

A Pharmacist friend, a specialist in drug rehabilitation, has this to say in reply to my question "One doc you

recall is using high doses of Pepcid™! What would you suggest to increase speech?"

"Stay away from xenobiotics (chemicals not natural to the body). Natural Eugregorics or gregariants like SAMe, methycobalamin (B_{12}), adapton (extract of deep sea, cold water fish garum amoricum), DHA/fish oils and cofactors, Pyritinol or Piracetam which are essentially analogues of thiamine and pyroglutamate are harmless and of course the coenzyme forms of B-vitamins. Piracetam (2-oxo-Pyrrolidine Acetamide) is derived from the neurotransmitter GABA (Gamma Amino Butyric Acid). The subjective effect described by some people is that piracetam, "wakes up your brain." Pyroglutamate plus TMG is a great combination for Blood Brain Barrier uptake of glycine and enhancement of the cholinergic system needed for verbal memory. **Methionine and calcium or antifolates may be of help where there is histadelia (too much histamine), and even copper supplementation with niacin and Ester C.** Avoid vanadium. Perform a niacin flush test if in doubt, and then take appropriate action to influence ceruloplasmin and histaminase. **Lithium will improve verbal ability if histamine is high by reducing effects of sodium excess and aid of repolarization. Stay away from folic acid if histadelic—even a high-protein meal containing small amounts along with histidine can result in withdrawal.** Gotu Kola is good verbalizer if liver function is not impaired. The phytonutrient Bacopin is another good loquacient, but again it puts pressure on detoxification. Generally, I prefer to take the brakes off rather than increase the gas and so your GI support and chelation would be my first line of attack. Lipofuscin digesters like centrophenoxine, and cerebrovasodilators like hydergine and vincamine have been shown to have efficacy in withdrawn states and social anxiety. Fried liver and onions for breakfast, believe it or not, works wonders. Hyperbaric oxygen is another belter."—Simon Galloway, pharmacist, specialist in recovery of drug and alcohol damaged minds.

Water is the best antihistamine known, and the amino acid methionine detoxifies excess histamine. Make sure you and your children are drinking one-half your body weight in ounces of pure water each day. Water—not fluids (that's doctor talk). Water—not juices or coffee, or tea, or soft drinks. These are all diuretics, and further dehydrate the body—drinking them requires one to drink still more water! This dehydration increases the allergic responses due to the fact that a thirsty cell releases histamine—that irritates and swells mucus membranes and can cause pain anywhere in the body. Dr. Fereydoon Batmanghelidj, MD, in his book, "The Body's Many Cries for Water", states passionately that he has cured asthma and all gastrointestinal diseases in over 3000 cases with nothing but water—and a little salt taken on the tongue after drinking a glass of water.

"Dehydration causes all cells to release histamine. Histamine increases the output of stomach acid, and the severity of reflux! Heartburn may be a signal of water shortage in the upper part of the gastrointestinal tract. It is a major thirst signal of the human body. The use of antacids or tablet medications in the treatment of this pain does not correct dehydration, and the body continues to suffer as a result of its water shortage. Treating with antacids and pill medications will, in time, produce inflammation of the stomach and duodenum, hiatal hernia, ulceration, and eventually cancers in the gastrointestinal tract, including the liver and pancreas"—Dr. Fereydoon Batmanghelidj, MD.

More importantly, as regards Pepcid™, and other H2 blockers, they not only reduce HCl and the "intrinsic factor" produced by the stomach, but they act on H2 receptors throughout the system. They seem to have secondary, side effects that have been reported very beneficial in alleviating autistic symptoms. However, giving these to a child who makes too little hydrochloric acid would further reduce digestion and assimilation to a dangerous degree. This would affect not only assimilation of vitamins A, C, and B-complex, but protein and most minerals, especially zinc that is necessary to HCl production. It would surely cause a vitamin B_{12} deficiency, causing growth problems, because the same cells of the stomach that produce hydrochloric acid produce the "intrinsic factor" necessary to absorption of vitamin B_{12}. Prilosec™ specifically drains the body of vitamin B_{12}, and Pepcid™ depletes calcium, folic acid, and vitamins D and K. Tagamet™ and Zantac™ deplete calcium, folic acid, iron, zinc, and the vitamins B_{12} and D. If these drugs are used, these nutrients must be supplemented at higher rates than

the minimal amounts recommended (RDI-RDA). In addition, they reduce digestion of certain foods, and the tough more fibrous parts, along with hair, rug fibers, and other inedibles and may eventually cause a Bezoar that can block the digestive tract (impaction) requiring surgical removal! If you insist on using these dangerous drugs, you must supplement the enzyme cellulase. H2 blockers also block Phase I (cytochrome p450) liver enzymes creating a potentially damaging buildup of toxins as well as natural substances, including fatty acids, estrogen, steroids, Prostaglandins, body alcohols, retinoic acid (vitamin A), glycine, and certain drugs. If using an H2 blocker, it would be unwise to supplement DMG/TMG.

An interesting report is that Zantac™ and Prilosec™ have relieved both nighttime reflux and sleep apnea! Gastroesophageal reflux is often associated with apnea, and is believed to cause (or worsen) apnea either directly by causing aspiration of milk or by sending a signal to the brain to stop breathing when the milk is coming back up. Further information indicates that some of these drugs block the receptors for some time, so it should not be necessary to take them every day. This from a Mom: "It takes Clayton about 2 weeks to regress if he has no Prevacid™, we give it at about the 9th day off, and we give it for about 2 days, sometimes 3. Prevacid™ (and Prilosec™—WSL) keeps the proton pump that inhibits the acid production blocked or stopped for nine days according to the pharmacy book."

To produce HCl in the stomach, a hydrogen ion in the parietal cell must be exchanged for a potassium ion from the stomach. In the stomach, the hydrogen ion then combines with a chloride ion to produce the acid. Prevacid™ and Prilosec™ are proton pump inhibitors that stop this exchange, and totally stop HCl production. Perhaps most alarming is how much higher the risk is: In a Dutch study, the risk of pneumonia was 89 percent higher for people using proton-pump inhibitors (PPIs) and 63 percent higher for those using H2-receptor antagonists. A lack of potassium or chloride will have the same effect. A zinc-containing enzyme controls it all, so these three minerals are vital to HCl production. The absence of an adequate supply of potassium salts gives rise to a diminution of the hydrogen chloride production. The production of hydrogen chloride falls short and the condition known as hypochlorhydria supervenes. The progressiveness of this metabolic disorder is apparent for sooner or later there is a total suppression of the production of hydrogen chloride and the condition know as achlorhydria becomes manifest. This deficiency in HCl production may be temporary or permanent in character, and may be brought about by one or more predisposing factors such as malnutrition, focal infection, chronic poisoning, exposure, fatigue, and shock. Hydrochloric acid secretion may be completely SUPPRESSED by emotion or worry. Many with autism are highly anxious. It is not usually an excess of HCl, but a lack of adequate HCl in the stomach that causes reflux!

It is interesting to note that within two hours of the injection of hydrogen chloride intravenously, 32% of the white cells were showing pronounced phagocytic activity and engulfing microorganisms. Twenty-four hours after the injection phagocytic activity showed that 69% of the white cells were in phagocytic activity. When hydrochloric acid is injected into the body in very dilute, physiologic amounts that do not damage the red cells visibly, the white blood cell systems increase their activity**, the blood pH returns to normal regardless of whether it is too acid or too alkaline**, and the number of white cells increase. Autism is a disease of the immune function, and absence of HCl can affect that function significantly! HCl and EDTA have both been used topically with DMSO to get these substances in the blood stream without the usual shots. DMSO can usually be obtained in health food stores and Vet Suppliers. Using DMSO diluted with 15% to 50% sterile water, some treat themselves.

Good health and the presence of absolute immunity depend on the existence of a normal production of hydrochloric acid, and upon its presence in the bloodstream and other fluids of the body. When the HCl production falls short, and a progressive diminution takes place, we find a loss of absolute immunity, a decreasing degree of tissue susceptibility, an imbalance of blood chemistry, and poor digestion and assimilation. This is the starting point of general ill health and malnutrition. It is a logical assumption that a

lack of sufficient minerals in the daily diet must of necessity give rise to a deficiency in the hydrochloric acid production, and a lack of HCl will produce a disastrous lack of necessary minerals!

As indicated above, hydrochloric acid is necessary to digestion and utilization of vitamins, minerals, and proteins. Acidity is also the trigger for Secretin release in the duodenum, and that accounts for the release of bicarbonate of soda and pancreatic enzymes, and indirectly for the release of fat digesting bile. Now, why would you want to interfere with that life-giving process when these children are suffering symptoms that can best be described as starvation? Nevertheless, I know of one case where Prilosec™, but not Pepcid™, has given dramatic behavioral improvement, with prompt regression when it is removed. It seems it is not the reduction of HCl that is helping, but rather a beneficial "side effect" of Prilosec™, unless Prilosec™, in usual dosage, is doing what it takes large doses of Pepcid™ to accomplish in blocking of histamine in the speech and social behavior areas of the brain.

A related thing we adults do. We have a bit of stomach distress or reflux so we grab a Pepcid AC™ or Tums™. It stops the symptoms of stomach distress, but so would additional hydrochloric acid, or possibly an effective digestive enzyme (GI-Zyme^{R} by Mannatech)! Which would improve our digestion? About 80% of those grabbing a Tums™/Pepcid™ are actually deficient in digestive acid, and thus starving themselves all the more when they grab that palliative. (O, the power of advertising!) If one is, in fact, producing too much HCl, the remedy may be a good thing, but, as I've indicated, most have too little HCl. The symptoms of too much or too little acid are the same! This may be because absence of HCl has allowed creation of large amounts of lactic and other acids due to the resultant putrefactive processes due to stagnation of gastric contents. It is interesting to note that Dr. Jeff Bradstreet has said that 90% of his autistic patients are blood Type A. It has also been noted that Blood Type A people are apt to be deficient of hydrochloric acid, and are apt to be the ones with vaccine problems!

Make sure that you use these H2 blockers and antacids only under direction of your doctor who has checked the child's hydrochloric acid production. Ask for the Heidelberg test. That involves swallowing a small radio that broadcasts on various frequencies depending on the strength of the stomach acid. If you find that one of these drugs produces benefits for your child by blocking the action of histamine, make sure his stomach is producing enough HCl to digest the food properly. That will probably necessitate supplementing hydrochloric acid as suggested above.

There may be an advantage in taking Pepcid™ or Prilosec™ for those autistics that do make too much acid and have an ulcer or gastritis (or who have too much copper - copper is depleted by binding to antacids). That would stop the gastric distress caused by an over-acid stomach and allow healing of the lesion. Find out if that is a fact before using these drugs for they stop the production of hydrochloric acid and "intrinsic factor" the stomach produces. They destroy a vital digestive process. Nevertheless, one mother writes that her son's HCl levels were normal while taking Pepcid™. The child that makes too much acid would probably also show signs of low blood sugar. Nevertheless, a large Spanish study showed a 96 mg daily dose of elemental zinc to be as effective as a 40 mg daily dose of Pepcid^{R} in healing of duodenal ulcers. Zinc also prevents ulcers and gastritis induced by usage of NSAIDs. The zinc provides a multitude of other benefits whereas Pepcid^{R} provides only the real threat of deteriorating health. A zinc-carnosine formulation from Life Extension Foundation^{TM} is said to be even more effective, and is not inhibited by continued usage of NSAIDs.

Occasionally, the stomach produces strong acid at night, when the stomach is empty, causing reflux and pain and sleeplessness. Remember the 70% that showed reflux with symptoms of wakefulness with irritability or crying, pressing of the lower abdomen, and diarrhea? A Tums™ or a 1/2-teaspoon of bicarbonate of soda should work wonders. Be careful not to over alkalize the child by too large or too

frequent dosing with soda. Drink more water before depending on these dangerous drugs. Check the saliva pH. It should be in the range 6.6 to 7.4 pH when not eating.

The media and FDA are quick to make people fearful of "poisonous" fresh produce, it seems to me that the reports miss a really important side of the story: Susceptibility to food-borne illness can be increased by use of common acid-lowering drugs. It's not so much that there is more Salmonella and E. coli in our midst as it is the fact that people are taking more acid-suppressing medications than ever... which leaves them less resistant to the germ. Dr. Leo Galland, ND, director of the Foundation for Integrated Medicine in New York City, a leading expert in nutritional medicine, affirmed that the increase in food-borne illness can, in fact, be influenced by the use of acid-suppressing medications including proton pump inhibitors (PPIs). People think stomach acid is primarily responsible for digesting food. But Dr. Galland pointed out another important function, "Stomach acid is necessary to kill the germs unavoidably present in the food and drink that we all consume. Using drugs that take away the acid can weaken our defenses against a food-borne intestinal infection," he said.

Detoxification 101

I mentioned Phase I liver enzymes and PST above. Your liver changes chemicals in your body (that come in from food and from the environment, or that your body makes) into other chemicals that can be disposed of. This is called biotransformation. Biotransformation is broadly broken into Phase I and Phase II pathways.

The Phase I enzymes are mostly of the Cytochrome p450 family. These combine oxygen with the toxic molecule and use the reduced form of nicotinamide adenosine dinucleotide (NADH) as cofactor to add a reactive group (i.e., hydroxyl radical) to the substrates and oxidize it, allowing disposal via the kidneys. This is bioactivation, and it generates lots of free radicals. Sometimes, the result of this reaction is the generation of a reactive molecule, which is often more toxic than the parent compound. Unless this intermediate is further metabolized, it may react with and cause damage to proteins, RNA, and DNA within the cell. To rid itself of poisons that are produced by Phase I bioactivation, the liver employs a Phase II system in which the oxidized chemicals have some other substance attached to them making them soluble so they can be excreted readily by the kidneys. This is the preferred action, but if the load on the liver is high, or if the toxins are present in large amounts, or if the Phase II enzyme systems are not working well (PST), or if there are insufficient numbers of Phase II enzymes or of their necessary substrates (sulfate, glutathione) one of three negative possibilities may occur instead. There may be tissue damage, such as toxic liver damage, or it may react with a cell protein forming an antigen. The antigen may lead to a negative immunological reaction; or, finally, the toxin may bind with DNA causing a mutation that can lead to cancer.

Individuals with immune, CNS, and endocrine disorders often present with complex xenobiotics (foreign chemicals) involving disturbances in the cytochrome p450 super family of liver enzymes that parallels disturbances in peroxisomal function. The cytochrome p450s are responsible for the biotransformation and excretion of endogenous compounds including fatty acids, steroids, estrogen, body alcohols, Retinoic acids (vitamin A), glycine, prostaglandins, leukotrienes, many drugs and vitamins, as well as the detoxification of exogenous compounds resulting in substantial alterations of p450s as xenobiotics may turn off or greatly reduce the expression of these constitutive isoenzymes. Low protein intake has been found to increase markedly the toxicity of a number of xenobiotics. Excessive histidine, however, increased liver cytochrome P-450, whereas excessive tyrosine markedly decreased liver cytochrome p450. P450 production may be inhibited or substantially used up by H2 blockers, some antacids, SSRIs (Prozac™, Paxil™, Zoloft™, etc.), and perhaps one fifth of all medications. In this manner, these drugs have the potential to worsen, or even create, a susceptibility to many common chemicals, Chemical Sensitivities/Environmental Illness, and

related syndromes. Prozac™ also loads the body with fluoride. The oddness of some of these symptoms may prompt some doctors to prescribe SSRIs, thus making the situation worse!

Long-term inhibition of heme (a deep red iron containing pigment found in hemoglobin) synthesis due to p450 insufficiency may cause anemia. This, and the resulting metabolic reductions, may cause reductions in the body's ability to maintain itself, showing up as a wide variety of health problems similar to those of Wilson's Syndrome, as well as behavioral and cognitive problems. In other words, these liver enzymes are inhibited, and aromatics, such as benzene-ring containing chemicals, aldehydes, epoxides, and organic volatiles, build to toxic levels. As a result, some herbs, listed later, that enhance the action of these enzymes may be very beneficial for a time.

The balance between Phase I and Phase II is critical, however, and stimulation of Phase I in absence of stimulation of Phase II reactions is dangerous. When toxins are high, we want to enhance Phase I and Phase II together so there is a smooth passage of these toxic products from Phase I to Phase II and out of the body. Sluggish action of Phase II due to low sulfate/glutathione levels, or to low PST enzyme activity, can lead to increased concentrations of toxic neurotransmitter amines, peptides, steroids, bile acids, GAGs, and phenol amines, and to prolonged effects on the central nervous system.

Accumulation of toxic substances depends on an individual's quantity and quality of immune and enzyme detoxication responses along with his age and overall health. Newborns and very young children have detoxification reaction rates that are much slower than adults. Accumulation may also occur with constant exposures that allow no time for clearing. The nutritional state needed to maintain good health is depleted by this toxic exposure. Overload of pollutants can increasingly tax the detoxification systems, eventually resulting in depletion of nutrients, system/organ malfunctions, and susceptibility to illness. Among the most insidious toxic metals are the sulfhydryl-reactive metals, which include mercury (Hg), cadmium (Cd), lead (Pb), and arsenic (As). The pro-oxidative effects of the metals are compounded by the fact that they inhibit antioxidative enzymes and deplete intracellular glutathione. The metals have the potential to disrupt the metabolism and biological activities of many proteins due to their high affinity for free sulfhydryl groups. In addition to promoting lipid peroxidation, depleting GSH, and inhibiting antioxidative processes, the sulfhydryl-reactive metals disrupt the structure and function of numerous important proteins through direct binding to free sulfhydryl groups. Intact sulfhydryl groups are critical for the biological activities of virtually all proteins. Since all these metals are sulfhydryl reactive, the presence of more than one is cumulative in their effects.

Chemical sensitivity is one of the major manifestations of environmentally triggered disease involving Phase II enzymes. It is an adverse reaction(s) to ambient levels of a toxic chemical(s) contained in air, food, and water. The nature of these adverse reactions depends upon the tissue(s) or organ(s) involved, the chemical and pharmacologic nature of the substance(s) involved (that is, duration of time, concentration, and virulence of exposure), **the individual susceptibility of the exposed person** (nutritional state, genetic makeup, and toxic load at the time of exposure), and the length of time and the amount and variety of other body stressors (total load), and the synergism at the time of the reaction(s).

Chemical allergies are a small but significant part of the overall spectrum of chemical sensitivity. They may involve both allergic (immunologically mediated mechanisms including all of the four types of hypersensitivity reactions) and toxic (nonimmune mechanisms) responses. They involve the mechanisms of the IgE class of immunoglobulins. An example of chemical allergy is the IgE-mediated toluene diisocyanate antigen/antibody reaction that frequently manifests itself as asthma or some other form of respiratory or vascular dysfunction. Other immune mechanisms such as IgG, cytotoxic response, immune complexes (IgG + complement), or T- and B-cell abnormalities are often involved in chemical sensitivity, although these reactions are frequently secondary responses following an initial enzyme detoxification response. **Failure of enzyme detoxification appears to be the prime mechanism in**

chemical sensitivity. Regardless of the mechanisms involved, clinical manifestations of chemical sensitivity may be the same. For example, rhinitis may occur either as an IgE response to toluene diisocyanate, or it may be an enzyme detoxification system response to formaldehyde, or it simply could be a zinc deficiency.

Chemical sensitivities may arise in several ways. Individuals who survive near-fatal exposures to toxic substances often experience lowered resistance to disease as a result of the depletion of their nutrient pool brought on by the exposure. They may then develop chronic symptoms of ill health. If these people are later exposed to ambient doses of toxic chemicals, they may experience additional and/or enhanced symptoms. Numb, tingling hands and face are typical of people who are working in contaminated buildings. "Spreading", which can involve both new organ systems and increased sensitivities to additional substances, may occur. For example, an individual working in a chemical plant may be exposed to high doses of xylene after an explosion. He immediately develops headaches and flu-like symptoms that become chronic. Weeks later, after ongoing ambient exposures in the workplace and at home, this person develops asthma and sensitivity to ambient doses of various toxic and nontoxic (e.g., perfume) substances. Of the chemically sensitive patients seen at the EHC-Dallas, 13% relate the onset of their sensitivity to a severe, acute exposure.

These credited quotes express well the problems faced by MCS sufferers, and point to a protocol.

"One reason that (Autism and) Multiple Chemical Sensitivity (MCS) can be such a stubborn problem is that it involves so many of the body's interlocking systems, and lying at the center of it all is an adrenal deficit in enzymatic detoxification. For this reason, doctors are finding it maddeningly hard to minimize or eliminate the symptoms of MCS, thwart unwanted pain and inflammation, and stop carcinogenesis. Lifestyle changes aren't enough. For the nation's major diseases to be controlled, doctors must learn how to unlock tensed, energetic streams that govern healing and repair via adrenal energetics and physiology (the adrenal influence on detoxification enzymes).

"Increasing worldwide pollution coupled with overcrowding, contaminated water and food, and indoor air contaminants has between 15 and 37% of the American population complaining of sensitivities or allergies to chemicals, car exhaust, tobacco smoke, air fresheners, and the scents of many common household cleaning agents and body care products. Indoor air contaminants (synthetic cleaning agents, synthetic colognes, perfumes, body care products, and air fresheners) wreck havoc with detoxification functions and the chemistry of the whole body goes awry. These pollutants act as stressors that infiltrate and damage the body and rapidly deplete the nutrient precursors and co-factors required by the body. Moreover, these pollutants throw off the calibration of the body's stress defense mechanisms, propelling the body into a vicious cycle of stress-driven reactions that allow stagnant energy to build up in the upper abdomen.

"The best way to understand what MCS is - and what it is not - is to observe how it affects the lives of people who have it. MCS has serious implications and social effects that demand more public and professional understanding. MCS sufferers experience personality changes--becoming angry, depressed, irritated, anxious, fearful, and lethargic--acute heart symptoms, brain and nervous system reactions, paralysis, an inability to breathe or a feeling of suffocation, intense headaches, dizziness, brain fog, short-term memory losses, muscle and joint pain, and convulsions when exposed to certain chemicals.

"Most sufferers find it impossible to live a normal life. Shopping and the normal social routines of life become impossible making isolation and withdrawal the only option to avoid a chemical exposure that could trigger a serious or near fatal neurological reaction. When they seek professional help, they are labeled as "psychosomatic" or misdiagnosed with psychiatric disorders, cognitive and neurological impairment, allergies, migraine headaches, sinusitis, or asthma. Sadly, the real cause (enzyme detoxification deficits and the deferral of repair routines due to

undetected hypoadrenia) remain obscure and are masked by commonly prescribed antihistamines, decongestants, anti-inflammatory drugs, megavitamins (especially B-complex and vitamin C), herbs, and cortisone.

"Detoxification in Individuals with Impaired Enzymatic Detoxification is Contraindicated and Dangerous."

"Effective detoxification protocols for MCS (and PST) patients must address sulfoxidation deficits, specifically the impairment of the enzyme cysteine dioxygenase (CDO). The fact that CDO is the primary enzyme deficit in MCS, (Down's, and autistic) patients and that it's not adequately identified by the acetaminophen challenge test, the urinary-sulfate-to-creatinine-ratio, and the plasma cysteine-to-sulfate ratio make it an exceedingly bad idea to employ detoxification strategies that do not conjugate or disarm volatile and inflammation-producing toxins. Indeed, impaired CDO activity has been linked to Rheumatoid arthritis, Lupus, Parkinson's Disease, MCS, and neurological diseases."

"The abnormal expression (lack) of CDO (and glutathione) breaches the body's primary metabolic barrier against the systemic entry of xenobiotics. Since the lungs are the first point of contact for airborne toxins, it makes sense that their entry and access to other tissues before being detoxified by the liver has the potential to cause many of the neurological and organ symptoms of MCS, (Autism), and other diseases. In contrast, orally ingested xenobiotics undergo the hepatic first-pass effect. Therefore, it is possible that, without the potential for CDO (and glutathione) detoxification within the alveolus, many carcinogens or potential carcinogens would enter into the systemic circulation unimpeded, without detoxification, as strong electrophiles (electron-deficient molecules - that is, free radicals). (Never use Tylenol^{tm} for any reason as it destroys all glutathione in both lungs and liver.) Electrophiles react with electron-rich DNA causing mistranslations, mutations, defective DNA repair mechanisms, and chronic maldigestion. In these cases, boosting nutrient uptake with new carrier protein-co-transporter technologies may be necessary to nourish these patients and supply the necessary nutritional support to the adrenals and detoxification organs of the body." (As spelled out in this paper.)

"Rather than pursuing aggressive detoxification strategies, practitioners need to make sure that detoxification enzymes (CDO, GSH, PST) are functional and can safely disarm and excrete toxins in a natural fashion and appreciate the fact that innate healing mechanisms repair these damaged enzymes at the acupuncture-energetic juncture."

"Hypoadrenia causes chronic and prolonged infection and unwanted inflammation which lies at the root of heart disease and other disorders. A buildup of stagnant energy in the liver and diaphragm inhibits enzymatic detoxification triggering a wide spectrum of reactive and pro-inflammatory symptoms."

"After decades of using different clinical approaches, **I have concluded that natural therapies should never stimulate the adrenals and never force detoxification unless CDO (needed to produce sulfates) is functional.** While stimulation may result in the disappearance of many symptoms, it will eventually backslide as it goes against innate intelligence and acupuncture-energetic physiology. What types of natural therapies stimulate and evoke stress response? Nutritional approaches that advocate the use of B-vitamins, vitamin C, stimulatory herbs, expansive or contractive inorganic minerals, DHEA, pregnenolone, and synthetic vitamins. Even acupuncture, without detoxification, may be viewed as a stressor to the body. Dr. Seem states '... in line with modern stress theories, acupuncture serves as a minor stressor to activate the sympathetic nervous system (SNS). In doing so it activates the adrenals (the mother of the Liver in acupuncture energetic physiology)...'"

"The adrenals connect to SNS nerves at the medulla cells which secrete epinephrine (adrenaline) and norepinephrine (noradrenaline) with SNS stimulation. The SNS, involved in the preparation of the organism for "fight or flight" in emergency situations, inhibits the Parasympathetic Nervous System (PSNS) and anabolic processes, thereby acting as an inhibitor of gastrointestinal function. The common use of digestive enzymes

enforces (supports?) the SNS-dominant pattern, keeps the adrenals in a perpetual state of stimulation, and fails to address core issues underlying maldigestion and malnourishment. Rather than stimulate, our goal is to nourish and strengthen weak physiology in a manner that restores disrupted energetic patterns." (As outlined elsewhere in this paper. Magnesium down regulates SNS and potassium upregulates PSNS.)

"The duality of nourishment, physically and energetically, allows the body to keep itself in equilibrium and to balance itself when that equilibrium is disrupted. The body's restorative secrets are intrinsically linked to its ability to expand and exploit its myriad resources at these frequencies. Enhancing quantum coherence synchronizes adrenal-energetic functions, making one highly resilient to stress. In nutritional applications, this coherent, amplified, crystalline resonant field propels nutrients deep into cells, providing a plausible scientific theory on how to regulate the entire organism while shielding it from EMF-microwave stressors that weaken the hypothalamic-pituitary-adrenal axis. The body needs nourishment from healthy resonances that are woefully missing in today's polluted environment. Plus, the naturopathic goals of enhancing electron transfer functions and stabilizing molecular defenses to reduce oxidative stress are supported in the sub-molecular realm where homeopathy has already shown us powerful methodologies to control and regulate biochemical reactions."

"Once the adrenals are functioning optimally, both physically and energetically, the body can adapt to the stresses and strains of everyday living without distress. Detoxification is without effort and without harm to the body. Healing energies are not hindered by stress overload (daily doses of unwanted toxins or interferences from electromagnetic pollution) because they operate coherently and with functional unity.

"Clinically, I use a wide array of botanicals to strengthen adrenal function which, in turn, boosts detoxification enzymes and facilitates the destruction of reactive electrophiles and oxidants into innocuous, excretable metabolites. However, a strong word of caution: a high percentage of supplements we tested were toxic and presented a serious challenge to MCS sufferers. A high percentage of natural supplements are irradiated (nearly all imported herbs) or contain toxic ingredients that trigger MCS reactions. These toxic ingredients silently suppress immunity, weaken and stress the adrenals, and make MCS patients more toxic." - Hypoadrenia: a causative factor in MCS and impaired enzymatic detoxification Townsend Letter for Doctors and Patients, Feb-March, 2005 by Paul Yanick, Jr.

"If you have a strong immune system, you don't have environmental illness. If by heredity, you have a weakened (imbalanced—WSL) immune system, or your immune system has been damaged by chemicals (and vaccines—WSL), then you are apt to develop allergies, cancer, and all kinds of terrible problems. So, one of the things we have to do is to strengthen (balance) the immune system. You are only as strong as each cell in your body and, if all the cells lack magnesium, or manganese, or copper, or some other essential nutrient, you will not be well. If the immune system is damaged, then the endocrine system and all the other systems go out of balance and you're in serious trouble. The immune system can be enhanced or improved by certain nutrients"—Dr. Doris Rapp, MD, Allergy specialist. Those nutrients are enumerated in this paper.

Remember that chemical sensitivity requires multiple factors, one of which is that the person must be deficient in certain nutrients that are necessary for the detoxification pathways to operate normally. Once the deficiencies in these pathways are corrected, many times, the chemical sensitivity is corrected. For example, a 33-year-old lab technician for years could not tolerate shopping malls, auto exhaust fumes, and many businesses because of chemical sensitivity. She felt confused, suffered from headaches, and became weak and tired when she breathed the higher levels of chemicals commonly encountered in these environments. Copper is present in superoxide dismutase, an enzyme that is useful in protecting us from developing chemical sensitivity. When we found that she had a copper deficiency and corrected it, within one month, she was no longer as chemically

sensitive, and could tolerate these exposures without symptoms. In cattle affected by Cu deficiency induced by Molybdenum, neutrophils were impaired in their ability to kill ingested Candida albicans (Boyne and Arthur, 1986). **Copper deficiency reduces at least two neurotransmitters, dopamine and norepinephrine (O'Dell, 1984).** The best test for copper deficiency is intracellular, or red blood cell (RBC), while serum or plasma copper tests are too insensitive, and hence not worth obtaining.

The enzyme superoxide dismutase (SOD), which declines with age, plays a role in the retarding of arthritis, general body deterioration, and aging. In fact, in nearly all diseases, lower than normal levels of SOD are found. For example, people with colitis were found to have much lower levels of SOD in the bowel, and people with Alzheimer's disease were found to have much lower levels of SOD in the brain. Finally, and inexpensive SOD supplement is available from Life Extension Foundation. Ask for SODzyme with GliSODin™.

It seems quite clear that the chemicals act synergistically. In one 1976 study, a scientific team used three chemicals on a group of rats. The chemicals were tested one at a time on the rats without ill effect. When the scientists gave the rats two at a time, a decline in health was noted. When the rats were given all three chemicals at once, they all died within two weeks. (Alternative Medicine: The Definitive Guide, by The Burton Goldberg Group).

In addition to phenol in foods, there is another toxic content to some foods that may play heavily in Autism. It is malonic acid or malonate found in alfalfa sprouts, apricots, all kinds of beans, broccoli, butternut squash peel, carrots, chaparral (dry), chocolate, ginger root skin, grape jam (commercial), dark green zucchini, kombo (seaweed), limes, mangos, onions (purple), oranges, papaya (Mexican), parsnips, passion fruit, persimmons (Fuji, regular), radish (daikon), red skin of peanuts, Tamari soy sauce, tomatoes, turnips, rutabagas, and wheat grass. This acid is highly toxic if not excreted properly. Some of the things affected read like a list of autistic symptoms:

- Inhibits the uptake of glycine and alanine.
- Depresses Phagocytosis of bacteria by neutrophils.
- Chelates calcium.
- Causes air hunger (dyspnea).
- Methyl malonate is toxic to kidneys
- Acetoacetyl CoA can transfer its CoA to malonic acid to make malonyl CoA. This depletes the system of Coenzyme A. This could lead to acetoacetate buildup, namely ketonuria, and possibly a block in fat utilization of even numbered carbon atoms, leaving odd numbered carbons to predominate. You will have a need for increased amounts of pantothenic acid and sulfur.
- Inhibits succinate dehydrogenase, and may lead to elevated succinate levels. (Large amounts of succinate can be produced from bacterial degradation of glutamine also.) This enzyme requires ferrous iron and vitamin B_2 as FAD. Malonic acid may come from extra-mitochondrial malonyl CoA involved in fatty acid biosynthesis and from foods.
- Induces ketonemia.
- Reacts with aldehydes.
- Competes with zinc and magnesium, depleting them.
- Can reduce concentrations of magnesium and calcium by 25% to 50%.
- Severely reduces calcium and iron transport in rats.
- Cause a fall in malate concentrations leading to depletion of NADP.
- Causes oxidation of NADH and cytochromes.
- Raises cholesterol.
- Reduces survival times of animals.

- Can pick up an amino group from glutamine, thereby destroying it.
- Depresses the reduction of GSSG to glutathione.
- Inhibits insulin stimulation of muscle respiration.
- Inhibits acetylcholine synthesis.
- Inhibits entry of phosphate and potassium into cells.
- Causes systemic acidosis.
- Inhibits pyruvate oxidation.
- Increases lactic acid formation by inhibiting cellular respiration.
- Stimulates glycolysis.
- Much less glucose goes to form amino acids and proteins.
- Diverts fatty acid metabolism to acetoacetate, acetone, and alcohol in dogs.
- Inhibits oxidation of fatty acids.
- Inhibits cell cleavage (the formation of a wall between dividing cells). The resulting multinucleate cell is a hallmark of cancer.

The body detoxifies unwelcoms substances by methylation. This is costly to the body's resources, requiring large amounts of vitamins B_6, B_{12}, folic acid, methionine, betaine, glycine, taurine, cysteine, lecithin, and vitamin C.

Migraine patients without aura had lower levels of Phenol-sulfotransferase enzymes in platelets, with the P-forms being more severely involved. This, coupled with a lack of sulfates, will create toxic levels of phenols and amines, and possibly heavy metals, in particular. This may necessitate avoidance of high content amine foods, to enable the body to keep amines within limits to avoid headache and other symptoms. One should first "unload the donkey" and supplement sulfates before avoiding amines or phenols in foods. Should foods need to be eliminated to lower amines enough to eliminate headache, these foods are <u>very high</u> in amines: sauerkraut, spinach, butternut, any dried, pickled, salted, or smoked fish or meat, anchovies, beef liver, fish roe, pies and pastries, processed fish products (fingers, cakes, and pastes), salmon, sausage, canned tuna, virtually all cheeses, dark chocolate, hydrolyzed protein, miso, tempeh, yeast extracts, chocolate drinks, colas, orange juice, tomato juice, and all vegetable juices.

These foods are <u>high</u> in amines: avocado, banana, fig, grapes, lemon, pineapple, plum, raspberry, aubergine, gherkin, mushroom, tomato, pecans, walnut, bacon, hotdogs, frozen fish, gravy, ham, canned mackerel, meat juices, meat loaf, offal, pork, canned sardines, milk, cheeses, meat extracts, soy sauce, vinegar, Worcestershire sauce, cocoa, milk chocolate, white chocolate, and all fruit juices.

Histamine is a biogenic amine found in many foods, often in the form of the amino acid, histidine. If the body doesn't clear it efficiently, problems can arise. This can happen when there is a deficiency of the enzyme diamine oxidase needed to metabolize histamine and tyramine. Alcohol and many, many drugs inhibit this essential enzyme leading to a build up of histamine in the system. Should this enzyme be inhibited, in addition to migraine, one may become suicidally depressed. It may be necessary to restrict certain foods containing histamine and tyramine. Histamine sensitivity can produce allergy-type reactions that no test will detect. One form of Schizophrenia is marked by high histamine, and it too can be benefited by avoiding these foods: all cheeses, especially blue, camembert, cheddar, emementhal, gouda, harzer, mozzarella, parmesan, provolone, Roquefort, Swiss, and tilsiter, anchovy, herring, mackerel, sardine, tuna, all dried or cured meats, aubergine, pickled cabbage, spinach, tomatoes, beer, champagne, red and white wines, sparkling wine, tamari, and soy sauce.

The above foods vary widely as to content of histamine, and some may be tolerated dependent upon the content and your individual tolerance. Additionally, egg whites, crustaceans, chocolate, strawberries,

tomatoes, and citrus fruit don't contain significant amounts of histamine, but are reported to trigger a histamine release.

It is vital to remember that water, lots of water, is the best antihistamine known to man, with no side effects. Further, calcium triggers mast cells to release histamine, so the problem may relate to a lack of magnesium to balance the calcium and guard the calcium channels into the cells. Methionine (amino acid) methylates histamine and removes it from the body. This should be supplied by an adequate intake of protein rather than by a single amino acid supplement unless supervised by a knowledgeable natural practitioner. There are some potential dangers in single amino acid therapy.

Phase I liver enzymes detoxify aromatics, such as benzene-ring containing chemicals, aldehydes, epoxides, organic volatiles, and if you develop nausea/poor feeling from these chemicals, you have impaired Phase I liver activity that causes these toxins to accumulate. The reaction comes from the exposure raising the levels of these chemicals too high due to impaired Phase I activity. It is noteworthy that of 20 cases examined, 100% showed liver detoxification profiles outside of normal. An examination of 18 autistic children in blood analysis showed that 16 of these children showed evidence of levels of toxic chemicals exceeding adult maximum tolerance. If there is a vitamin B_6 deficiency, aldehydes will accumulate, and serotonin levels could be impaired, thus causing poor sleep and other neurotransmitter disruptions. Phase II liver enzymes detoxify such things as acetaminophen, nicotine, organophosphates, aspirin, sulfonamides, amines, phenols, and morphine.

These are some of the things to avoid: Aromatic oils; Azole antihistamine: cimetidine (Tagamet™); Azole antifungals: fluconazole (Diflucan™—it is fluoride based); and ketoconazole (Nizoral™), Itraconazole (Sporanox™) (among the reportable side effects of these three antifungal drugs are dark urine and pale stools indicating kidney or liver problems, respectively); Azole antiparasitic drug: metronidazole (Flagyl™); and all porphyrics. The main risks of Flagyl™ is the impairment of Phase I, cytochrome-p450, liver enzymes (in fact, all these impair Phase I liver detoxification especially that of aldehyde—Candida die-off—oxidation), and possible liver damage called "megamitochondria" that other "Azole-class" drugs, that Flagyl™ is part of, have caused. Flagyl™ has also failed to work in a number of cases. All these drugs are meant for short-term use only. The liver must be checked for elevated liver enzymes when using these antifungals, however, it should be noted that high amounts of vitamin B_6 will harmlessly elevate AST (SGOT) and ALT (SGPT).

Azole antifungals work by inhibiting the fungal cytochrome p450 enzyme that catalyzes C-14 alpha-demethylation in the production of ergosterols. The equivalent human enzyme is much less sensitive to inhibition by azoles, but is affected somewhat. This inhibition may become clinically significant when given with another compound that is metabolized by that enzyme. This is probably the action that prompted the observance that Nizoral (Ketoconazole) caused some male patients to develop breast tissue and a more feminized apparence. Ketoconazole interefers with metabolism of sex hormones! Specific drug interactions have been reported with rifampin, coumadin, phenytoin, cyclosporine, theophylline, oral hypoglycemics, terfenadine, cisapride, and astemizole. Cimetidine antihistamine and Fluconazole antifungal have caused such damage, so one has to be careful when Phase I liver enzymes are impaired already, for the risk is then higher. Vanillin (synthetic vanilla) greatly inhibits dopamine sulfation (Phase II) allowing a toxic buildup. Another possible source of excess dopamine with reduced norepinephrine is the presence of clostridia overgrowth.

Many popular herbs inhibit Phase I enzymes, and they should not be used by anyone suspected of having impaired Phase I function: black cohosh, blue cohosh, chaparral, boneset, buchu, comfrey, cyani, elecampane, fever few, Gotu Kola, bitter orange, grapefruit and grapefruit seed extract (Citricidal™), grapeseed extract or Pycnogenol™, and barberry (these and other anthocyanidins also provide phenolic compounds), Irish moss

(red seaweed), juniper, Kava Kava, mistletoe, mullein, nettle, periwinkle (Vinpocetine™), pokeweed, Quercetin, Reishi and Shitake mushrooms, Rosemary, Seneca, Una de Gata (cat's claw), excessive tyrosine, cranberry juice, and valerian root are ones that I know of. Valerian is also reported in long-term use to decrease adrenal function, leading to dizziness, fatigue, headache, irritability, extreme blood sugar levels, and other problems. These children already have decreased adrenal function! H2 Blockers also inhibit or substantially deplete Cytochrome p450 enzymes. Curiously, Rosemary is said to enhance Phase II function. It is possibly a good choice if PST

Using these herbs long term will lead to a buildup of Phase I toxins, for example, **benzene-aromatic rings** such as found in gasoline vapors; **1,4-dichlorobenzene** such as found in mothballs and room deodorizers; **xylene** such as found in deodorants, room fresheners, gasoline, and paint vapors (do you get a headache?); **dioxin** such as found in herbicides, auto exhaust, and wood treatment; **styrene** such as found in Styrofoam cups and on carpet backing (fumes); **ketones** (fat waste products); **aldehydes** (formaldehyde, furfural) a major source of which is aspartame, a phenolic compound (Nutrasweet™ type sweeteners); **various perfumes** (most are made with petroleum chemicals, phenyl-acetaldehydes, not with flower scents), and **Candida yeast toxins (acetaldehydes)**. These children must be kept away from these substances some of which are found in aerosols and room fresheners that have been shown to contribute to headache and depression in adults, and to ear infection and diarrhea in children. Additionally, these inhibit release of steroids, estrogens, body alcohols, prostaglandins, retinoic acid (vitamin A), fatty acids, and glycine, and can cause a toxic buildup of various drugs.

In 1984, Prof Rochlitz created the RADH--the Rochlitz Aldehyde Dyslexia Hypothesis--which stated that the Candida toxin, acetadehyde (even more toxic than its cousin formaldehyde), from the Candida overgrowth of the mother, could cross the placental barrier and later result in dyslexia, ADD, ADHD, balance and behavioral problems, and other mental problems. These problems can last a life-time, or they can be quickly corrected with the Rochlitz-HEBS methods at any time in life. Rochlitz found that the environmentally ill (toxic) person (allergies, Candida, parasites) is dyslexic to some extent. There are learning or memory problems (names) or reading problems, though not fully dyslexic.

The dyslexic, when tested, has severe allergies (and therefore addictions), Candida, parasites, and similar problems. Dyslexia and environmental illness, then, are closely related. The Rochlitz-HEBS methods address the problems simultaneously with the corrective, energy-balancing techniques as well as the ecological testing and restoration. These methods not only correct dyslexia, they powerful enough to help severely brain damaged people. The Doctor reports that he helped a brain-damaged boy who was said to be completely "brain dead" who is now a spelling champion in his school!

In 1979, Dr. Robert Gardner, a very allergic person, hypothesized that his allergies were caused by sensitivity to some aromatic compounds found naturally in all plants. He acquired some of these pure aromatic compounds, made dilutions, started sublingual tests and monitored changes in pulse rates upon applications. There were reactions to various extracts, and neutralizing doses were found for each compound. He found that neutralizing doses of these compounds would neutralize allergic reactions to specific foods. Dr. Joseph J. McGovern, an allergist in Oakland, was the first clinician to investigate Dr. Gardner's findings. He has shown that these natural, food-borne aromatics induce behavioral disturbances in children, including hyperkinesis.

Progressive neutralization of these aromatic compounds has led to vast improvements in the majority of patients. Neutralizing these compounds results in disappearance of arthritic pains, decreased abdominal bloating, improved bowel function, decrease of recurrent canker sores, and less anxiety. School performance improves noticeably, and this has been noted in most children treated. The treatment has been particularly successful with infants and

children, with excellent results in autism, mental retardation, hyperactivity, dyslexia, insomnia, enuresis, respiratory allergies, headaches, abdominal pains, and asthma. Results with adults have been as exciting with remissions achieved in many chronic problems including migraine, fatigue, depression, asthma, arthritis, colitis, hypertension, menstrual disorders, dermatological problems, chronic constipation, and arrhythmias.

A phenolic compound may cause a variety of different symptoms in various individuals. When a suspected phenolic is given to a person, exactly the same allergic symptom occurs over and over. Some people begin crying for no apparent reason, become depressed, or have any of their usual symptoms. When a neutralizing dose is given to stop the reaction, they start smiling, laughing, joking, and their allergic symptoms disappear. Instead of desensitizing to several foods containing the same phenolic compound, you would desensitize the one chemical that is in all of the foods. Since these chemicals are often repeated throughout nature, desensitization to a few main chemicals could reduce most of the symptoms caused by foods, pollens, and environmental chemicals.

Regarding ketones, these accumulate, leading to ketoacidosis (ketosis) leading to a loss of calcium, magnesium, and potassium into the urine. This could relate to liver insufficiency due to a vitamin A deficiency—common among autistics. The early signs are nausea and a faster rate of breathing. Increased thirst, excessive urination, abdominal pain or vomiting, listlessness, and eventually sleepiness can follow this. If not recognized and dealt with, this acidosis will lead to coma. The build up of ketones in the blood for a few days, or even a few hours, can be life threatening. If you are not feeling well, or you are showing excessive amounts of sugar in the blood, you must test for ketones (Use Acetest™ tablets or Ketostix™ dipsticks). The use of L-carnitine as a therapeutic supplement (1000 to 3000 mg daily) can enhance the metabolism of fats, and prevent ketones, triglycerides, and cholesterol from building up in the blood. Those using high fat diets to produce a ketosis to control seizures must supplement magnesium, potassium, and calcium, and consider using carnitine to ensure adequate energy production. Remember that carnitine also burns essential fatty acids. So, when supplementing carnitine, ensure adequate Omega-6 and Omega-3 fatty acids are provided. When carnitine is used, one must ensure that adequate calories are taken in also. A failure to do so can produce seizures. Vegetarians are apt to be lacking in carnitine due to a diet low in lysine, and the absence of meat. Additionally, vegetarians lack zinc, CoQ10, and alpha lipoic acid as well as vitamin B_{12}, unless they are supplementing these things.

Mono-functional inducers of liver activity, such as polycyclic hydrocarbons from cigarette smoke and aryl amines from charbroiled meats, result in dramatic induction (increase) of the activity of Cyp1A1 and Cyp1A2 (cytochrome p450) enzymes, leading to a substantial increase in Phase I activity, with little or no induction of Phase II enzymes. Similarly, glucocorticoids and anti-convulsants induce Cyp3A4 activity, and ethanol, acetone, and isoniazid induce Cyp2E1. Induction of these activities without co-induction of Phase II activities may lead to an uncoupling of the Phase I and Phase II balance of activity and, therefore, a higher level of reactive intermediates, which can cause damage to DNA, RNA, and proteins. In other words, you will be phenol and amine toxic with lots of free radicals.

When Phase I is under high stress, additional antioxidants are needed to help the Phase I system act smoothly, and to ensure there is no oxidative damage occurring in the liver, impairing its function. The best antioxidants to help the liver with no toxicity to the liver or Peripheral Mononuclear Blood Cells (immune cells) and no adverse effect on Phase I are Ambrotose AO™ and Phyt•Aloe® by Mannatech™, and Green Tea Extract (found in Ambrotose AO™) (however, the high content of both aluminum and fluoride in tea is cause for great concern when drinking green tea, as aluminum greatly potentiates fluoride's effects on G-protein activation, the on/off switches involved in cell communication and of absolute necessity in thyroid hormone function and regulation). Other helps recommended by natural healers are the hormone pregnenolone (25 mg), phosphatidylcholine, Milk Thistle, and Turmeric.

Pregnenolone enhances Phase I liver function by conserving the cytochrome p450 enzymes. Its use could be considered when the EPA/DHA levels are excessively high in relation to GLA, but I think it more basic to look to support the thyroid and adrenals that are likely sluggish. More than two decades of clinical trials indicate that phosphatidylcholine (PC) protects the liver against damage from acetaldehydes from alcohol and Candida, pharmaceuticals, pollutant substances, hepatic viruses, and other toxic influences, most of which operate by damaging cell membranes. The human liver is confronted with tens of thousands of exogenous substances. The metabolism of these xenobiotics can result in the liver's detoxicative enzymes producing reactive metabolites that attack the liver tissue. Dietary supplementation with PC (a minimum 800 mg daily for adults, with meals) significantly speeds recovery of the liver. PC is fully compatible with pharmaceuticals, and with other nutrients. PC is also highly bioavailable (about 90% of the administered amount is absorbed over 24 hours), and PC is an excellent emulsifier that enhances the bioavailability of nutrients with which it is co-administered. PC's diverse benefits and proven safety indicate that it is a premier liver nutrient (Alt Med Rev 1996;1(4):258-274). Even when milk thistle failed, PC was successful in improving the liver. Long-term intakes of certain of the antiepileptic drugs, especially phenytoin (Dilantin™), pose a high risk of liver damage. Hisanaga and collaborators (1980) in Japan followed 38 subjects who had received phenytoin and other antiepileptic drugs for an average of five years. A subgroup with the highest degree of damage (assessed by SGGT enzyme elevation), after being given PC orally for six months, experienced remarkable benefits.

Milk thistle assists the glutathione-S-transferase (GST) (a Phase II enzyme that adds a glutathione group to Phase I products) activity by increasing glutathione production up to 35%, but it does not directly stimulate the enzyme. Silymarin also causes liver regeneration, but milk thistle is dangerous for one with impaired sulfation (PST) for it also enhances cytochrome p450 (Phase I) activity. Other herbs and foods best supply the glutathione it supplies. Rosemary and sage are sometimes recommended because they contain an antioxidant and inhibit the bioactivation of certain toxins that combine with DNA, but Rosemary inhibits Phase I while enhancing Phase II activity (Shaw says it enhances both pathways) and Sage is toxic to liver and immune cells. Turmeric enhances Phase I and Phase II activity, but is toxic to the liver and immune cells (An Invitro Screening Study of 196 Natural Products for Toxicity and Efficacy by Dr. Darryl M. See, MD, JANA, Winter 1999). These four herbs should not be used except under direction of a competent herbologist. These may not have a deleterious effect in the short run, but to stimulate Phase I activity for long periods (unless testing proves it needs stimulation) will be detrimental for it will clear many necessary body substances at a higher than normal rate and produce deficiencies in fatty acids, estrogen, steroids, body alcohols, Prostaglandins, retinol, and glycine, and it reduces the effectiveness of many drugs. It would also overload a deficient Phase II system (PST). Similarly, to inhibit this pathway will build these substances to unnatural and unwanted levels. Good herbalists would not recommend one of these herbs for long periods, but would suggest Dandelion, Ambrotose®, and Phyt•Aloe® to enhance glutathione. These would work well with a combination of antioxidants and Phase I/Phase II enhancers such as Schizandra and Phyt•Aloe.

Glutathione-S-transferase T1 (GST T1), the enzyme that forms glutathione, displays a genetic polymorphism. Due to this polymorphism about 25% of the individuals of the Caucasian population lack this activity ("non-conjugators"), while 75% show it ("conjugators") (Hallier, E., et al., 1993). Using our newly developed HPLC-fluorescence detection assay (Muller, M., et al., 2001) we have profiled the kinetics of enzyme inhibition in erythrocyte lysates of two individuals previously identified as "normal conjugator" (medium enzyme activity) and "super-conjugator" (very high enzyme activity). For the normal conjugator we have determined a 2.77 mM thimerosal concentration to inhibit 50% of the GST T1 activity. In the case of the super-conjugator a 2.3 mM thimerosal concentration causes a 50% inhibition of the enzyme activity. It is of interest to note that some lack the gene to form Glutathione S-transferase M1 that detoxifies environmental chemicals, and are more susceptible to certain cancers, particularly bladder cancer. A

Polymerase Chain Reaction test can determine if this gene is missing.

A study published in "Lancet" reports that St. Jude researchers determined that children who received the antiseizure medicines phenytoin (Dilantin™), phenobarbital, and carbamazepine (Tegretol™), which potently increase the amount of drug-metabolizing enzymes in the liver, have lower chances of event-free survival than those who did not receive such medicines. The Phase I liver enzymes are responsible for clearing many clinically-used medications from the body, so that the use of these antiseizure medicines, by enhancing Phase I, is comparable to lowering the doses of the antileukemic chemotherapy and many drugs. These Phase I enzymes also deplete the substances listed two paragraphs above. Additionally, Dilantin™ depletes the body of biotin, folic acid, vitamins B_1, B_{12}, D, and K, and the mineral calcium, and Tegretol™ depletes albumin (needed to detoxify), biotin, folic acid, vitamin D, carnitine, zinc, selenium, and copper while diminishing IgG, and platelets. It prevents conversion of vitamin B_6 to its active form, P5P. It also decreases alpha-ketoglutarate thereby increasing toxic ammonia levels—"Drug-induced Nutrient Depletion Handbook" by Pharmacists Pelton, LaValle, Hawkins, and Krinsky. Conversely, several human pharmacokinetic studies have shown that vaccination may deserve full consideration as a cause of inhibited hepatic drug metabolism. Influenza vaccination impaired theophylline elimination with a 122% increase of its half-life, and it inhibits aminopyrine metabolism markedly. Some medicines can give falsely low thyroid blood test results, especially Tegretol™ (carbamazepine).

Phenol-sulfotransferase (PST)

This speaks of a condition that affects approximately 80% of the children with autism. It is vital that you understand the symptoms, and if they affect your child, you must "unload the donkey". PST is a Phase II enzyme that detoxifies leftover hormones (amines) and a wide variety of toxic molecules, such as phenols that are produced in the body (and even in the gut by bacteria, yeast, and other fungi) as well as food dyes and chemicals. These PST reactions include the clearing of bilirubin and biliverdin, which are the breakdown products of hemoglobin. A high reading could indicate possible PST deficiency. Yellow eyes or skin might be apparent. Low CO_2, low glucose, and high bilirubin are also indications of low thyroid function. **In children, a low thyroid condition often is not apparent in the blood.** The high bilirubin interferes with the clearance of thyroid hormones from the blood; so, the blood will look normal, but there aren't enough thyroid hormones available to the cells.

There are many varieties of phenols. This may indicate why children's intolerances vary. Remember, Bolte notes that tetanus infection of the intestines leads to the formation of toxic phenols, and states that these are particularly formed by overgrowth of the Clostridium family of bacteria. The toxins formed can peel the lining of the colon right off the organ, and lead to an explosive, debilitating form of diarrhea. She notes that tetanus also attacks the Purkinje cells of the brain potentially reducing the production of the amino acid GABA, a calming neurotransmitter known to affect speech.

"The PST enzyme is only one of many sulfotransferases, and various other body chemicals can increase the quantity of some sulfotransferases, and that would increase their activity....Sulfate must be grabbed by any sulfotransferase before the enzyme can attach it to something else, like phenols or MHPG (3 methoxy-4-hydroxyphenylglycol, a natural breakdown product of a class of neurotransmitters called catecholamines). If the PST enzyme activity towards something is low, you can boost it by two approaches. The first is to increase the amount of sulfate available to it. The second is to increase the amount of the enzyme so it has an easier job finding the available sulfate."—Susan Owens.

The PST enzyme links an oxidized sulfur molecule (a sulfate) to these various toxic substances to solubilize them so the kidneys can dispose of them. Obviously, if sulfate is low or missing, this can't happen effectively. Hence, the problem can be twofold: there may be a lack of phenol-sulfotransferase

enzymes, or of the sulfates (due to the absence of protein and of sulfur carrying raw vegetables in the diet, the poor absorption of sulfur from the diet, a failure to metabolize sulfur into sulfate form, or increased urinary excretion of sulfite and sulfate), or both. These deficiencies cause sulfate levels in PST children to be about 15% of NT kids! The sulfates are easily inhibited by flavonoids (Quercetin in particular) and foods that provide neurotransmitters that then must be subsequently metabolized with sulfate (cheese, banana, chocolate), and by foods that inhibit PST enzymes (citrus fruits).

Dr. Rosemary Waring's research shows that the lack of sulfate is the primary problem in 73% of these children (another study found low levels in 92%), but all of those Waring checked had a low PST level too. "Patients with well defined reactions to foods were examined for their ability to carry out both sulphur and carbon oxidation reactions. The proportion of poor sulphoxidisers (58 of 74 or **78%**) was significantly greater than that of a previously determined normal control population (67 of 200 or **33%)**. Metabolic defects may play a part in the pathogenesis of adverse reactions to foods."—Poor Sulphoxidation Ability in Patients with Food Sensitivity, Scadding GK et al., British Medical Journal, 1988 Jul 9; 297 (6641): 105-7. Similar sulfate deficiencies have been reported in people with migraine, rheumatoid arthritis, jaundice, and other allergic conditions all of which are anecdotally reported as common in the families of people with autism. Adequate sulfoxidation requires adequate supplies of B-vitamins, especially vitamin B_6. **The PST enzymes are inhibited or overloaded by chocolate, bananas, orange juice, vanillin, and food colorants such as tartrazine.** Removal of these from the diet and supplementation of sulfates may well relieve all these symptoms. The lack of sulfation could well be due to the largely carbohydrate diet of most of these children. It is likely a combination of all these things. In any case, toxic compounds of these aforementioned chemicals can build to dangerous levels. A high value for the tIAG as well as a high reading for DHPPA (rather HPHPA—a phenolic metabolite of tyrosine) both indicate a PST problem.

There are two pathways by which the Phase II enzymes process these toxins. One attaches the sulfates as mentioned, and the other attaches glucuronide. Unfortunately, beta-glucuronidase, an enzyme produced by intestinal bacteria, reverses the glucuronidation reaction and releases previously conjugated toxins to be reabsorbed from the intestine, resulting in increased toxicity. One can improve the glucuronic pathway by eating cruciferous vegetables, grapefruit, apples, and oranges, or by supplementing Phyt-Aloe^{R} (by Mannatech^{TM}) or Calcium D-Glucarate (now being proven a powerful cancer preventive and treatment aid) that inhibits the action of this enzyme by 50%.

Dr. Waring has found that in autistic patients there is not nearly enough sulfate to glucuronate ratio. She and her associates feel that the "leaky gut", that causes a need for a Gf/Cf diet, is caused by this lack of adequate sulfate to provide sulfation of the glucosaminoglycans (sulfated sugars). They found that the glucosaminoglycans (GAGs) in the gut were very under sulfated, and that this causes a thickening of the basement membrane of the gut. IGF (insulin-like growth factor) is important for cell growth. IGF-1 (which is reduced in zinc deficiency) increases the incorporation of sulfate in glucosaminoglycans. Individuals who have poor sulfation in the gut allow polar xenobiotics to freely enter the circulation. They then go to the liver for cytochrome p450 and glutathione detoxification. These excess xenobiotics, dysbiosis, and allergies overwhelm the detoxification pathways and deplete vital stores of antioxidants compromising the health totally. I'll mention that IGF-1 is also needed to enhance stem cell activity and to repair muscles, and stem cell production is enhanced four-fold by Ambrotose (Mannatech, Inc). IGF-1 is plentifully supplied by Colostrum.

Unfortunatelefy, a lack of sulfated GAGs in the kidneys will allow loss of these sulfates. There is often found low plasma sulfate and high urine sulfate and high urinary thiosulfate as if the kidneys are not able to retain (recycle) sulfate. This needed retention requires the work of a transporter that has been found in "in vitro" studies to be blocked almost completely by mercury and by excess chromium (but not as thoroughly). One study found urinary sulfite to be elevated due to a lack of molybdenum in 36%. Supplementing moly showed improvements in clinical symptoms.

When supplementing sulfur or sulfates, as in Epsom salts baths, molybdenum is being lost and must be supplemented. **Sugar increases the amounts of calcium, oxalate, uric acid, and glucosaminoglycans being wasted in the urine.**

Sulfates have a negative charge and repel each other, so that charge forms a barrier on the outside of the cell called the matrix, or the glycocalyx. Sulfate is often found in the glycoprotein film also, usually attached to the essential saccharides Galactose, N-acetylgalactosamine, and N-acetylglucosamine. Glycoprotein is a sugar-protein film that enables cell-cell communication. This film is on all cells of the body, so if systemic sulfate is low, you most likely have a big problem that is quite general to the whole body. Specifically, the more densely sulfated the GAGs, the more they can resist all kinds of infection. These sulfate molecules govern or influence the ability of the cell to produce its unique set of specialized proteins. It is not something you want to be operating from a deficit, yet that is the condition of most autistic children especially those we call PST deficient. This lack of sulfates may well block the effects of the glycoprotein supplements such as Ambrotose®.

Dr. Waring found that 92% of autistic children seem to be wasting sulfate in the urine, for blood plasma levels are typically low and urinary levels are high. There is also an abnormal cysteine to sulfate ratio. In the aged and in chronic disease, methionine is not efficiently converted to cysteine, but builds homocysteine, an intermediate between methionine and cysteine. This can create a deficiency of this vital amino acid, cysteine, and a lack of sulfate. Cysteine is the amino acid that should metabolized to sulfate, so it appears that the sulfate is probably being utilized far faster than the cysteine can be converted, leaving a deficit of sulfate (sugar wastes it), or the cysteine is not being metabolized to sulfate (cytokines hinder it). That may cause the cysteine to build up to toxic levels. Homocysteine and cysteine are powerful excitotoxins. **A deficiency of cysteine, or a failure to metabolized it to sulfate, will produce multiple chemical sensitivities and food allergies.** Being a major part of the powerful antioxidants alpha lipoic acid and glutathione, a deficiency of cysteine, or a failure to metabolize it into these antioxidants, would greatly affect the liver's ability to detoxify, and would lead to destruction throughout the body by free radicals This would also allow buildup of the heavy metals lead, cadmium, mercury, and aluminum. Supplementation of vitamin B_2, B_6, B_{12}, folic acid, magnesium, and TMG may normalize metabolism of methionine into cysteine, but vitamin C is needed to prevent cysteine (which contributes its sulfur more readily) from converting to cystine, its oxidized form.

What could be interfering with sulfation? Primarily, mercury, but Hepatitis B vaccine was found to inhibit sulfation chemistry for at least one week in typical people. When tumor necrosis factor alpha (TNF-a) is elevated (frequently in autism), it can inhibit the conversion of cysteine to sulfate. A methylation defect, when present, can cause a defect in sulfation. Another is swimming! High concentrations of chlorate were detected in samples from a number of pools; in one case as high as 40 mg/l. Higher chlorate concentrations were associated with those pools using the oxidant hypochlorite solution as a disinfecting agent, while relatively low chlorate concentrations were found in pools treated with gaseous chlorine. Chlorate IS the biological substance of choice to block sulfation. Additionally, chlorate is known to inhibit hematopoiesis [the making of new blood cells], a problem with many of our kids. Additionally, hypochlorite reportedly combines with any phenolic compound, even in very dilute solutions, to form an aromatic compound that can react in the body. This combining of chemicals can be very toxic to susceptible individuals. One Mom found that an Epsom salts bath immediately following eliminated after-swimming problems in behavior. So, if you must swim, do the bath immediately after coming from the pool. For home pools, one Mother reports, "An ionizer cuts down chlorine use by 70-80%. Since installing this, we don't see the reactions anymore."

Cysteine is one of the sulfur containing amino acids. It can be manufactured in the body from two other amino acids, serine and methionine. When a critical enzyme, cysteine oxidase, used in metabolizing L-cysteine, is deficient, an abnormal metabolite of L-cysteine, called cysteine-S-sulfate, accumulates in the nervous system. This may cause the same pattern of neuron destruction seen with high doses of glutamate or MSG. Dr. John

Olney and others found that when L-cysteine is given orally to mice in large doses it produced a pattern of brain damage identical to that of excess glutamate.

The excess-cysteine/low-sulfate condition that Waring observed may be because of a deficiency of the amino acid histidine that can be run low by seasonal allergies and the medications taken to treat them. Metal toxicities, common in these kids, can run it low. **Experimental deficiency of histidine causes an excess of free iron in the blood producing free radicals that must be neutralized by a good antioxidant.** This deficiency can adversely affect the enzyme cysteine dioxygenase (CDO), the essential nutritional components of the enzyme being histidine and iron. A deficiency of this amino acid, possibly caused by allergies, heavy metals poisoning, and medications, not only affects HCl production (histidine delivers zinc to the cells, and together they produce HCl), but it will likely cause a toxic build up of the amino acid cysteine, and a lack of sufficient taurine and sulfate contributing to the PST problem. High histidine lowers zinc and copper by chelating them from the body, so supplementing histidine, though needed, may be dangerous without testing to ensure no new deficiencies are created. Supplementing taurine, the sulfur containing amino acid that is at the end of the metabolic chain, has been helpful in meeting this need for taurine; and, being the immediate precursor, may supply needed sulfates. Taurine is reported to have an anti-opioid effect (Braverman 1987). You must support the sulfation pathway and supplement sulfates.

The CDO problem is much more likely caused by inadequate kidney clearance of the hormone glucagon than any other reason I have found. Glucagon is insulin's alter ego and acts like a switch to turn CDO off. When we eat, glucagon is supposed to clear the blood and insulin is secreted, CDO is enabled and excess cysteine is rapidly catabolized. When we fast, insulin clears and glucagon is secreted. CDO is turned off preserving available free cysteine levels for the body to use as needed. When glucagon doesn't rapidly clear as it is supposed to, it continues to turn off CDO even after eating, resulting in toxic, free-cysteine levels. The kidney location where glucagon is cleared is also the place in that organ where most pollution and damage occurs from mercury—the brush border lining of the proximal end of the kidney tubule — Jeff Clark, www.cfsn.com. This is another reason to eat according to the glycemic index of foods, and to avoid a high carbohydrate meal.

Vitamin A, GAGS, Measles, and PST

Those with inadequate protein in the diet, or with poor assimilation, resulting in a deficiency of histidine and other nutrients, form poorly sulfated GAGS robbing the cells of ability to resist infection (that describes 100% of these children). Additionally, it produces dysbiosis (flora imbalance) in the gut whose lining normally is highly sulfated. Those with chronic infection shed and replace GAGs so quickly that inadequate sulfate is available even with adequate protein intake. **Vitamin A deficiency has been shown to produce an accelerated turnover of GAGs as well as their undersulfation. When the live viral, measles vaccine is given, it depletes the children of their existing supply of vitamin A. The measles virus hidden in the gut is able to create a chronic vitamin A deficiency.** Natural vitamin A (cis form) is important for activation of T and B cells for long-term immune memory to develop, for optimal Natural Killer Cell function, and for conversion of thyroid hormone T4 to T3. Cis vitamin A can bypass blocked G-protein pathways and turn on central retinoid receptors. **Available zinc controls the amount of vitamin A the liver will release.** Thus, the lack of zinc and a high intake of vitamin A may produce vitamin A toxicity in the liver with a deficiency in the cells!

In one study, the urinary GAGs changed to normal when the vitamin A deficiency was corrected, but if protein starvation caused the undersulfation of GAGs, the urinary GAGs did not return to normal with adequate protein intake, but did improve quite a bit. Most autistic children are vitamin A and protein deficient. Do you or your child have bumps on shoulders, thighs, elbows, and calves? Supplement with pure amino acids, Seazyme™, Brewer's yeast, or desiccated liver for their protein, and with Evening Primrose oil (for its GLA), and cod-liver oil for its EPA/DHA and vitamins A and D. Seazyme™ is available at www.bestflora.com or (800) 914-6311. They offer a 60-day money back guarantee.

It was Dr. Andrew Wakefield's work that showed that at the core of the problem might be an inflammation of the gut caused by a chronic measles infection. Other researchers are vindicating Dr. Wakefield's work. Under oath before Congress on April 6, 2000, Professor John O'Leary told how his state-of-the-art laboratory had identified the measles virus, something that certainly shouldg not have been there, in samples taken from the intestines of 24 of the 25 patients. From Japan: "The sequences obtained from the patients with Crohn's disease shared the characteristics with wild-strain virus. The sequences obtained from the patients with ulcerative colitis and children with autism were consistent with being vaccine strains. The results were concordant with the exposure history of the patients. Persistence of measles virus was confirmed in PBMC (blood cells) in some patients with chronic intestinal inflammation"—Kawashima H, Mori T, Kashiwagi Y, Takekuma K, Hoshika A, Wakefield A, Department of Paediatrics, Tokyo Medical University, Japan. From Canada: "The presence of measles virus in the brain tissue was confirmed by reverse transcription polymerase chain reaction. The nucleotide sequence in the nucleoprotein and fusion gene regions was identical to that of the Moraten and Schwarz vaccine strains; the fusion gene differed from known genotype A wild-type viruses"—Bitnun A, Shannon P, Durward A, Rota PA, Bellini WJ, Graham C, Wang E, Ford-Jones EL, Cox P, Becker L, Fearon M, Petric M, Tellier R; Department of Critical Care Medicine, The Hospital for Sick Children, Toronto, Ontario, Canada. Clin Infect Dis 1999 Oct;29(4):855-61. From Sweden: "This study provides evidence that measles virus can spread through axonal pathways in the brain. The findings obtained in the gene-manipulated mice point out that a compromised immune state of the host may potentiate targeting of virus to the limbic system through olfactory projections"—Urbanska EM; Chambers BJ; Ljunggren HG; Norrby E; Kristensson K, Department of Neuroscience, Karolinska Institute, Stockholm, Sweden.

The gut sheds sulfated glucosaminoglycans during inflammation, which could account for the low levels there and the high levels in urine. This leads to a "Leaky Gut" condition, and to the excess opioid problem. Not only do macrophages (scavenging white blood cells) eat GAGs and release inorganic sulfate, there is a transporter the

intestines use to absorb sulfate from the diet, called the DRA transporter. Its levels will decrease five-to-seven fold when the gut is inflamed. That would make it extremely difficult to absorb adequate sulfate from food or from oral supplements. The problem is a nutritional one, but it is not one easily solved by oral supplementation of sulfate. Epsom salts baths and transdermal creams seems to be the best way to replenish sulfates.

Studies have shown that patients suffering from ulcers, Inflammatory Bowel Disease (IBD), Crohn's Disease, Colitis and other inflammatory disorders have a mucosal layer turnover rate several times greater than normal. The synthesis of N-acetylglucosamine (NAG) precursors is also higher in patients with IBD compared to normal patients. The turnover of cells in the lower intestinal tract is three times greater in patients suffering from ulcerative colitis compared to normal patients. These high, turnover rates require increased amounts of glucosamine sulfate and of the metabolite NAG; but as **Burton and Anderson have shown, tissues from patients suffering from IBD have a reduced ability to perform an early biochemical step in NAG synthesis, namely the N-acetylation of glucosamine.** Thus, in many cases of inflammatory diseases, the body may not have sufficient resources to manufacture enough of its own NAG, or it may be simply unable to make its own properly-formed molecules. The result is poorly formed and deficient NAG layers which are unable to adequately protect the rest of the mucosal layer. This creates a vicious circle and leads to increased turnover in the intestine and increased damage. This damage leads to intestinal permeability ("leaky gut") which has been linked to a wide variety of disease conditions, including food allergies, autoimmune syndromes, microbial manifestations, and malabsorption syndromes. This reduced ability to acetylate probably explains somewhat the variable results seen with Ambrotose®.

Because of its role in the repair of mucous membranes, sufficient quantities of NAG are important in cases of asthma, food allergies, respiratory allergies, vaginitis, and candidiasis. As a substance involved in the synthesis and proper use of collagen and bone matrix, NAG is in great demand for the continuous repair processes occurring during cases of tendonitis, bursitis, osteoporosis, and various skin problems. Additional substances needed for good collagen production are silicon, copper, and manganese. Because of its role in the production of immunological substances, NAG also could be important to help prevent immune related disorders such as lupus erythematosus, Hashimoto's Disease, rheumatoid arthritis, diabetes mellitus, and myasthenia gravis. The role of amino sugars (glycoproteins) and the tissue "glue" is especially important in the intestines since the molecules form the protective mucous layer that regulates intestinal permeability. **The gut must be healed.** Fortunately, Glucosamine sulfate and NAG can both be taken orally. Since sulfate leaves the blood in 4-8 hours, it should be used at least twice a day, and possibly more often. Precursors to NAG, one of the eight vital sugars, are found in Ambrotose®.

These vital saccharides have also been shown in clinical trials to reduce allergies and to restore normal function in such chronic diseases as arthritis, diabetes, lupus, and kidney disease. They accelerate the healing of burns and wounds and help heal skin conditions from poison ivy to psoriasis. They increase the body's resistance to viruses, including those that cause the common cold, influenza, herpes, and hepatitis. They quell the recurrent bacterial ear infections that plague toddlers and children. Some people with fibromyalgia, chronic fatigue syndrome, Gulf War syndrome, and HIV have reported improvement in their symptoms when they supplement their diet with these simple sugars—"Sugars that Heal" by Dr. Emil Mondoa, MD.

In the August, 2002 issue of the journal "Immunity", study leader Herbert W. Virgin, M.D., Ph.D., professor of pathology and immunology and of molecular microbiology at Washington University School of Medicine in St. Louis reports that a mouse herpes virus uses molecules that mimic a cell's own proteins (Regulators of Complement Activation [RCA]) to help thwart an immune attack by Complement during the acute stages of infection. Further, once the acute phase is past and the virus is in chromic or latent stage typical of herpes, it is susceptible to Complement attack. Thus, the chronic, latent stage of Herpes viruses, so common in our children,

indicates a malfunctioning immune system. This explains why glyconutrients have been so very successful in overcoming herpes and other viruses. They are antiviral and they strengthen the immune function. A number of antiviral drugs are being prescribed, but Dr. Jeff Bradstreet warned, at DAN! 2002, not to use Ribovarin. In one study, only vitamin A, monolaurin, and lactoferrin inhibited the growth of CMV. Many studies have shown that high-dose pancreatic enzymes taken on an empty stomach is equally as effective against viruses, in particular against shingles, as is Acyclovir (but the enzymes were better in that they prevented post-herpetic neuralgia (pain) and was less costly).

Another sugar that has proven helpful is Xylitol. Daily doses of this sweetener derived from birch bark may reduce the incidence of ear infections in children by as much as 40 percent, according to a study from Finland. It is commonly administered in a chewing gum, syrup, or lozenges, however Xlear™ is a saline/Xylitol nasal wash that stops the bacteria at the point of entry preventing them from adhering to cells. It reportedly reduces attachment of Strep and pneumonia by 68%, and flu by 50%. Expected ear infection was reduced by 98% in one study. Order Xlear™ by calling 800-471-4007.

Since sulfur intake is low, and its oxidation is hindered in many autistic children, sulfate is low, and PST activity is slower than it would be otherwise. It would seem that this sub optimality of sulphotransferase activity is a function of low, plasma sulfate levels rather than of deficits in the actual enzyme. Cellular level enzymatic effects of mercury's binding with proteins include blockage of sulfur oxidation processes and of the neurotransmitter amino acids. These have been found to be significant factors in many autistics. Thus, mercury, fasting, and any foodstuff that requires or uses up sulfate ions during its metabolism, will make the situation worse. These include foods that supply neurotransmitters, like bananas (serotonin), chocolate (phenylethylamine), and cheese (tyramine), apple juice (and one mother reports her child drank a quart a day!), citrus fruit juices, and paracetamol/acetaminophen (Tylenol™). For instance, one or two minutes after a dose of Tylenol™, the entire supply of sulfate in the liver is gone!

In fact, any chemicals with a high proportion of phenolic groupings will have this effect, and will enhance the problems referred to above. Many coloring materials, whether of natural or synthetic origin, possess phenolic groupings. Phenol, an organic compound, has other names such as hydroxybenzene. If the PST enzyme is deficient or sulfoxidation is lacking in some 70% to 80% of autistic kids, as some say, it behooves mothers to seriously heed the information in this section, and to carefully guard their children from certain obvious sources of trouble.

It is interesting to note Dr. Waring's statement that those with the PST/low sulfation problem have central nervous system problems from the toxic amines. For example migraine sufferers usually have low PST activity, and are readily affected by dietary "triggers", especially those with amines. Compounds such as flavonoids (red wine and citrus fruits), aged cheese, beers, chocolate, and strong odors **inhibit PST** leading to headache in the less resistant. Apple juice, citrus fruits, chocolate, and paracetamol/acetaminophen (Tylenol™) were precisely those that were known to precipitate migraine attacks in susceptible individuals. It should be noted that many multivitamin supplements, grapeseed extract, Pycnogenol™, Quercetin, and other antioxidants contain high amounts of flavonoids. Quercetin is found in 78% of the foods. It is useful in hay fever (suppress the histamine release), some forms of cardiovascular disease, and it chelates metals to prevent oxidation. It decreases vascular fragility, but stimulates adrenaline release (decreasing thymus weight), reduces general metabolism (reduces temperature and oxygen consumption), suppresses thyroid activity, inhibits cytochrome p450 (Phase I) liver enzyme activity, and it is linked with male impotence. When Quercetin was added to the growth medium of cultured human intestinal cells, Caco-2, the level of metal-binding, antioxidant-protein metallothionein decreased. The effect of Quercetin on metallothionein was dose-and time-dependent. Genistein and biochanin A (from soy), on the contrary, increased the level of metallothionein—Kuo SM, Leavitt PS, Lin CP, Nutrition Program, State University of New York at Buffalo, 14214, USA. From this list of negatives, one can see Quercetin should not be used in quantity for

long term.

Modifications of serotonin (5-HT), dopamine (DA), and DA metabolites [homovanillic acid (HVA) and dihydroxyphenylacetic acid (DOPAC)] were assessed at urinary levels. Responders and nonresponders showed a significant decrease of urinary 5-HT levels on fenfluramine (appetite suppressant related to amphetamine). The main differences between the two groups of subjects were found with HVA, the major metabolite of dopamine. Fenfluramine (an amphetamine) significantly increased HVA levels in responders whereas no significant modification was found in nonresponders. Moreover, the initial level of HVA (lower in responders) significantly differentiated the two groups. These results suggest that the clinical response to fenfluramine could be related to the dopaminergic action of this drug and that urinary DA metabolite levels could be considered as indicators of the responsiveness to fenfluramine treatment in children with autistic behavior—Barthelemy C; Bruneau N; Jouve J; Martineau J; Muh JP; Lelord G Source: J Autism Dev Disord, 1989 Jun, 19:2, 241-54. When HVA is elevated in relation to VMA, HPHPA is elevated. This high level of HPHPA likely inhibits conversion of dopamine to norepinephrine leading to a relative excess of dopamine.

Drugs such as Ritalin™ and ADDerall™ enhance dopamine activity, and thus stimulate the part of the brain that monitors the arousal system, resulting in better regulation. There are safer ways to build dopamine than psychostimulants, amphetamines, and alcohol. In France, scientists found administration of NADH (ENADA™) caused more than a 40% increase in production of dopamine and norepinephrine, which are vital for strength, coordination, movement, cognitive function, mood, and sex drive (Birkmayer 1996). The amino acid tyrosine builds dopamine and norepinephrine also. A nicotine patch would be safer than the drugs!

"... Dopamine sulphotransferase (ST) activity was inhibited strongly by (+/-)-catechin, (+)-catechin, octyl gallate, tartrazine (yellow #5), and vanillin (synthetic vanilla). Sulfation of the xenobiotic steroid (foreign to the body) 17 alpha-ethinyloestradiol (EE2) was inhibited by vanillin, erythrosin B, and octyl gallate [antioxidant used in margarine]....Vanillin was found to inhibit 50% of liver EE2 ST activity ..."—Common Food Additives are Potent Inhibitors of Human liver 17 Alpha-ethinyloestradiol and Dopamine Sulphotransferases.—Bamforth KJ, Jones AL, Roberts RC, Coughtrie MW, Biochem Pharmacol 1993 Nov 17;46(10):1713-20. Additionally, a study of 1-million students in New York showed that those who ate lunches that did not include artificial flavors, preservatives, and dyes did 14 percent better on IQ tests than students who ate lunches with these additives. David Schab, Columbia University Medical center, co-author of another study, said, "The science shows that kids' behavior improves when these artificial colorings are removed from their diets and worsens when they're added to their diets." Additionally, a British study tested 297 children for sensitivity to artificial coloring. These children's parents were not previously aware of any reaction to such additives. The results, published in The Lancet, stated, "Artificial colours or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in children." Further, acesulfame-K may cause thyroid problems or cancer. Of four artificial sweeteners tested, it was the only one present in 65 of 100 groundwater samples and in tap water as well. Scientists are unaware if it has any impact on the environment. Aspartame is even more dangerous to health of both children and adults.

There are a number of consequences attributable to PST/sulfate deficiency including impaired breakdown and metabolism of classical neurotransmitters such as serotonin and dopamine; impaired breakdown and metabolism of the bile pigments bilirubin and biliverdin, and impaired action of the hormone CCK on CCKA receptors. The latter would result in decreased secretion of pancreatic enzymes and of bile from the gallbladder and biliary tract into the intestines. This would result in low uptake of certain vitamins and other nutrients from the intestines; reduced activity of gastrin (and subsequent reduced secretion of stomach acid, mucus, and pepsin in the stomach), and, probably, reduced production of Secretin farther downstream. Secretin (esp. at high concentrations) inhibits the histamine releasing action of gastrin and pentagastrin reducing HCl as the stomach empties.

Because there is a lack of serotonin available to the brain, which causes many of the most distressing symptoms of autism, it seems reasonable to build the available serotonin by providing its precursor 5-HTP. The use of 25-50 mg three or four times a day (unless it causes a drowsiness that interferes with school) should be most beneficial. If drowsiness interferes with school, reduce the amount and/or give it later in the day. Giving 100 mg one to four hours before bedtime has safely improved the sleep of many. Use of SAMe may work better. Nevertheless, a PST child may not tolerate it. If hyperactivity or sleeplessness is observed, please discontinue.

Those with these PST deficits cannot readily excrete the phenols, amines, and other listed toxic substances. These substances are strongly acidic, and they exert toxic effects in the brain, where normally certain enzymes prevent their accumulation. They build up to abnormal levels and interfere with the neurotransmitters serotonin, dopamine, and noradrenaline among other things. **Symptoms of PST/sulfate deficiency are excessive thirst, normal urination, night sweats, odorous bedclothes, black eye shadows, facial flushing, and red ears. These vary with the degree or level of toxic buildup. Certain foods may cause fevers, and some, especially those taking Paracetamol™ (Tylenol™), may go up to 24 hours without urination.**

A phenolic compound may cause a variety of different symptoms in various individuals. There is evidence of immune suppression on exposure to testing doses of phenolics. There may be a drop in T-suppressor cells or total T-cell numbers. An overabundance of B-cells was interpreted as a reflection of toxic image to the immune system. An increase in helper cells, antibody formation, and elevation of some immunoglobulins was also noted. Other findings on phenolic exposure have been depressed serotonin, elevated histamine and prostaglandins, abnormal complement and immune complex formation. These compounds can contribute to the toxic overload in PST, or they can precipitate an allergic reaction.

Neurologic symptoms: In **severe** phenol poisoning, initial signs and symptoms may include nausea, diaphoresis (heavy perspiration), headache, dizziness, and tinnitus (ringing ears). Seizures, coma, respiratory depression, and death may ensue quickly. Coma and seizures usually occur within minutes to a few hours after exposure or after a delay of up to 18 hours. Phenol also may cause demyelination and axonal damage of peripheral nerves. Typically, transitory central nervous system (CNS) excitation occurs, and then profound CNS depression ensues rapidly. Metabolic acidosis and acute renal failure may complicate the condition. Vomiting and diarrhea are common effects of phenol toxicity by any route. Peristalsis is increased in the intestine and distribution of blood is altered by these phenolics because of sensitizing smooth muscles to epinephrine, norepinephrine, and other physiological stimulants. “Unloading the Donkey” of phenolic compounds (reduction in quantity and supplying sulfates to detoxify them) has resulted in the disappearance of arthritic pains, improved bowel function, decreased abdominal bloating, fewer emotional problems, the elimination of headaches and migraines, and a decrease or elimination of recurrent canker sores.

Nutritional deficiencies will affect the body’s ability to detoxify foreign chemicals. Nutrition science offers some protection against chronic acetaldehyde (AH) toxicity, even when it is not possible to completely avoid the four main offenders that promote AH in our bodies: alcohol, Candida, cigarettes, and heavy auto exhaust. For example, magnesium is important in over 300 enzyme systems that relate to Phase I and Phase II detoxification; however, the average American diet is low in magnesium. The Phase I enzymes, alcohol dehydrogenase and aldehyde dehydrogenase, are zinc dependent, and NAD, the coenzyme form of niacin, activates these two enzymes that break down alcohol and acetaldehyde (AH). Magnesium and NAD are both dependent on adequate supplies of vitamin B_6 in the form P5P. Aldehyde oxidase requires molybdenum. A deficiency of P5P, NAD, vitamins B_1, B_2, iron, zinc, magnesium, molybdenum, or the amino acid histidine could

significantly impair the ability to detoxify those chemicals, especially the toxins of Candida (acetaldehyde). Those with aldehyde sensitivity are incredibly sensitive to any type of fragrance.

Molybdenum is chemically responsible for breaking down AH into acetic acid. Acetaldehyde cannot be excreted from the body; it accumulates. Acetic acid can be, though, and the body naturally removes it or changes it into acetyl coenzyme A, a major player in the body's energy system. AH accumulations in tissue are responsible for weakness in muscles, irritation, and PAIN.

Herbert Sprince, MD, et al, published many articles in the 1970's detailing the results of their experiments that used various nutrients to protect rats from AH poisoning. Sprince fed a control group of rats an amount of AH sufficient to kill 90% of the control group in 72 hours. The experimental group of rats given the same amount of AH were also given various nutrients, either singly or in combination, that might detoxify the AH. After 72 hours, the death rate for rats given large oral doses of Vitamin C was only 27% (vs. 90% in controls), 20% for rats given the sulfur amino acid L-cysteine, 10% for rats receiving Vitamin B_1, and **an amazing 0% for rats protected by N-acetyl cysteine or lipoic acid**. A lower dose combination of C, B_1, and either L-Cysteine or N-acetyl cysteine also gave near 0% death rates! The nutrient doses Sprince administered were rather gigantic compared to RDA levels of nutrients, being equivalent to multi-gram doses for humans. Fortunately, however, most people are not subjected to such high levels of AH, so lower doses of these nutrients would doubtless provide significant AH-detoxifying power when used on a long-term basis.

John Cleary, M.D. has published papers summarizing many doctors' and researchers' successful use of niacin (Vitamin B_3) and zinc in alcohol and AH detoxification. Since the enzymes that break down alcohol and AH are both B_3 and zinc-activated, this provides an obvious rationale for their protective use in chronic alcohol/AH toxicity situations. Finally, because chronic, high-tissue levels of AH impair the normal process of recycling the active form of B_3 (NAD) for continual re-use, it is obvious why normal dietary levels of B_3 might be insufficient to provide optimal brain B_3 levels in chronic AH toxicity situations.

By supplementing molybdenum and histidine (needed in the molybdenum-histidine containing enzymes, sulfite oxidase and cysteine dioxygenase, that oxidize sulfur), along with iron and the B-complex (preferably in coenzyme form), minerals in sulfate form, such as iron sulfate, Epsom salts (magnesium sulfate—taken orally it is a good laxative for those that need it), and glucosamine/chondroitin sulfate (stimulates synthesis of the GAGs we studied about above, and is mildly anti-inflammatory without inhibiting the synthesis of Prostaglandins, and more effective when taken together), one may supply both the minerals and the sulfate needed to detoxify phenols and other metabolites. Chondroitin is comprised of N-acetyl-D-galactosamine and D-glucuronate (used in Phase II detoxification). Collagen Type II™ may be even better for it supplies at least 50 other types of sulfate such as heparan, keratan, and dermatan sulfate. Curiously, bread is sulfate rich. Glucosamine is a mild preventive of hypercoagulation; thus enhances memory and learning, so give it before a long ABA session begins. Additionally, numerous studies have shown that glucosamine, a derivative of chitin from fungal cells, has the ability to prevent the binding of Candida to epithelial mucosa cells (Saltarelli). This program will increase the number and enhance the efficiency of the available PST enzymes in doing their job. Be aware that when glucosamine gives up its sulfate, it supplies glutamine. Excess glutamine in the brain, as glutamate, can be excitotoxic. A Mom writes, "My Pediatrician prescribed Glucosamine Sulfate. Within a few hours he began to lose eye contact, awareness, and speech, and a marked regression was observed. I repeated the trial with the same results." This sounds like allergy to the chitin rather than excitotoxicity.

Buy a quality brand (one using Good Manufacturing Practices) of glucosamine/chondroitin sulfate that uses low molecular weight ingredients the use of which will supply adequate GAGs to enable the cells to resist infection.

Nutramax Laboratories now offers a natural, root-beer flavored liquid Glucosamine/chondroitin sulfate product, CosaminDS. The 16 oz. bottle will retail for under $25. There are four different methods of manufacturing glucosamine capsules. According to sources at Jarrow Formulas, both glucosamine hydrochloride and N-Acetyl-glucosamine have been stripped of the "sulfate" component in the manufacturing process. Neither of these forms is expected to have any anti-viral effect against lipid envelope viruses like HIV, EBV, CMV and HHV-6, and of course, they would not supply needed sulfate for PST. Published scientific research indicates that only the sulfated polysaccharides and one sulfated monosaccharide (glucosamine sulfate) have a powerful effect against lipid envelope viruses. If the word "hydrochloride" or "N-Acetyl" appears anywhere on the label, do not buy it unless you are planning to use it exclusively for arthritis or rheumatism. Additionally, glucosamine sulfate helps heal the leaky gut, supplying the necessary sulfate for forming GAGs. Remember to choose capsules instead of tablets. Former heart surgeon Dr. Fukumi Morishige, a leading Japanese authority on vitamin C, reports that when Reishi and vitamin C are combined, the results against cancer and other diseases are far better than when Reishi is ingested alone. **This is because the vitamin C makes the polysaccharides more accessible to the immune system.**

In addition, take an Epsom salts bath (two cups or more in a tub of hot water). It may be best not to use soap, as there may be chemical reactions that could be adverse. Soak it up through the skin for 20 minutes, and don't rinse off—and don't worry if the child drinks some of the water. This bath has been shown to increase sulfur content of the blood up to four times. Sleep is improved immediately, as the child is relieved of pain and calmed. Children begin to beg for the bath!

I should mention that there is a small chance of 0. Decreasing kidney function, common in the elderly, may prevent magnesium from being excreted normally leading to a toxic condition. Initially, symptoms include: drowsiness, lethargy, and weakness. At higher levels, nausea, vomiting, and serious arrhythmia (irregular heart beat) may occur. In blood tests, elevated GGT levels may indicate excessive magnesium ingestion. If this be the cause of these symptoms, they will disappear quickly once the use of magnesium bearing products are discontinued—Dr. Richard M. Ratzan, University of Connecticut Health Center. This could only occur with very poor kidney function for the toxic level is approximately 6000 mg daily. So, **high-dose magnesium is contraindicated with kidney or adrenal failure and in severe hypothyroidism.** If there has been any indication that the child's kidneys are not functioning fully (possibly high levels), check with your doctor before using magnesium (or potassium), and have him monitor magnesium/potassium levels. Strive for high-normal levels. Adequate potassium stimulates the kidneys to excrete poisonous body wastes (usually toxic protein acids from inadequate protein digestion).

Boron, Omega-3 fatty acids, and lecithin are capable of stopping magnesium loss and allowing our reserves to be restored. Magnesium deficiency is usually associated with hypocalcemia (low blood calcium), hypophosphatemia (low phosphate), and/or hypokalemia (low potassium). When a person is unresponsive to treatment for hypokalemia or hypocalcemia, magnesium may have been depleted. What to do? The medical literature clearly supports taking more magnesium and taking boron supplements or eating foods high in boron to help prevent the loss of these critical minerals.

If, after taking magnesium for a year or two at high dosages, daytime sleepiness becomes a problem, one can be assured that magnesium reserves have been restored and intake of supplemental magnesium can be reduced or replaced totally with high, magnesium-content foods. Sometimes, the first sign of replenished magnesium balance is type II insomnia (very early awakening—3 to 4 AM). In that case, 500 mg of calcium can be added to the 400 mg magnesium supplement at bedtime to help maintain sleep. Most people will require supplemental magnesium for the rest of their lives.

Be sure to filter chlorine, fluoride, and other poisons from the water you drink and bath in. Chlorine and fluorine in bath water are breathed and absorbed, especially from hot water. This is important, as both chlorine and fluorine are deadly poisons. They can produce fatigue and tiredness after the bath. Industrial chemist, J.P. Bercz, Ph.D., showed in 1992 that chlorinated water alters and destroys unsaturated, essential fatty acids (EFAs), the building blocks of people's brains and central nervous systems. The compound hypochlorite, created when chlorine mixes with water, generates excess free radicals; these oxidize EFAs, turning them rancid. Both chlorine and fluoride inhibit the stomach's ability to produce HCl, and impair the ability of beneficial flora to grow in the gut.

Dr. W. L. Gabler and Dr. P. A. Long at the University of Oregon Health Sciences Center found that as little as 0.2 ppm fluoride in the body (the "safe" level for public water supplies is 1.0 ppm, 8 times higher) stimulates superoxide production in resting white blood cells. This seriously depresses the ability of white blood cells to destroy pathogenic agents. Superoxide in the bloodstream also gives rise to tissue damage and acceleration of the aging process. Ref: "Fluoride Inhibition of Polymorphonuclear Leukocytes", Journal of Dental Research, Vol 48, No.9, p1933-1939, 1979.

Do not buy a filter that uses silver as a bactericide. It is known to leak into the water and elevate levels in the blood dangerously. Do not use distilled water as it has the wrong ionization, pH, polarization, and oxidation potentials and does not remove solvents from the water. Do not use a Reverse Osmosis membrane filter, it not only wastes 5-gallons of water to produce one gallon, but both it and distilled water will deny your body needed minerals.

While taking a warm shower or lounging in a hot tub filled with chlorinated water, one inhales chloroform. Even worse, warm water opens the pores, causing the skin to act like a sponge. One will absorb and inhale more chlorine in a 10-minute shower than by drinking eight glasses of the same water. This irritates the eyes, the sinuses, throat, skin and lungs, makes the hair and scalp dry, worsening dandruff. It can weaken immunity. A window from the shower room open to the outdoors removes chloroform from the shower room air, but to prevent absorption of chlorine through the skin, a showerhead that removes chlorine from shower water is a must. The ShowerWise™ filter and showerhead can be ordered for about $69, Replacement filter cartridges $26.00. They last about one year. An extension hose can be used to fill the tub with filtered water.

For those times when the bath is not convenient (camping), or when one wants to increase the amount of magnesium, but bowels are sensitive to it, one can have the benefits of the bath with a cream. Kyle, for whom it was developed, prefers the cream. Rub 1/2 teaspoon of the cream on the tender parts to obtain 250 mg magnesium. Key Pharmacy, 1-800-878-1322 or 1-416-633-2244 especially formulates the cream, FAX: 1-416-633-3400. (A lotion is available from Kirkman Labs.) Ask for the Epsom salts cream. A 4 oz. jar for $29.89, plus shipping, has approximately 48 servings. All ingredients seem safe for children, for it contains fatty acids, a form of lecithin, and magnesium sulfate. The use of the cream should avoid the following possibility.

One researcher makes this observation, "I have no doubt that oral sulfate is a substrate to feed (some strains of) Candida. It probably takes some energy from the SO4 form and excretes it as H2S, and robs the energy it may be able to get from reducing the sulfur, excreting toxic H2S." H2S is very foul smelling, so if an increased foul-smelling gas is created in following these recommendations, you will need to deal with the yeast overgrowth.

Sulfate is the most oxidized form of sulfur. It doesn't need to be oxidized any more, so supplementing or bathing in sulfate supplies what is lacking because of the body's inability to oxidize the sulfur in foods. Oral sulfate will be poorly absorbed; so, supplement a gram or more of sulfate each day. Some will get through. Supplementing papain

enhances absorption of sulfates. SAMe (SAM) is said to improve sulfoxidation; in fact, it is necessary to the manufacture of all sulfur-containing compounds in the body. Dr. Jeff Bradstreet, MD, father of an autistic child, has this to offer: "If the child has an unusual odor at night or their bedclothes do, or if they sweat while asleep (PST defect), use methylsulfanylmethane (MSM), 1500 to 3000 mgs per day. In the study, 83% of autistic children were PST abnormal, and MSM should help this. It did in our son's situation."

MSM works with copper in many functions, and may get depleted with copper supplementation or when high copper levels are present. Additionally, our soils are depleted of sulfur, and such sulfonyl as there is in foods is lost in cooking. MSM is a white, crystalline powder that is odorless and somewhat bitter tasting. It mixes in water more easily than sugar, and just barely affects the taste. In juice or other beverages, it is undetectable. MSM is effective in ameliorating gastrointestinal upsets such as that produced by the ingestion of aspirin and other pharmaceuticals, or that from parasitic infections. Individuals with gastrointestinal symptoms such as diarrhea, chronic constipation, nausea, hyperacidity and/or epigastric pain (having been reported more effective than Tagamet™), or inflammation of mucous membranes also will experience dramatic relief. Individuals presenting symptoms of pain and inflammation associated with various musculoskeletal system disorders, including arthritis, report substantial and long-lasting relief. Those lacking in sulfite oxidase cannot metabolize MSM, or the sulfite used in Chinese foods or on some green salads, to sulfate, and may get headache, dizziness, fatigue, wheezing, leg pain, and other symptoms. MSM also seems to cause hair loss when there is heavy metals poisoning, particularly mercury. This may be overcome by supplementing molybdenum and vitamin B_6, and this will enable more efficient metabolism in this pathway relieving the sensitivity to sulfur-bearing foods, and producing needed sulfates. Many cannot tolerate more than 500 mg MSM; yet show very positive benefits from even this amount. So, start low and increase dosage as you can tolerate it. Always supplement molybdenum when taking MSM. Two hundred to 300 mcg a day may be enough, but moly absorbs poorly, and adults may require 1000 mcg twice daily for three or four months or longer to overcome this aversion to sulfur-bearing foods.

One should note that mercury binds to the -SH (sulfhydryl) groups, resulting in inactivation of sulfur and blocking of enzyme function, producing toxicity. Sulfur is essential in enzymes, hormones, nerve tissue, and red blood cells. Mercury also blocks the metabolic action of manganese and the entry of calcium ions into cytoplasm. Mercury thus has the potential to disturb all metabolic processes. Under these conditions MSM should be most helpful.

DMSO is being used as the solvent in transdermal Secretin. This is essentially the same as MSM. At least one Mom is reported to have found good results with DMSO alone. When she added Secretin further gains were noted, but when she ran out of Secretin, the gains continued with DMSO alone! DMSO has long had a reputation as a panacea for about everything that ails you. A case in point, applying it to the abdomen has alleviated all symptoms of colitis and Irritable Bowel Syndrome. Both it and MSM work wonders for arthritis. To avoid skin dryness, dilute DMSO by15% with distilled water.

If the child can metabolize organic sulfur (like MSM/DMSO) all the way to sulfate, then MSM is a good way of increasing sulfate. However, if the enzyme sulfite oxidase is not working well, then MSM is a bad idea. Sulfite oxidase requires molybdenum as a cofactor, and since mercury depletes selenium; and mercury, MSM, oral sulfate, and copper tends to deplete molybdenum; selenium and molybdenum must be supplemented. Conversely, tungsten inhibits the action of molybdenum and thus inhibits the molybdenum-based enzymes sulfite oxidase, xanthine oxidase, and aldehyde oxidase. This would likely cause an excess of molybdenum to accumulate. Thus, both excess mercury and excess tungsten would create a shortage of the listed enzymes.

A coenzyme, vitamin B-complex supplement of moderate potency should be supplemented. One mother in

supplementing molybdenum reports that her daughter, who was doing quite well, regressed into severe, autistic symptoms for three days, including 18 hours of screaming—possibly due to detoxifying. Her doctor urged her to cease, but she stayed the course, and her daughter was far and away better! This is serious stuff.

Incidentally, a gross deficiency of molybdenum manifests as tachycardia, headache, mental disturbances, and coma. An excess intake of 10-15 mg daily (for adults) can cause a gout-like syndrome because of an elevated production of uric acid. Dosage range should not exceed 1 mg per day (adult), bearing in mind that more than 0.5 mg causes a loss of copper. Very little molybdenum is needed, but it is an important element in several important metalloenzymes (xanthine oxidase, aldehyde oxidase, and sulfite oxidase) that participate in crucial liver detoxification pathways.

Until the body regains its ability to oxidize sulfur, it may be desirable to limit high sulfur containing foods (cruciferous vegetables, broccoli, onions, garlic, turnips, eggs, red meat, turkey, dairy products); and supplements like alpha lipoic acid, glutathione, L-cysteine, and N-acetylcysteine (NAC can be better tolerated when used with its teammates, the amino acids lycine, glycine, and glutamine in ratio 2:1:1, and the B-complex vitamins. It should be tried for the glutathione it produces is so vital). Those who have a problem with these foods likely have an impaired sulfur oxidation (a cysteine oxidation) problem, and should be alert to cysteine toxicity. Even those who do not oxidize cysteine well can usually tolerate NAC at 500 mg daily (adult dose) without contributing to cysteine toxicity. Dr. Russell Blaylock, MD, says that NAC is not an excitotoxin (unless taken in such quantities as to overflow the cysteine pool, for excess cysteine is an excitotoxin) for it enters the brain cell and is converted to glutathione (if glycine and glutamine are also available). Supplying any of these sulfur foods may be a problem to some of these kids who do not oxidize sulfur well. One indicator may be fatigue after eating these. Unless a problem is observed, however, these foods should not be restricted unnecessarily for that will cause a reduction of the vital antioxidant glutathione, and interfere with the conversion of T4 thyroid hormone into T3.

Blueberry extract, grape seed extract, pine tree bark, green tea extract, and other foods have phenols, salicylates, and other stuff that are normally detoxified by PST, an enzyme needed by the brain and the gut to metabolize high-phenolic compounds like the artificial colors and flavors. Recent studies indicate that salicylate also has an effect on PST. Salicylate suppresses PST enzymes up to 50%, so, all high salicylates foods, dyes, and colors should be removed from the diet. Phase II has been shown to be low for people with ADHD or autism.

As previously stated, boron conserves calcium and magnesium. An experiment was designed to test part of the hypothesis that physiologic amounts of dietary boron also enhances utilization of, or alternatively compensates for, inadequate concentrations of active vitamin D_3 metabolites to normalize energy substrate utilization and mineral metabolism. Day-old cockerel chicks fed a diet supplemented with boron, as orthoboric acid, gained 38% increase in growth compared to those lacking boron in the diet! Another group was fed a vitamin D deficient diet. After 26 days, the chicks receiving inadequate vitamin D had decreased food consumption and plasma calcium concentrations. They also showed increased plasma concentrations of glucose, beta-hydroxybutyrate, triglycerides, triiodothyronine, cholesterol, and alkaline phosphatase activity.

This is astounding information that is vital to the health of all dwellers north of the Mason-Dixon Line; doubly so for you in far Alaska and Canada and other Northern Climes! None but sun worshippers are getting enough vitamin D! The recommended 400 IU is a drop in the bucket! Children should have 800-1200 IU (because of the scare that sun causes cancer, we are seeing a return of Rickets), adults should have 2000 IU, and those over 40 should have 4000 IU, those over 60, 6000 IU, according to other research.

The study found that when those chicks who lacked vitamin D received physiologic amounts of boron, they increased their food consumption and returned to normal amounts of plasma glucose and triglycerides they had

before being put on a vitamin D deficient diet, seemingly compensating for perturbations in energy substrate utilization induced by vitamin D_3 deficiency. Boron also helped to prevent inflammatory disease by inhibiting several key regulatory enzymes involved in the inflammatory response.

A similar study showed that boron increased concentrations of serum vitamin D_3 and ionized calcium while reducing bone copper. An increase in bone boron concentrations was observed also. Scientific literature involving animal and human studies show boron to have an integrative role in the areas of bone metabolism, joint health, mental acuity, wound healing, and proper functioning of the endocrine system. Other sources tell us that boron, by conserving estrogen and testosterone, reduces calcium loss by 30%!

Dr. Jonathan Wright of Tahoma Clinic of Kent, Washington admits it's a bit early to know for sure, but recent research indicates that boron may prevent prostate cancer and autoimmune diseases (including lupus, Graves' disease, Hashimoto's disease, type-1 diabetes, Vitiligo, multiple sclerosis, and more).

New Zealand lacks boron, and so fruit is often sprayed with boron leading to a possible excess of boron in those eating lots of fruit. Excess boron interferes with the metabolism (breakdown and excretion) of phenols. Ritalin, used in the treatment of ADHD, also inhibits the metabolism of coumarins (phenols). Excess boron induces high copper levels that reduce vitamin B_1 levels, and this reduces oxygen supply to the brain. Excess boron reduces the vitamin B_6 levels in the body also. Boron is found in apples, pears, grapes, nuts, leafy green vegetables, and legumes. Supplying these substances, especially apples, pears, and grapes, or their juices, in large amounts to PST deficient children, will cause a build up of phenols, amines, salicylates, and other toxic substances normally cleared by PST.

In fact, any chemicals with a high proportion of phenolic groupings will have this effect, and will enhance the problems referred to above. Methyl Salicylate: (Salicylic Acid, Wintergreen Oil) is one such. This phenolic is toxic in moderate concentrations. It is used in birch beer, chewing gum (in high concentrations), grape, mint, root beer, sarsaparilla, spice, walnut and wintergreen flavor in baked goods, beverages, candy, ice cream, ices, syrups, mint-scented cleaning products, and in perfumery. Symptoms of methyl salicylate poisoning are acidosis, pulmonary edema, and vomiting. This compound has lethal drug interactions with many substances including anticoagulants, tricyclic antidepressants, Indocin, and Methotrexate. Gallic Acid is another. Gallic Acid is found in food coloring agents and is, unquestionably, the most important of all phenolics. Neutralization of gallic acid is the basis of the Feingold Diet, which eliminates salicylates.

In the experience of one who suffered it, salicylate intolerance is one of the most difficult things to get under control. "The symptoms can, in my personal experience, be fragmented visual perception, exposure anxiety and emotional hypersensitivity, muscle tension (including throwing oneself backwards and back arching), compulsive rocking, muscular twitching (ants in your pants feeling), attention problems, muscular aches and pains, allergic 'shiners' (black rings under the eyes), difficulty sleeping, and OCD." Salicylate intolerance mimics a cocaine-like effect. Sometimes they cause skin problems such as eczema and urticaria. For salicylate poisoning, doctors administer the amino acid called glycine to help the liver remove the salicylates. Since glycine is also particularly beneficial for people with too much serotonin influence, it may be a good supplement to consider even if it doesn't test low in an amino acid assay.

Beef patties containing 30% fat and grilled over mesquite wood had 24 aromatics at a total concentration of 549 g/kg of meat while the same beef cooked over hardwood (hickory) charcoal had 16 aromatics representing 68 g/kg. A heavy, smoke flavor would produce a higher concentration of phenols than light smoke. Hamburgers barbecued with lots of smoke (especially in a covered grill) may be a potential phenol problem as will smoked bacon. Smoked bacon cured with nitrates is even more toxic than phenols by themselves.

Additionally, fruit sugars will feed the Candida causing an explosive overgrowth with increased acetaldehyde toxins. Candida also produces arabinose and tartaric acid. Dr. Wm. Shaw of The Great Plains Laboratory, Inc. thinks that high concentrations of arabinose may inhibit the liver's production of glucose, causing hypoglycemia and impairing neurological function. Cheney described two boys diagnosed as autistic. Their urine test showed high levels of arabinose and tartaric acid. Tartaric acid looks like malic acid, and poisons cells by interfering with the Krebs cycle. Both boys had been on repeated antibiotics for recurring ear infections, and had not been autistic until recently. They were about six years old. In these unusual cases, when the boys were treated with Nystatin™, they both recovered, and were no longer autistic!

Dr. Bill McAnalley, Mannatech Inc., a foremost authority in carbohydrate technology says, "The elevated arabinose readings in autistic children are caused by the Candida. It is the signal the body looks for to destroy the undesirable organisms. It is possible that ingesting Ambrotose® (that contains arabinose sugar) could further elevate Arabinose levels in the urine initially. Ambrotose® has been studied for its candidicidal benefits. These were demonstrated in the paper by Stanley and Doris Lefkowitz titled 'Macrophage Candidicidal Activity of a Complete Glyconutritional Formulation versus Aloe Polymannose'. This paper is available at www.glycoscience.org. Arabinose is a physiologically important component for cellular recognition of errors of metabolism. See the 24th edition of Harper's Biochemistry, page 139, Table 15-2. Pentoses of physiologic importance."—Email dated 1/26/01.

Many coloring materials (porphyrin), whether of natural or synthetic origin, possess phenolic groupings. For this reason, some practitioners recommend the removal of all pigmented foods from the diet (Sara's Diet). This may not be necessary due to the nature of enzyme activity (the greater the need, the faster it works), but you must at least eliminate juices (or limit to a little pear juice), and eliminate all artificial colors and flavors. Avoid "deodorant" soaps and deodorants containing "triclosan", a chlorophenol. It should be noted that problems relating to inhibition of cytochrome p450 liver enzymes (Phase I liver detoxifying) are involved with porphyrin in the foods and supplements named in the above paragraphs. Additionally, potatoes, tomatoes, and eggplant contain glycoalkaloids that, even in small amounts, can greatly slow the metabolism of anesthetic agents and muscle relaxants, requiring up to 10 times longer to recover from an anesthetic. An excellent indicator of mercury toxicity is a porphyrin excretion test. High porphyrin levels in the urine suggest a heavy metal burden. FDA has approved a test measuring porphyrins as a test for mercury poisoning. However, some other dental problems such as nickel crowns and root canals also can cause high porphyrins. "There is a simple test for porphyrin that you can do. Take a urine sample and place it in the sunlight. Look for color changes from a reddish-amber to dark (almost black). The color change is indicative of type and quantity of metabolites in the urine"—Jack Dwayne Thrasher, Ph.D. Toxicologist/ Immunotoxicologist.

DPT immunization in inbred mice has been shown to result in decreased synthesis of cytochrome p450, and of phospho-sulfotransferase, and of the messenger RNA necessary for their production. A decrease in production of the liver enzymes phospho-sulfotransferase and the cytochrome p450 family of enzymes causes a failure to break down food proteins (including gluten and casein) into amino acids. The resulting intermediates, called peptides, can cross into the blood. Anything that further inhibits these cytochrome p450 liver enzymes would compound the problem of toxicity, and further contribute to the opioid problem. **"Treatment of the latter (Candida) with conventional synthetic antifungal agents often causes impairment of liver detoxification functions,** and a decrease in the synthesis of phospho-sulfotransferase, an enzyme necessary to cleave food proteins, e.g. casein, into smaller easily absorbable peptides."—Dr. Hugh Fudenberg, MD. Many drugs and opiates interfere with the immune system. Opiates increase apoptosis (cell suicide) of T–lymphocytes from the norm of 5% to 30%. Additionally, multiple chemical sensitivities and liver pain would likely result.

Metallothioneins (MT) are small (short) cysteine-rich proteins that do more than just help cells detoxify, scavenge free radicals, and regulate metals. They are involved in cell growth and cell specialization

(differentiation) and homeostasis. Growth factors such as epidermal growth factor (EGF) cause rat liver cells to grow and secrete MT. Zinc also stimulates MT and EGF plus zinc made the effect additive (the EGF effect plus the zinc effect). It is believed that lots of growth factors that influence liver regeneration play a major role in regulating MT synthesis and secretion.

MT is known to modulate three fundamental processes: 1) the release of gaseous mediators such as hydroxyl radicals or nitric oxide, 2) apoptosis, and 3) the binding and exchange of heavy metals such as zinc, cadmium, or copper. Thus, an MT deficiency would be expected to create a hypersensitivity to heavy metals and to vaccines, to produce zinc depletion and copper overload, to cause an incomplete breakdown of casein and gluten (through a deficiency of zinc-dependent, digestive enzymes and HCl, and a depletion of DPP-IV), to contribute to intestinal inflammation, diarrhea, and yeast overgrowth, to impair development of brain cells and neuronal connections, and to create a tendency for seizures, anxiety, and emotional meltdowns. MT has been shown to be an excellent antioxidant in in-vitro experiments, but it does not seem to play any major role against oxidative stress in Zn and Cd challenged cells. Most of the cross-resistance to oxidative stress in Cd challenged cells seems to be accounted for by the parallel increase in glutathione. These results suggest a dominant protective role of MT against Cd compared with other metals.

In one study, it was determined that cadmium, zinc, and copper all induce the same metallothionein isoform, MT1a. This is likely important information because this provides a mechanism by which each of these three metals can compete with the other two: by competition for binding locations on the metallothionein molecule.

William Walsh, senior scientist, Health Research Institute and Pfeiffer Treatment Center of Naperville, Ill., in his study of 503 children with PDD, Asperger's, and autism, found all but four were missing MT, which the body needs to bind with toxic metals—like mercury—so it can be excreted before it damages the brain and gut. Walsh believes a child who lacks MT may develop any of these developmental conditions if he gets mercury in his system. This may explain why some children become autistic after receiving a mercury-enhanced vaccine. It also explains why autism hits before the age of 3. After that, the brain and the gut have matured enough to withstand further doses of mercury, although the child may develop ADD and lesser developmental problems. Additionally, one out of five children has attention deficit disorder (ADD). A recent study in the Journal of Autism linked ADD with a milk protein, casomorphin (www.notmilk.com/aa.html). Of course, autistic children have responded most favorably to a casein-free diet. Casein/gluten peptides are broken down by zinc dependent enzymes (carboxypeptidase A, aminopeptidase, etc.). MT dysfunction is associated with severe zinc depletion and reduced production of these enzymes. Diminished MT in GI tract results in increased levels of unbound mercury, lead, cadmium, etc., which can disable enzymes that break down casein and gluten. Correction of MT disorder may eliminate need for a casein/gluten free diet.

Glutathione (along with L-histidine and zinc) is a key resource for the formation of metallothionein (MT). The MT molecule prevents cellular toxicity by creating a stable storage for excesses of essential minerals such as copper and zinc, and toxic metals such as mercury and cadmium. In 1995, Sato et al. reported that inhibition of glutathione-S-transferase induces decreased expression of MT. Walsh recently reported that 91% of autistic patients had a deficiency of metallothionein, and suggested this deficiency is likely to be genetic, and may be a primary susceptibility factor for neurotoxicity from heavy metals including vaccinal thimerosal. The cumulative effects of ingesting mercury can cause brain damage. Thimerosal, a mercury compound, is used as a preservative in hepatitis B, diphtheria, pertussis and acellular pertussis, tetanus and HIB vaccines. Most infants have received a total of 15 doses of these mercury-containing vaccines by age six months! Studies document thimerosal as both an allergen and a toxin to sodium channels.

Another interesting connection: Some cysteine is broken down into taurine and sulfates unless the essential

enzyme cysteine dioxygenase is lacking. In some cases, the sulfur-oxidation of cysteine is defective. About 30% of the population are slow sulfur-oxidizers and 2% are "nul" S-oxidizers, but in a small study of autistics, 45.8% were "null" oxidizers! It appears that, in a high percentage of autistics, oxidation of cysteine is impaired. Slow Sulfur-oxidation appears to be inherited, and has been associated with a number of disease states, especially rheumatoid arthritis and allergy that are five times more common in the families of autistic children. One study of severe food and chemical allergies found 94% had low S-oxidation capacity and reduced plasma sulfate. It appears, then, that the PST-troubled kid has numerous allergies, a light-colored stool, a failure to digest fat from a lack of taurine-formed bile, and is phenol toxic for want of sulfates. **This condition might be indicated by an elevated copper and mercury reading indicating not enough bile is being made by the liver.** This can sometimes be improved by taking taurine and glycine, and the overall condition can be improved by supplementing sulfates. This seems to be added reason to supplement L-histidine and molybdenum. The liver should be supported as indicated elsewhere in this paper. Clinical studies show that autistic children with significant allergy problems have elevated cysteine/sulfate ratios in their blood, and there are other indications of disordered sulfur amino-acid chemistry.

High, plasma cysteine/sulfate ratio indicates a problem of the body either consuming or wasting sulfate too fast, or not properly forming sulfate in the enzyme cascade. Cysteine itself is usually in normal or elevated range, and the problems are concerning the sulfate. Sulfite oxidase is the enzyme at the end of the metabolic chain from methionine > cysteine > taurine > sulfate, and is a histidine-molybdenum enzyme. Supplementing sulfate would surely be a benefit for the problems directly related to not having enough sulfate for completion of detoxification and for sulfating GAGs. However, the intermediate products of the impaired sulfur-oxidation, and not just the lack of sulfate, may cause some health problems. High, plasma or tissue cysteine, that is, cysteine that is above the normal range, irrespective of the sulfate levels, is actually quite a different problem, indicating a failure of the first enzyme step in metabolizing cysteine. This enzyme, cysteine dioxygenase (CDO), is an iron-histidine enzyme.

People with high, cysteine levels will report discomfort and illness as a direct result of eating methionine/cysteine rich meats and plants such as garlic and broccoli. Don't take the glutathione precursors that contribute directly to the cysteine pool. Both L-cysteine and whole glutathione do this. It's of interest to note that cysteine is commonly incorporated into pharmacological preparations as a stabilizer for peptides such as Secretin. Standard chemical calculations show that a rapid infusion of 1.0 mg cysteine HCl, as contained in a vial of porcine Secretin, will produce a significant increase in the plasma concentration of cysteine. Since Secretin is not currently given in a weight dependent manner, the lower the weight of an individual, the greater the concentration of cysteine in the plasma. The increase in the cysteine level from one vial of Secretin is negligible in adults, but it almost doubles the cysteine concentration in a 30-pound child. This could have very definite toxic effects for some with a sulfoxidation problem (PST kids).

Cysteine possesses excitatory, neurotransmitter properties, acting centrally and peripherally at NMDA (N-methyl-D-aspartate) type glutamate receptors (Parsons et al., 1997). This effect in the CNS may be responsible for hyperactivity reported by some parents soon after a child receives Secretin. In the presence of bicarbonate ions in the GI tract (such as the bicarbonate-rich pancreatic fluid induced by Secretin), cysteine becomes a potent excitotoxin (Williams et al., 1991), which could account for anecdotal reports of loose stools or diarrhea a few days after a Secretin infusion. NAC does not contribute directly to cysteine toxicity unless you take massive amounts of it. At 500 to 1000 mg/day (adult) you stand to benefit without significantly increasing risk of cysteine toxicity. The common thread in all of these failing enzymes is the need for adequate L-histidine. L-histidine is used by the body in many metal/mineral bearing enzymes, storage molecules, and transport and excretion molecules. People having metal/mineral enzyme problems, or metal/mineral dysregulation should be looking at supplementing this amino acid in addition to adjusting their source of minerals such as molybdenum, copper, iron, zinc, and manganese. In fact, histidine is such a powerful chelator of heavy metals and minerals that it should probably be used only under medical supervision lest a deficiency of

necessary minerals be created.

Following the Feingold diet plan will benefit these kids by exclusion of foods substances known to include high amounts of phenols. Salicylates, dyes, sodium benzoate, BHA, BHT, FD&C yellow dye #5 (tartrazine), vanillin, eugenol are all phenolic compounds. Foods have differing amounts of phenols and salicylates in them and you need to eliminate some of the highest ones and choose from the lower ones. For a small membership fee, The Feingold Association will provide a listing of foods to avoid, as well as a continually updated list of safe foods. Their address is: Feingold Association of the United States, PO Box 6550, Alexandria, VA 22306, 1-800-321-3287.

Sodium benzoate (#211) has been implicated in everything from asthma to itchy skin rashes to behavior. Behavioral reactions are likely to be next day irritability, lasting all day, with outbursts if things go wrong. One woman who hadn't noticed the new preservative wrote, "My son had temper tantrums 20-24 hours after having the 7-UP". Twenty non-allergic subjects with chronic rhinitis reacted to sodium benzoate with symptoms including runny or blocked nose, sneezing and itchy nose. There were similar but fewer reactions to tartrazine (#102), erythrosine (#127), para-hydroxybenzoate (#214-#219), sodium metabisulphite (#223), and monosodium glutamate (#621). Pacor ML and others. Monosodium benzoate hypersensitivity in subjects with persistent rhinitis. Allergy. 2004;59(2):192-7. Recent reports indicate that sodium benzoate in soft drinks switchs off vital parts of DNA in the mitochondria, effectively destroying its function in producing energy - Professor Peter Piper, a professor of molecular biology and biotechnology, Sheffield University. An earlier study showed that when mixed with the additive vitamin C in soft drinks, it causes benzene, a carcinogenic substance.

Researchers say that many more adult asthmatics are sensitive to salicylates than are aware of their sensitivity. While only 3% report aspirin sensitivity, 21% of adult asthmatics reacted to oral challenges. Most also react to ibuprofen, naproxen, and diclofenic NSAIDs—Jenkins C and others, Systematic review of prevalence of aspirin induced asthma, BMJ 2004;328(7437):434-8. German researchers using a diet 'largely avoiding preservatives, dyes, and natural pseudoallergens' found nearly three quarters of patients with urticaria (hives) experienced remission of more than 6 months compared to one quarter with spontaneous remissions. Nearly all patients who improved on diet reacted to tomatoes. Henz BM, Zuberbier T. Exp Dermatol. Most chronic urticaria is food-dependent, and not idiopathic. 1998;7(4):139-42.

Short of avoiding all these otherwise good foods containing phenols and malonic acid, what can a PST child do to counter these undesirable happenings? Increase the amount of insoluble fiber and supplement the amino acid glycine (possibly as DMG/TMG). Take a teaspoon of apple cider vinegar several times a day as recommended elsewhere in this paper. Two mothers report that Cranberry juice has reduced or eliminated these effects, probably by reducing the yeast overgrowth. One should use Schizandra chinensis, a very important liver herb. It protects the liver function and tissue from toxic damage, and has demonstrated a clinically significant influence on both the Phase I and II detoxification process. Schizandra extract enhances liver glutathione status, and helps to synchronize the Central Nervous System. Unlike other enhancers, it significantly enhances glutathione production within the mitochondria. Researchers show that it enhances cellular levels of heat-shock proteins that are partly responsible for the potent effect against stressors, damaging chemicals, and free radicals. Animal tests show that it calms those who show anxious behavior (Chang 1986) and enhances cognitive function (Hong Kong University of Science and Technology). Two lignans inhibit swelling and disintegration of brain mitochondria reducing the possibility of brain damage (Chinese Academy of Medical Sciences, Beijing). It reduces lactate build up from exercise. It has no toxic activity, however, for some it may cause mild indigestion, nausea, and headache. Russian research shows that it enhanced endurance and physical efficiency and decreased sickness. Adult dosage is between 2-4

grams, or its equivalent in extract form. Glutathione is a substrate for Phase II activity, and particularly for glutathione-S-transferase (GST), a Phase II enzyme that adds a glutathione group to Phase I products, enabling their excretion.

Additionally, corticosteroids, specifically the adrenal hormone, hydrocortisone, with the thyroid hormone T3, increase PST enzyme expression three- to five-fold, specifically 75% with hydrocortisone (20 nM) and T3 (10 nM) invitro. This is because it prevents normal decay of these enzymes (half life is 43 hours)—Regulation of Phenol Sulfotransferase Expression in Cultured Bovine Bronchial Epithelial Cells by Hydrocortisone, Joe D. Beckmann, Mary Illig, and Ronald Bartzatt, University of Nebraska Medical Center. This explains why Kane suggests pregnenolone. I urge first a support of the burned-out adrenals and the thyroid as outlined elsewhere in this paper.

Ambrotose®, Phyt•Aloe®, Dandelion, Ligustrum lucidum, Bovine colostrum, Shark liver oil, excipients of powdered rice bran, Schizandra, Green Tea, vitamins A, C, E, undenatured whey, and wheat grass all produce glutathione effectively without any adverse toxicity or without messing with the Phase I enzyme activity. A number of foods stimulate the body to produce more of the Phase II enzymes. They contain indoles, glutathione, and glucosinolate compounds found in broccoli, kale, and Brussels sprouts, and choline and inositol found in buckwheat and Lecithin. These foods have been shown to improve liver detoxification function, and to decrease the risk of developing cancer. They include members of the cabbage family (crucifers), which includes not only cabbage but broccoli, cauliflower, Bok Choy, Brussels sprouts, green onions, garlic, and kale (all but one are in Phyt•Aloe®), These vegetables contain compounds called aryl isothiocyanates that directly stimulate the activity of an enzyme, glutathione S-transferase, an important component of the Phase II system. Unfortunately, these same vegetables contain high levels of phenol which is the toxin not being excreted adequately in PST kids. They also supply high sulfur that some cannot tolerate, and of course, some are allergic to them, so they must be used with caution. If you have "unloaded the Donkey" as outlined herein, you should be able to tolerate these vital foods.

Some have found Essaic™ (Ojibwa) tea helpful in this condition. Dr. Hugh Fudenberg uses it with his immune-compromised patients, and states that it heals the endothelial cells of the GI tract and the liver. It is a proprietary formula of Burdock Root (arctium lappa), Slippery Elm (ulmas vulva), Sheep Sorrel (rumex acetosella), and Indian Rhubarb (rheuma palmatum). It probably should be used intermittently for Burdock is potentially toxic to the liver and peripheral blood mononuclear cells (PBMC). Sheep Sorrel enhances cytochrome p450 (Phase I) liver enzymes that will deplete fatty acids, steroids, estrogen, Prostaglandins, retinoic acid (vitamin A), glycine, and body alcohols faster, and make many drugs less effective. At least be aware, and if you use it, supplement fatty acids (Evening Primrose and cod-liver oil if your child can tolerate them) and glycine, and have the doctor watch the liver and PBMC functions carefully. **For limited periods, use of herbs that enhance Phase I liver enzyme action would seem beneficial to those whose liver is sluggish and/or to those without the PST/sulfoxidation problem. It can be dangerous, however, for PST kids because the more toxic metabolites of Phase I activity cannot be cleared effectively by PST (Phase II deficient) types.** Defense against this oxidative stress requires the support of compounds with antioxidant properties, which are helpful to prevent the potential tissue damage from the highly-reactive oxygen species often produced during Phase I activity. Antioxidants help by "neutralizing" these reactive oxygen species.

Nevertheless, enhancement of Phase I could enhance breakdown of protein to amino acids, and limit the peptides that upon entering the blood stream produce opioids. Some nontoxic herbs that do that are Milk Thistle, Bistort, Ginger, Royal Jelly, and the aforementioned sheep sorrel. Dandelion is nontoxic, a good chelator and detoxifier, and has no effect on the Phase I function, thus it may be the best choice for strengthening the liver function. I strongly advise that you get the small book "The Liver Cleansing Diet, Love Your Liver and Live Longer" by Sandra Cabot, MD, and follow this liver friendly guide to eating. Half the small book consists of recipes. It can make a world of difference when the liver functions as it should—otherwise nothing else really works. Dr. Carson G. Burgstiner,

MD, PC, reports that thymus glandular and a good multivitamin/mineral supplement restored his and many patients' normal liver function after suffering longstanding Hepatitis C.

Three things that build the liver, even reversing hepatitis, are Alpha Lipoic acid, Milk Thistle (for short time use), and selenium. To combat hepatitis requires significant amounts of each (600 mg, 900 mg, and 400 mcg, respectively for adults) that should be used only under direction of a nutritionally savvy doctor, but it does work (Dr. Burton Burkson, MD, 505-524-3720). Also extremely effective is Ambrotose AO™ by Mannatech™. All these except Milk Thistle should be very effective in restoring liver detoxification in PST kids. Nevertheless, Alpha Lipoic Acid can be dangerous with the mercury toxic and/or those with high cysteine values. Additionally, a German study reports that six months of lipoic acid supplementation caused a vitamin B_{12} deficiency.

An example of what can happen when cysteine (sulfur) toxicity occurs: this happened to a mother of a 17 and a 15 year old, both autistic—the older one more severely so. She is a very experienced, well-informed mother who taught me much of what I know. In fact, she saw tremendous gains in the first year using Mannatech™ products and many other nutritional interventions. He actually went for over a year without seizures. She had been using Immunocal™ for six months or longer. Though she had seen this PST/sulfate information, she overlooked their obvious PST symptoms. While Christmas Shopping, her daughter, who now passes for "Normal" suddenly began screaming, attacked her, nearly ripped off one side her face, bit her arm—generally went berserk. Her eyes were glaring with the pink of a bunny rabbit! A red, lacy rash broke out all over her body! Of course, she hastened home, only to see the rash disappear almost as quickly as it came. The child showed high anxiety, and a day later diarrhea. She suspected Immunocal™, called them, and was informed it was possibly a sign of Immunocal™ having created too much glutathione. I suggested that before glutathione excess would come cysteine excess (what with it not being oxidized), probably triggered by toxic odors in the store. When I listed the symptoms of cysteine/NAC toxicity: violence, rash, anxiety, wheezing, nausea, cramps, and diarrhea, she immediately recognized these as the symptoms her daughter displayed, and when I reminded her of PST/sulfate symptoms (listed above), she acknowledged that both children had them, red ears and all! She discontinued Immunocal™, and the children are doing really well, in fact, her daughter is now classed non-autistic! This is serious stuff! Pay attention to what I am saying. We are modifying a child's brain and central nervous function.

What is MHPG? Why Measure it?

MHPG (3 methoxy-4-hydroxyphenylglycol) is a natural breakdown product of a class of neurotransmitters (chemical messengers that pass across the narrow space, or synapse, between neurons) called catecholamines. One of the catecholamine neurotransmitters that is broken down to MHPG is norepinephrine (NE). Since the 1970s, the urine of autistic children has been known to contain abnormally low amounts of MHPG (Young, J.G. et al., Decreased 24-Hour Urinary MHPG in Childhood Autism. Am J Psychiatry 136, August 1979, pp. 1055-7).

In order for the body to get rid of MHPG, it has to convert it, in a process called "conjugation", either to MHPG sulfate or MHPG glucuronide—the two pathways referenced above.

By measuring the amount of MHPG sulfate, MHPG glucuronide, and total MHPG (the sum of the sulfate and the glucuronide) excreted in the urine in 24 hours, we can find out two things:

1. The turnover rate of the catecholamine neurotransmitters, especially NE, in the body. It is the use (i.e., the release) of NE that leads to the breakdown of NE to MHPG. Low total urinary excretion of MHPG suggests that smaller than normal amounts of NE are being released into the synapses of the brain. (Young, J.G., et al. Cerebrospinal Fluid, Plasma, and Urinary MHPG in Children, Life Sciences, Vol. 28, 1981, pp. 2837-45) and Peyrin, L, Urinary MHPG Sulfate as a

Marker of Central Norepinephrine Metabolism: A Commentary, J. Neural Trans [Gen.Sect], Vol. 80, 2990, pp.51-65). C. Barthelemy and Associates found higher than normal levels of NE in the urine—J Autism Dev Disord, 1988 Dec, 18:4, 583-91. These findings suggest that autistic behaviors might be related to an abnormal functional imbalance among monoamines either at a molecular level or at a systemic level.

2. The relative efficiency of the two main conjugation pathways for MHPG (and by extension, for other phenolic compounds, such as salicylates and artificial food colors): sulfoconjugation and glucuronidation.

If needed, you can strengthen the effect of the glucuronidation by supplying calcium-d-glucurate. The calcium-d-glucurate prevents an enzyme produced by the bacteria in the intestine (beta-glucuronidase) from removing the glucuronides that were conjugated with (attached to) the toxins. When the bacteria remove the glucuronides, the now unconjugated toxins can be reabsorbed from the gut back into the body. Wilner's Chemists carries calcium-d-glucurate.

An exciting new bit of information indicates that resveratrol, when taken orally, has virtually no unmetabolized resveratrol entering the bloodstream. Why is this exciting? To be useful, a nutrient must be bioavailable; that is, it must be readily absorbed into the bloodstream, and it must survive long enough to reach the cells that need it. For all resveratrol's benefits, getting it to where it is needed poses an extraordinary problem, because even though resveratrol taken orally is well absorbed by the gut (at least 70%), its bioavailability turns out to almost zero. This apparent "paradox" can be traced to its rapid and extensive metabolism into two types of chemical derivatives: sulfates and glucuronides (both desperately needed to enhance Phase II liver detox). Most resveratrol is converted into these metabolites in the gut and they are readily absorbed. The liver completes the process within about half an hour. This makes resveratrol an unsurpassed supplement to enhance both legs of Phase II detoxification! Additionally, resveratrol turns off the cancer promoting genes such as bcl-2 and mcl-1, while turning on cancer-suppression genes like P53 and Bax! Do not buy the versions with Quercetin, and do not give it at the same time you supplement quercetin for that defeats our purposes. A lot of vitamin C increases glutathione and (according to one doctor) will increase the glucuronidation pathway activity.

Let's digress a moment to understand vitamin C. This is a two-edged sword, and has hurt as many as it has helped. When we find a truth for ourselves, we think it applies to everyone in the world, and so the great Linus Pauling did as much harm as he did good. His recommendations nearly killed me :-(. For maybe two years, I was taking increasingly larger doses of vitamin C in an amino acid formulation, and observed a soft, frequent stool with undigested food, and increasing deficiency symptoms of the very nutrients I was ingesting in large amounts! After I finally realized it was the vitamin C that was doing me in, and ceased taking so much (only 7,500 mg) my problems turned around, and eventually, I recovered most of the ground lost. Thirty years later, I still have minor problems that are probably traceable to that episode.

There are many who have gotten great results, Pauling of course, and Dr. Rimland and his son and daughter have taken many grams of Sodium Ascorbate, and swear by it. The disease fighting T-cells depend upon adequate vitamin C, and levels of vitamin C do drop during infection, sickness (especially collagen diseases), surgery, pregnancy, and high stress, including the stress of radiation, drugs, alcohol, fever, burns, exposure to cold, and cigarette smoking. Adequate vitamin C (preferably sodium ascorbate) at these times increases the immune function, especially enhancing the activity of neutrophils, lymphocytes, and natural killer cells. It also increases the levels of the antibodies IgA, IgG, and IgM, which are needed to fight infection. In large amounts, vitamin C is strongly antiviral, especially against herpes, shingles, hepatitis, and polio, because it stimulates production of interferon and glutathione (a 30% increase). It has strong antihistamine properties, inhibiting release and enhancing degradation of histamine. Large amounts, coupled with vitamin B_6, are strongly diuretic, relieving edema. At these times of need, increasing vitamin C intake is most helpful and well tolerated. Normally, however, an adult should take no more than 1,000 to 2000 mg,

There are four thing's one should look for when supplementing vitamin C: 1) A loose stool, that will indicate the system is not digesting foods because of a too-fast, passage time. The tolerance amount for this effect on the bowel is highly variable with each individual. 2) Vitamin C in amounts larger than 1000 mg (adult) chelates many toxic things, including mercury, lead, cadmium, and nickel, and is one reason it is beneficial, but it also chelates copper and zinc, and probably other things I know not. I became copper anemic. It took me a couple of years or longer to overcome that. 3) If taking ascorbic acid, as many do, it will make the system horrendously acid, disrupt all enzyme functions, and stop stomach acid production causing all digestion of protein and assimilation of vitamins A, C, B-complex and most minerals to largely cease. This is, apparently, what happened to me. Many fear to use sodium ascorbate for fear of excessive amounts of sodium depleting potassiou. Dr. Bernard Rimland and others using Sodium Ascorbate in high amounts say this has not been a problem. I would urge no more than 2000 mg day (adult) unless fighting inflammation. If taking larger amounts, one must test saliva and urine to determine that the system is not acidic, and must not allow soft, loose stools to continue, but must cut back until all stools are formed and normal, showing no undigested food.

Never discontinue these high doses abruptly. The enzymes necessary to handling those large amounts of vitamin C don't disappear when the vitamin level is reduced. They keep merrily clearing the vitamin C until it is possible to develop subclinical scurvy before the body realizes it no longer needs all those enzymes. That's just another thing we are not normally told when we are urged to use those huge amounts of vitamin C. This principle probably applies to other things as well. Additionally, most natural antioxidants, such as Coenzyme Q10 and Vitamins C & E are phenolic in nature, and so large amounts of vitamin C would be an unacceptable burden on the PST child.

There is no doubt that when vitamin C is used medically in huge amounts it can be life saving. Dr. Rimland saved his daughter's life. A famous publisher saved his life. Vitamin C intravenously, when chelating mercury, has protected many from the terrible symptoms of detoxification. Unfortunately, it's dangerous in the hands of the uninformed. Now, you know. Additionally, ascorbic acid is used as a preservative and antioxidant in foods. The use of this phenolic can make barbiturates more toxic, and is pharmaceutically incompatible with sodium salicylate, sodium nitrate, theobromine, and methenamine. As many as twenty percent of the people tested are reactive to ascorbic acid. This is likely because the source is corn.

Sulfation Ratio as a Measure of PST Activity

Conjugation means the joining of two dissimilar molecules. The enzyme-mediated conjugation reactions of Phase II – glucuronidation, amino acid conjugation, sulfation, acetylation, glutathione conjugation, and methylation – require the presence of energy in the form of adenosine triphosphate (ATP), and cofactors obtained through dietary sources. The main types of enzymes catalyzing Phase II reactions are: glucuronyl transferases, glutathione transferases, sulfotransferases, N-acetyl transferases, N- and O- methyl transferases, amino acid transferases, and epoxide hydrolase. In the body, MHPG and phenolic compounds can be conjugated (joined) to sulfate (sulfoconjugation) or to glucuronide (glucuronidation). In either case, the conjugation of MHPG and phenols facilitates their removal from the brain, and its excretion by the kidneys. The ratio of the amount of MHPG conjugated to sulfate to the amount conjugated to glucuronide is the "sulfation ratio" of MHPG. The sulfation ratio of MHPG is a measure of the efficiency with which the enzyme PST is functioning in the body. Certain areas of the brain appear to lack the glucuronidation pathway, and in those areas deficient PST activity might allow the accumulation of toxic phenolic compounds.

We know that when the body is faced only with a small load of phenolic compounds (such as those allowed on the Feingold diet), even a rather PST-deficient individual will sulfoconjugate a normal proportion of these phenolic substances. In this case, the term used for the behavior of PST is "first order kinetics." With

first order kinetics, the greater the need for an enzyme, the faster it works. Enzymes also work faster in an acidic environment. Unfortunately, many are alkaline.

As we increase the phenolic load through this "first order segment" of the sulfoconjugation curve, sulfoconjugation keeps pace with the increasing need. As larger amounts of phenolic compounds are introduced into the body (such as may be done in Candida overgrowth, or the use of food colorings and such things), the enzyme PST can become saturated so that a higher proportion of the phenolic load is conjugated to glucuronide instead of sulfate. By this process, the sulfoconjugation curve transitions from its first order segment into its saturation segment where the sulfoconjugation rate can no longer increase as a function of need. With additional phenolic loading, the glucuronidation pathway is utilized relatively more heavily, and the sulfation ratio falls. This allows a buildup of the harmful toxins being discussed.

PST is like a donkey. When loaded too heavily, he lies down. Remove a few pounds and he will trot all day. Unload the PST system with the Feingold diet and by removal of toxins from the home. Studies show indoor air often contains 2 to 5 times more hazardous chemicals than outdoor air, even in highly industrialized areas! In rural areas, this can be 5 to 10 times more indoors! Benzene and formaldehyde are the two major toxic substances in the home, but carbon monoxide is likely to be high in winter. All load the PST donkey. The Department of Biochemistry and Molecular Biology, Jefferson Medical College of Thomas Jefferson University, Philadelphia, Pennsylvania states that Benzene is an ubiquitous environmental pollutant and chronic exposure causes aplastic anemia, leukemia, and other cancers. Benzene is added to unleaded petrol, drugs, pesticides, herbicides, paints, solvents, and many other toxic products. This chronic exposure to indoor toxins has been linked to a vast spectrum of illness ranging from asthma, chronic sinus infections, headaches, insomnia, anxiety, fatigue, skin rashes, watery eyes, burning sensations in eyes, throat, and nasal passages, breathing difficulties, and joint pain, to full-blown, multiple chemical sensitivities. Carbon monoxide robs the system of oxygen and causes malaise and lethargy. Always leave a window open a bit to provide ventilation even in winter!

Remember: "A small percent of autistic spectrum patients have methylation defects due to deficient methyl groups…The **methylation defect, when present, can cause a defect in sulfation.** However, this is measurable, and if present, trimethylglycine (TMG) will provide more methyl groups, and in addition, decrease the abdominal complaints present in patients with such deficiency"—Dr. Hugh Fudenberg. TMG may need to be accompanied by significant amounts of vitamins B_6 and B_{12}. "A far more direct and effective way would be to supplement with D-L-methionine and/or SAMe. TMG increases methyl status largely by enhancing the conversion of homocysteine to methionine. Undermethylated persons may have very low rates of formation of homocysteine, thus limiting the benefits of TMG"—Dr. Wm Walsh.

Phase II conjugation reactions also require the specific nutrients that are used as cofactors for each Phase II enzyme, as well as the specific molecules that are attached in the different conjugation pathways (i.e., sulfate, glucuronic acid, glutathione, specific amino acids). Additionally, since Phase II requires ATP, nutrients providing support for ATP production (energy) are also needed.

When you "unload the donkey", autistic children notice the change and make purposeful attempts to compensate. Examples include: finding and rapidly smelling overlooked items, compensating for the loss of exposures with a new behavior such as spending hours flushing the toilet (fumes from chlorinated water), laying on the floor with nose directly into the carpet and breathing deeply while also rolling or rubbing on the carpet. Autistic children will try frantically to compensate for the removal of volatile organic substances, plastics, and molds. They will find new types of exposures, find overlooked substances, and maintain their symptom levels until all of these other sources of exposure are removed. When everything is successfully removed, they recover quickly. This behavior has been labeled "Seeking Behavior", and indicates very severe chemical sensitivities.

Yeast and other fungi, as well as the exposure or intake mentioned above, all produce phenyls, and as phenyls build up they reduce norepinephrine, and interfere with NE's function in the synapse. Pronounced increases in catecholamine excretion also occur when exposed to noise, although it appears that preexisting magnesium deficiency is necessary for this effect to occur. The effect of magnesium status on the behavioral and biochemical response to noise completes the cycle. Urinary catecholamine excretion increases progressively with increasing dietary magnesium deprivation even without noise stress. The addition of noise further increases excretion of NE, but not of epinephrine (adrenaline). The more pronounced the noise, and the greater the magnesium deficit, the higher the catecholamine excretion, with epinephrine and NE excretion reaching five and 10 times control levels under extreme, but nonlethal, conditions. Many Autistics are so hyper to noise they are living with this stress constantly. This produces very adverse effects in the brain, and affects many functions throughout the body as airways and cerebral blood vessels constrict. This loss of blood flow to the brain in the autistic is judged to be a major cause of autistic symptoms.

NE is the neurotransmitter whose effect in the brain is augmented by stimulant drugs such as amphetamine and methylphenidate (Ritalin™). Children whose learning was affected by the challenge dose of artificial-color mixture proved to be those who had an earlier "positive" effect with this type of stimulant medication. In other words, children who respond to the Feingold Diet, that eliminates all artificial colors and certain other compounds, are the same children who lack sufficient NE effect in their brains, and who respond to Ritalin™. (Swanson, J.M. and Kinsbourne, M., Food Dyes Impair Performance of Hyperactive Children on a Laboratory Learning Test. Science 207, March 1980, pp. 1485-7). Mary Coleman investigated the effectiveness of Ritalin™ and vitamin B_6 on hyperactive children. One group was given Ritalin™; a second group was given vitamin B_6, and a third group was given a placebo. Both the vitamin B_6 and Ritalin™ groups improved significantly as compared to the placebo group, and there was no difference between the vitamin B_6 and Ritalin™ groups. The study was published in Biological Psychiatry, 1979. Dr. Robert Sinaiko, MD, says, "The children upon whom I have obtained the 24-hour, urine MHPG test have thus far sorted themselves into four groups"—three of which respond to the Feingold Diet. Obviously, the approach to this problem would not be vitamin B_6 alone, but high intakes of magnesium and zinc are indicated.

In addition to the behavioral aspects, normally, NE's role in the regulation of immunity is one of "fine tuning" and adjusting the timing of the various phases in the immune response. In addition to being reduced by a build up of phenols, some evidence suggests that the brain's supply of NE may become depleted if the immune system is constantly stimulated by allergy or infection as it is in most autistic. We have seen above that the amino acid L-histidine is reduced by allergies, by the drugs used to treat them, and by metal toxicities leading to reduced histamine, HCl, and NE. **This interferes with cysteine metabolism by reducing the available sulfite oxidase and cysteine dioxygenase that require histidine and molybdenum. The lack of histidine and molybdenum, and the presence of heavy metals, mercury, cadmium, lead, and arsenic, that bind the sulfhydryl molecules, can well be the reason for low, available sulfate creating the PST phenomenon.**

A reduction of norepinephrine (NE) and/or dopamine, or too much acetylcholine activity causes diarrhea, irritable bowel syndrome, cramps, nervous stomach, increased saliva, and raised insulin levels, and, as stated, airways and cerebral blood vessels constrict. A lack of dopamine is a problem in some patients with chronic anxiety, Parkinsonism, one case of drug-induced dyskinesia, schizophrenia, dyslexia, ADHD, and autism. This phenolic (dopamine) is strongly vasodilative, and lowers pressure at which peristalsis begins. Other findings on phenolic exposure have been depressed serotonin, elevated histamine and prostaglandins, abnormal complement (an immune component that accounts for inflammatory attack on antigens), and immune-complex formation (a clumping of antigens and antibodies that when undestroyed can trigger a complement attack that damages self). It would seem most helpful, then, to enhance the production of NE, dopamine, and nitric oxide (NO) except in those with low muscle tone where acetylcholine seems reduced.

So, if you want to protect against the harmful effect of the PST/sulfoxidation problem, and perhaps get your kid off Ritalin™, what can you do? In addition to shielding the body from sources of the toxins as outlined above, eliminating Candida and allergens, ingesting sulfate, and taking Epsom salts baths, how can we ensure adequate NE is available? **Be sure that you eat an adequate intake of protein.** Levels of dopamine and norepinephrine, that counter acetylcholine, can be raised by eating a high protein meal (avoid fatty meats and cheese that rob the brain of oxygen and reduce alertness), **and by using a supplement of the amino acids histidine, tyrosine, tyramine, and phenylalanine, and the mineral molybdenum.** You can also eat of the high tyramine content foods listed below. Tyramine is an intermediate step between tyrosine and epinephrine. The manufacturer says it is the same thing as norepinephrine, and that it helps some kids who have ADD/ADHD. The supplement NADH also raises noradrenaline. Obtain tyramine as "BHB Plus" from Twenty-First Century Products, (940) 325-9284. Additionally, supplement Ambrotose® and Phyt•Aloe® from Mannatech™, and TMG. Clinical studies on Mannatech™ products and Autism and ADHD are available on request.

Tyrosine prevents reduction of norepinephrine levels that are associated with stress. Many clinical studies, along with a large body of anecdotal evidence, indicate that tyrosine may prove to be a vital substance in alleviating depression, as well as the irritating symptoms of premenstrual syndrome. By increasing dopamine, it controls familial tremors. The importance of Tyrosine is because it is a direct precursor to Thyroxin (Triiodo tyrosine) as well as being a precursor to Adrenaline and Noradrenaline. Thyroxin is, of course, a primary Thyroid hormone. Thyroxin deficiency results in a series of conditions including excess weight gain, cold hands and feet, and decreased basal metabolism. The catecholamines Adrenaline and Noradrenaline are critical in the following conditions: In Science magazine, it was reported that Tyrosine lowers blood pressure by increasing Norepinephrine metabolites which through feedback shut down sympathetic output. In this same issue, it was stated that Tyrosine increased blood pressure 38% to 49% in hypotensive rats through accelerated peripheral synthesis of catecholamine. A study by Dr. I. Goldberg in Lancet revealed that catecholamine also controls immune system output. Allergy sufferers have responded well to Tyrosine. In the American Journal of Psychiatry, Dr. Alan J. Gelenberg postulated that a lack of available tyrosine results in a deficiency of noradrenaline at a specific brain location, which in turn relates to mood problems such as depression.

Do not take phenylalanine, tyramine, or tyrosine with the antidepressants that contain Monoamine Oxidase Inhibitors (MAOI). N**ever take MAOI (including St. John's Wort) with the following high tyramine (amino acid) content foods for (rarely) the combination can cause severe high blood pressure, stroke, or even death: aged cheese, aged meats, pods of broad beans, beer, wines, pickled herring, yogurt, liver, yeast extract, ripe bananas, soy sauce, anchovies, avocado, or sour cream (ask your doctor for a complete list and discuss this with him); and avoid cold, flu, and weight loss medications. Avoid these for two weeks after you quit the MAO inhibitor. Do not take a MAO inhibitor if you have congestive heart failure or abnormal liver function.**

Tyramine can be purchased from DEWS. It is reasonably priced. DEWS is probably the only place you will find this, because DEWS invented a method of making it relatively inexpensively. (800) 360-5298 or (817) 282-7326.

The following nutrients have been found to inhibit MAO reducing losses of neurotransmitters: dimethylaminoethanol (DMAE), Vitamins B_1, B_2, B_6, B_{12}, C (ascorbyl palmitate), and E, para–aminobenzoic acid (PABA), folic acid, beta–carotene, calcium, magnesium, zinc, chromium, selenium, reduced glutathione (an antioxidant). A coenzyme, vitamin B-complex supplement of moderate potency should be supplemented.

As previously stated, until you have unloaded the donkey, it may be desirable to limit the colored foods that are high in phenols and malonic acid.

One mother writes (edited): On 1/6/99 all hell broke loose—Kyle woke up in excruciating pain, so much so that he had to hold his hands in the air most of the time. He behaved as though his hands were being sawed off with a dull blade, minute-by-minute, hour-by-hour, day-by-day, with no relief for 7 days. Two days later it was gone and he was back to normal. But the pain slowly reemerged in the next weeks and months, and his ability to use his hands never reverted to where it was just prior to 'The Event'. His handwriting went from slightly larger than normal to HUGE, uneven, and mostly illegible. He suddenly couldn't type or play the cello or piano without difficulty. There is no other explanation for what happened other than a yeast die-off reaction. When I finally found Great Plains Lab and Dr. William Shaw, they said they had seen it happen with other autistic children. Kyle always has had red ears, therefore, probably has had this PST problem for years. Could this happen with metals toxicity? (I wrote: Yes, mercury can adversely affect sulfoxidation.)

The Yeast die-off plus other possible offending toxins and phenol-containing foods, including occasional use of Tylenol™, led to a series of other symptoms in the ensuing weeks and months, including tingling and pain in the extremities (including tongue), fatigue, muscle weakness, reduced mobility of hands/feet/tongue, headaches, blotchy skin and 'hot spots', hypoglycemic-like reactions, increased brain fog and spaciness, sinus allergies, visual regression, ringing in the ears, sore throats, fevers, dry and irritated eyes, increased auditory sensitivity, and significant regression in writing, keyboarding, and in playing his cello. On July 12, 1999, Kyle began having spasms on the right side of his face, head, shoulder, and arm. The spasms quickly got much worse until he was having them about 3-times a minute all day long. This lasted for three weeks. More tests and another EEG were done, all negative. During June, Kyle suffered an attack of hay-fever-type allergies, and I gave him a generic version of Benadryl Ultratabs™ anti-histamines according to label: 2 tablets every 4-6 hours, but discontinued them just a week before the onset of the spasms. Now, I realize this may not have been desirable usage for him, what with the red dye and other possible toxic content.

Some time in the fall I began putting an orange in Kyle's lunch every day since he could no longer have apples. During the fall, I gave him Tylenol™ a few times for severe pain. In December 1999 and January 2000, I began diligently making salads every night for dinner, including tomatoes and red and orange peppers, because of course, they are such healthy foods. Every week, he seemed worse and in more pain. SAMe no longer seemed to work at all, and I had to give Tylenol™ more often. After his muscle biopsy in February 2000, he was given a prescription of Tylenol™ with Codeine, then his headaches became excruciating. Until you told me, I did not know how toxic Tylenol™ was to Kyle, and that it was actually contributing to his chronic pain and headaches. We were in a vicious cycle.

It finally makes sense why the pain would not go away: between the yeast die-off (Nystatin and probiotics), the allergy medicine, the Tylenol™, the oranges, and the salads, he was being bombarded with things that were toxic to him! All of this on top of the trauma his body went through with the initial die-off must have put his system over the edge. I'm still confused over that initial onset, but maybe the combination of PST deficiency, extremely high titers to measles and herpes virus 6, a very sick gut, plus a sudden flood of yeast toxins from the die-off created a very dangerous health situation, and resulted in the many bizarre symptoms that we have seen since that time.

At the 'Biological Treatments for Autism Conference' in Orlando last May, I posed Kyle's case to

> the entire panel of doctors at that conference who specialize in autism. Interestingly, no one made a connection between Kyle's symptoms and PST Deficiency, nor had any of them heard of symptoms similar to Kyle's. It seems incredible to me that in one-phone conversation you knew what Kyle's problem was, and none of those doctors did! In addition to numerous deficiencies, he was suffering from an overload of a variety of toxins (both natural and synthetic), each contributing their own 'poisoning' characteristics, to create a confusing hodgepodge of symptoms that could change as the level of each toxin would fluctuate.
>
> So many thanks to you, for helping me to understand WHY this has been happening so that I can do things differently. Without your help and advice, this horror could have gone on forever!
>
> I am now 'holding the course' as you advised (as recommended herein—WSL), and the improvement is awesome. Not just the pain, but also the hyperactivity (pacing, jumping, hand and body shaking) has reduced tremendously in just one week!
>
> My family is deeply indebted to you for your kindness, and the sharing of this unique knowledge that you have. I will do my best to pass this knowledge on to others that need it. Thank you so very, very much for everything!

In August of 2000, Kyle and family spent two weeks camping, and then he and his father spent a week of canoeing in Alaska. This outing has proved Kyle is once again a strong, active, young man, with little or no pain attending him. In lieu of Epsom salts baths, Kyle used a magnesium-sulfate cream during these outings. Kyle and family enjoyed the outing tremendously, all the more for they had thought it was never again to be.

Pacing and stomping is likely a sign of restless legs. This is described as ants crawling under the skin until one cannot hold the legs still. They must be moved. This will often manifest at bedtime. It can be caused by too great an intake of calcium, or a lack of magnesium, and vitamin B_6. One report told that a balancing of calcium/magnesium benefited, but the addition of adequate zinc stopped the restless-legs syndrome. There are many possible causes of restless-leg syndrome. Strong associations include kidney failure, some nerve disorders, vitamin B_{12} deficiencies, pregnancy, iron deficiency or anemia, hypothyroidism, and some medications (such as antidepressants). About 50% of those who have restless-leg syndrome have relatives with the same condition. Some say drinking warm salt water helps (sodium? Chloride?); others eat a banana (potassium? Serotonin?). Alcohol, nicotine, and caffeine can make it worse. In one study of pregnant women, it was found they lacked folate. Unfortunately, the typical medical approach is to do nothing or to prescribe a dopamine agonist (a drug that attaches to dopamine receptors). Studies do indicate a lack of dopamine, but that can be best supplied by a supplement of tyrosine.

Mercury Poisoned

Due to the high dosage of mercury previously in vaccines (187.5 mcg in first six month's vaccines), and the inability of these children to excrete metals normally, they probably have heavy-metal poisoning with mercury and aluminum (also in the vaccines), as well as arsenic, cadmium, antimony, nickel, and lead. These heavy metals not only affect the brain, but mercury impairs the functioning of enzymes that have sulfur and hydrogen (-SH) at the end of the molecular chain. These include glutathione, lipoic acid, and Coenzyme A. These toxic metals also impair the enzymes sulfite oxidase and cysteine dioxygenase interfering with sulfur oxidation, creating a lack of sulfate. Many people who are mercury toxic are sensitive to foods that are high in sulfur, which includes all dairy products and most green vegetables. We fret about the heavy metals in vaccines, yet we allow the kid to drink from aluminum cans! The Environmental Protection Agency requires that public

water have less than 50 ppb [Parts Per Billion] of aluminum, yet canned beverages contain as much as 6,160 ppb!

The PST children, having the least urinary thiols (sulfurs) and thus the least capacity to excrete heavy metals, especially mercury, are most poisoned by these vaccines! Low excretion of mercury may be due to low glutathione levels and low sulfation common to these PST kids. **Please have the GSH-status and sulfation status tested, and if those are low, it explains your low excretion levels, and can also mean that you actually have very high levels of mercury accumulated.** If that is the case, then you need to get your GSH-levels up and your sulfation pathways repaired and back on line. Then, if you succeed with that, your excretion levels may become huge for a while, provided there are enough nutrients, especially thiols available, and that sulfur metabolism is working right.

One study showed mercury was still gassing off ninety days after painting with latex paint: "These data demonstrate that potentially hazardous elemental mercury exposure may occur even in homes recently painted with indoor latex paint that contains mercury concentrations less than 200 mg/L."—Arch Environ Contam Toxicol 1991 Jul;21(1):62-4. Mercury is present in such diverse things as air conditioner filters, tattooing inks, lawn pesticides, and some fabric softeners. Environmentally safe household products and paints can be had from AFM at www.nontoxic.com/nontoxicpai, (800) 968-9355. Melalucca™, Shaklee™, Global Light Network™ (please give my number 516), and Neways™ also carry nontoxic household and personal care products that make a difference in the health of the entire family.

Paresthesia, or abnormal sensation, tingling, and numbness around the mouth and in the extremities, is the most common sensory disturbance in Hg poisoning, and is usually the first sign of toxicity (Fagala and Wigg, 1992; Joselow et al., 1972; Matheson et al., 1980; Amin-Zaki, 1979). In Japanese who ate contaminated fish, there was numbness in the extremities, face, and tongue (Snyder, 1972; Tokuomi et al., 1982). Iraqi children who ate mercury-poisoned bread experienced sensory changes including numbness in the mouth, hands, and feet, and a feeling that there were "ants crawling under the skin."

Methyl Mercury (MeHg), like cadmium, lead, and arsenic binds to sulfhydryl groups on cysteine, which may compromise the function of enzymes and ion channels. MeHg also interacts with DNA and RNA, resulting in reductions in protein synthesis. Metallothioneins (MT) are a group of low molecular weight, cysteine-rich, metal-binding proteins that bind a variety of metal ions. Zinc is probably the most important nutrient that protects the body against mercury and cadmium, for zinc can induce protective levels of metallothionein even before the body is exposed to cadmium. Cadmium is a strong inducer of MT, so it is apparent MT rises to meet the need if enough of its precursors are available. Copper can do this as well, but to a lesser extent. It is also induced by physical trauma and emotional stress. However, increased MT expression can be due to glutathione depletion! Low GSH levels increase a toxic-metals-adverse effect raising MT. It should be noted these heavy metal induced MTs are also toxic! "Both GSH and Zn were effective in protecting against CdMT nephrotoxicity. Elevation in renal-cortex GSH levels, however, was not essential for Zn protection, as a low dose of Zn, that caused no significant increase in renal GSH, also protected against CdMT. On the other hand, maintenance of normal GSH status was essential for Zn protection, as inhibition of GSH synthesis abolished this protection. Both GSH and Zn reduced the accumulation of Cd as well as MT in the renal cortex, with Zn causing greater reduction in Cd accumulation than that of MT" (Tang W, Sadovic S, Shaikh ZA). "Animals in bad condition, such as that resulting from fasting, cannot be protected against Cd toxicity even if the hepatic MT level is high" (Shimizu M, Morita S). A search will turn up more than 600 references to inositol and metallothionein as well (caffeine depletes the body of inositol, so no soft drinks or coffee!). Zinc, copper, and manganese can all interfere with the absorption of cadmium. Iron, ascorbic acid, and protein also can reduce the absorption of low levels of dietary cadmium. Calcium and thiols like cysteine reduce the toxicity of oral cadmium. "Thus, it appears that the cellular levels of GSH, but not MT gene expression, play an important role in resistance to arsenic toxicity and aberrant gene activation. Moreover,

depletion of GSH enhances arsenic-induced proto-oncogene activation, which might contribute to subsequent transformation" (Shimizu M, Hochadel JF, Fulmer BA, Waalkes MP). It is the universal lack of zinc and the depletion of GSH by heavy metals that account for most of the toxic accumulations in our children and further enhance their toxicity. Ensure adequate zinc and GSH!

Arsenic poisoning does cause a variety of systemic problems. The typical symptoms are: diaphoresis (heavy perspiration), muscle spasms, nausea, vomiting, abdominal pain, garlic odor to the breath, diarrhea, anuria (little urination), dehydration, hypotension, cardiovascular collapse, aplastic anemia, polyneuritis, optic neuritis, anesthesia (loss of feeling), paresthesia (such as burning pains in the hands and feet), weight loss, restlessness, nausea, headache, and death. The degree of and the symptoms a person has will be determined by the severity of the exposure. Sources of arsenic: cigarettes, ant poisons, insecticides, weed killers, paint, wallpaper, ceramics, treated wood used in playgrounds, plastic bedding and playpens pads, wool carpets and underlays, and your drinking water!

In one study, N-acetylcysteine completely suppressed arsenic induced apoptosis and incubation of the cells with catalase resulted in significant suppression of arsenic-induced apoptosis. As previously stated, selenium, enhanced with vitamin E, effectively neutralizes arsenic and mercury as does zinc and iodine, all of which support the thyroid. More recent studies show that folate supplementation (400 mcg, day) can significantly (14%) lower blood levels of arsenic.

I have mentioned several causes of vomiting and diarrhea, but of vital interest is the urgency of controlling these serious problems. Prolonged vomiting that loses the alkaline contents of the upper intestine and stomach contents creates metabolic acidosis. (Losing only the stomach contents produces metabolic alkalosis.) Prolonged diarrhea in which excess alkaline intestinal secretions are lost (especially in infants) also creates metabolic acidosis. When suffering vomiting or diarrhea, one must strive to maintain body pH while vigorously pursuing means of stopping these drains on the body stores.

To remove antimony, use SAMe, 5 mg a day per pound of kid, in divided doses. Or you can use the poor man's "methylating mix" of B_{12} (100 mcg per pound), folate (10 mcg per pound), and TMG or choline (10-20 mg per pound). Spread these through the day. They may be energizing, so you might want to give them in the earlier part of the day. Be aware of the fact that many undermethylated kids cannot handle more folate.

One of the greatest effects of cadmium, arsenic, lead, and mercury is that they deplete selenium in the body because selenium is essential for their removal. Selenium atoms combine with cadmium, arsenic, lead, and mercury atoms and escort them out of the body via the bile system. This bile must be bound with soluble fiber to prevent reabsorption! When selenium is depleted by these heavy metals, there is less selenium to form the deiodinase enzymes that convert T4 to T3 resulting in low T3 and hypothyroidism. Curiously, arsenic, which is also detoxified by selenium, is said to increase levels of T3! Also, there is less selenium to form glutathione peroxidase, one of the body's prime antioxidants that is involved in the production and uptake of T3. "Remarkably, selenium compounds catalyze the oxidation of MT even under overall reducing conditions such as those prevailing in the cytosol. In this manner, the binding and release of zinc from zinc-thiolate co-ordination sites is linked to redox catalysis by selenium compounds, changes in the glutathione redox state, and the availability of either a zinc donor or a zinc acceptor" (Chen Y, Maret W.).

Many have expressed the fear that continued supplementation of vitamin B_{12} and TMG would change systemic mercury to methyl mercury, its most toxic form. Methylation of mercury does not occur at a physiologically relevant rate in mammals according to Mr. Andy Cutler, Chemist, and PH.D. Methylation in general, he says, will benefit about 80-90% of the people, but the rest need to avoid it. People with problems who need more methylation will usually have some of the classic signs and symptoms of B_{12} deficiency (like a smooth, shiny tip of the tongue).

(Edited) "In this study, we have examined the effect of mercury as an inducer of oxidative stress, and the resultant effect on ß-Amyloid (Aß) production and phosphorylated tau levels in neuroblastoma cells. Furthermore, we demonstrated that these effects are reduced and/or reversed by the pineal indoleamine, melatonin.

"A 24-hour exposure to 50 μg/L mercury induced significant cell cytotoxicity in neuroblastoma cells. Treatment of cells with melatonin before administration of mercury greatly reduced the mercury-induced cytotoxicity. Mercury treatment of cells produced another undocumented phenomenon, that of inducing oxidative stress, as measured by the loss of reduced glutathione (GSH) from cells. This was a rapid process, requiring only 30 minutes of exposure to mercury. Similarly, pretreating the cells with melatonin...before administration protected cells from the mercury-induced oxidative stress. Melatonin's mechanism of action is at present unclear; however, melatonin is known to bind heavy metals (Limson et al., 1998REF15) and to increase intracellular GSH levels through an up-regulation of GSH-synthesizing enzymes (Todoroki et al., 1998REF3). It is thus possible to speculate on two mechanisms for melatonin's antioxidant action, namely, (a) melatonin as a chelating agent binding mercury, thus eliminating its cytotoxic properties, or (b) melatonin causing production of increased levels of intracellular antioxidants such as Glutathione (which chelates mercury) (Todoroki et al., 1998REF30). It is not excluded that both these mechanisms could be operating simultaneously.

"The release of both Aß 1-40 and Aß 1-42 into the culture medium was increased by exposure of SHSY5Y cells to mercury. Melatonin preincubation resulted in a significant decrease in Aß release....Mercury has previously been shown to be a potent inhibitor of enzymes, especially those containing sulfhydryl groups (Edstrom and Mattsson, 1976REF9). Protein kinase C activity in vitro and in brain tissue is markedly reduced in a concentration-dependent manner by mercury (Rajanna et al., 1995REF21)...Mercury induces both Aß production and oxidative stress; thus, the chelation of mercury by melatonin could shift the APP metabolism back toward the secretase pathway, reducing Aß production and the concomitant, oxidative, stress-inducing effects of mercury and Aß. Aß-Fibrillogenesis is also inhibited by melatonin, thereby potentially reducing the toxic buildup of Aß 1-40 and Aß 1-42 fibrils (Pappolla et al., 1998REF20). Furthermore, melatonin has been shown to reduce the release of soluble APP from cells in culture and to reduce the levels of APP mRNA and other housekeeping protein mRNAs (Song and Lahiri, 1997REF24). These data suggest that melatonin may be involved in metabolic mechanisms regulating APP and other essential cellular protein production, over and above its antioxidant capacity.

"In a similar fashion, mercury induced an increase in tau phosphorylation as compared with untreated cells. Melatonin treatment was able to protect cells from the mercury-induced tau hyperphosphorylation. Mercury's influence on tau phosphorylation remains unclear; however, it may be an indirect effect via oxidative stress and Aß production. Both Aß and oxidative stress have been shown to influence tau phosphorylation (Busciglio et al., 1995REF6; Takashima et al., 1996REF26)"—Journal of Neurochemistry, Vol. 74, No. 1, 2000 231-236 © 2000 International Society for Neurochemistry.

Melatonin is concentrated in the mitochondria, and protects them from oxidative damage. Dr. Reiter found melatonin to be 5.9 times more effective than glutathione and 11.3 times more effective than mannitol in fighting dangerous, hydroxyl radicals.

> A direct mechanism involving mercury's inhibition of cellular enzymatic processes by binding with the hydroxyl radical (SH) in amino acids appears to be a major part of the connection to allergic/immune reactive conditions. For example, mercury has been found to strongly inhibit the activity of xanthine oxidase and dipeptyl peptidase (DPP IV) that are required in the digestion of the milk protein casein, and the same protein that is cluster differentiation antigen 26 (CD26) which helps T-lymphocyte activation. CD26 or DPP IV is

a cell surface glycoprotein that is very susceptible to inactivation by mercury binding to its cysteinyl domain.

DPP IV has many different functions in the body besides digesting gluten and casein. As stated, this protein is known to influence T cells of the immune system. It is also a binding protein for purine and adenosyl deaminase. **Because of this, a problem with DPP IV can throw off the immune system, the amino acid profile, and methylation.** To improve methylation when this DPP IV is hampered, these nutrients may be helpful: Tri-Methyl-Glycine (TMG), B_6, folic acid, B_{12}, magnesium, and serine. A supplement of D-L-methionine or S-Adenosyl-Methionine (SAM) is often helpful to the undermethylated; however, a large amount of methionine readily chelates many vital minerals as well as histamine and heavy metals.

Mercury and other toxic metals also inhibit binding of opioid receptor agonists (mimics of the real thing) to opioid receptors, while magnesium stimulates binding to opioid receptors. Studies involving a large sample of autistic and schizophrenic patients found that over 90% of those tested had high levels of the milk protein beta-casomorphin-7 in their blood and urine, and defective enzymatic processes for digesting milk protein, and similarly for the corresponding enzyme needed to digest wheat gluten. The studies found high levels of IgA antigen-specific antibodies for casein, lactoalbumin, and beta-lactoglobulin, and of IgG and IgM for casein. Beta-casomorphin-7 is a morphine-like compound that results in neural dysfunction, as well as being a direct histamine releaser in humans, and it induces skin reactions. Minerals are also involved in the enzymatic processes involved in utilization of B_6, B_{12}, and Super Oxide Dismutase (SOD). Mercury blocks these enzymatic processes, and it affects cellular membrane influx/efflux of minerals such as calcium, magnesium, sodium, and potassium. Mercury also affects the ATP energy system and neurotoxicity by affecting the distribution and utilization of these minerals.

Elimination of milk and wheat products and sulfur foods from the diet has been found to improve the condition. A double blind study using a potent opiate antagonist (which blocks a receptor without having any effect on the cell), naltrexone (NAL), produced significant reduction in autistic symptomology among the 56% most responsive to opioid effects. The behavioral improvements were accompanied by alterations in the distribution of the major lymphocyte subsets, with a significant increase in the T-helper-inducers and a significant reduction of the T-cytotoxic-suppressors (Alpha Lipoic Acid also provides this same shift in these ratios—WSL), and a normalization of the CD4/CD8 ratio. (If naltrexone is used, it should be only in low doses of 3 to 6 mg per day in conjunction with a Gf/Cf dietary. Higher doses of 25 to 50 mg, usually prescribed, can cause children to have pain and headaches according to Dr. Bruce Semon, Child Psychiatrist—WSL.) Studies have found mercury causes increased levels of the CD8 T-cytotoxic-suppressors. As noted previously, such populations of patients have also been found to have high levels of mercury, and to recover after mercury detoxification. As mercury levels are reduced, the protein binding is reduced, and improvement in the enzymatic process occurs.

Another effect of mercury and toxic metals is a reduction in B-lymphocytes. One of these studies dealing with autistic patients has found this causes a tendency to be more seriously affected by viruses, and to develop intestinal disorders including leaky gut, lymphoid modular hyperplasia (measles lesions in the gut), and a high incidence of parasites.

> Additional, cellular-level enzymatic effects of mercury's binding with proteins include blockage of sulfur-oxidation processes which have been found to be significant factors in many autistic, plus enzymatic processes involving vitamins B_6 and B_{12}, with effects on the cytochrome-C energy processes as well. Epsom salts (magnesium sulfate) baths, supplementation with the P5P form of vitamin B_6, and with vitamin B_{12} shots are methods of dealing with these enzymatic blockages that have been found effective by those treating such conditions. Mercury has also been found to have adverse effects on cellular mineral levels of calcium, magnesium, zinc, and lithium. [By heavily depleting magnesium, excess calcium is allowed into the cells. Supplementing with these minerals, especially with high amounts of magnesium (preferably as glycinate), and zinc, has been found to be effective in the majority of cases—WSL]. Another result of these toxic exposures and enzymatic blockages is the effect on the liver and dysfunction of the liver detoxification processes which autistic children have been found to have. All of the autistic cases tested were found to have high, toxic exposures/effects and liver detoxification profiles outside of normal.—Immune Reactive Conditions: The mercury connection to eczema, autism, schizophrenia, lupus, asthma, and allergies (taken from larger study)—Bernard Windham, Chemical Engineer.

This abstract adds to Bernard's thoughts: Ciba Found Symp 1977 Apr 26-28;(46):243-61; "Gastrointestinal complications of immunodeficiency syndromes". Katz AJ, Rosen FS. Patients with B-cell deficiency have a high incidence of prolonged Giardia lamblia infection of the gastrointestinal tract that causes symptoms of malabsorption with villus flattening. The changes are reversible with therapy directed against Giardia. There is a high incidence of pernicious anemia in patients with agammaglobulinaemia. Those with abnormal B-lymphocytes tend to develop lymphoid nodular hyperplasia (measles in the gut). Gastrointestinal disease is rare in boys with X-linked agammaglobulinaemia (a lack of gamma globulins) when compared with adults with the 'acquired' or common variable form of the disease. T-cell deficiency results in intractable diarrhea and monilial (fungus, specifically Candida) infection of the gastrointestinal tract. End of abstract. In another study, a significant reduction in the number of B-lymphocytes was observed in mercury-exposed individuals. **Pernicious anemia (vitamin B_{12} deficiency) occurs 20 times more frequently in patients with hypothyroidism than generally. Another common anemia in hypothyroidism is caused by the bone marrow being too cold to produce adequate red blood cells! These anemias will be made worse with iron supplementation.**

Heavy metals inhibit cytochrome p450 enzymes and mitochondrial energy production; and they are neurotoxins. The stress pattern spoken of, indicative of adrenal stress, is presented in hair analysis by a marked, paired deviation in calcium and magnesium with an opposing deviation in sodium and potassium in the opposite direction. This pattern is accompanied by an increased level of zinc (which is displaced from functional sites by cadmium, nickel, lead, and mercury), and elevated boron. Very low levels of calcium, manganese, cobalt, chromium, copper, and sometimes zinc characterize the malabsorption pattern. Copper is essential for production of monoamine oxidase that degrades hormones after they have fulfilled their function. The malabsorption pattern can be associated with intestinal yeast overgrowth, hypochlorhydria, achlorhydria (B_{12}, thiamin, zinc, or histamine deficiency), food allergies (increased with heavy metal burden), or inflammatory bowel disease.

Nickel exposure is common, and nickel exposure has been found to be significantly related to perinatal unthriftiness (failure to thrive) and mortality in animal studies, and to large numbers of people affected by allergic conditions such as eczema and psoriasis vulgaris and serious autoimmune conditions such as lupus and CFS.

Hypoparathyroidism, vitamin D deficiency, kidney failure, acute pancreatitis, or inadequate amounts of plasma magnesium and protein may also cause a deficiency of calcium in the serum. Mild hypocalcemia is asymptomatic (or

shows as nocturnal cramps—WSL). Severe hypocalcemia is characterized by cardiac arrhythmias and tetany with hyperparesthesia (tingling as if "asleep") of the hands, feet, lips, and tongue. The underlying disorder is diagnosed, and calcium is given by mouth or intravenous infusion. Hypocalcemia is also seen in dysmature newborns, in infants born of mothers with diabetes, or in normal babies of normal mothers delivered after a long or stressful labor and delivery. The condition is signaled by vomiting, twitching of extremities, poor muscle tone, high-pitched crying, and difficulty in breathing—1998 Mosby-yearbook, Inc.

The very lack of calcium increases a parathyroid hormone that opens the L-channels allowing uncontrolled amounts of calcium into the cells of smooth muscles causing contraction and high blood pressure, for example. This would also contribute to a spastic colon. Then, the parathyroid hormone, stimulated by a lack of vitamin D, induces the extraction of calcium from the bones. Contrariwise, mercury and PCBs block the L-channels contributing to low muscle tone. Supplementing calcium (1000 mg), manganese, magnesium, and vitamin B_6 controls influx of calcium into cells.

Dr. Lynn Wecker and his colleagues at Louisiana State Medical Centre observed that the autistic population had significantly lower levels of calcium, magnesium, copper, manganese, and chromium, and higher levels of lithium as compared to sex and age-matched controls. Children with autistic features (autistic-like), classified as having childhood-onset pervasive disorder, had lower levels of magnesium, cadmium, cobalt, and manganese as compared to controls. Discriminant function analysis using the 14 trace elements correctly classified 90.5% of the normal and 100% of the autistic population. Using a stepwise procedure, the five elements with the greatest discriminatory power were calcium, copper, zinc, chromium, and lithium. Analysis based on these five trace elements led to the correct classification of 85.7% of the normal and 91.7% of the autistic group. You must supplement with a good vitamin-mineral product such as Mannatech™ GlycoBears® chewables (26 easily assimilated vitamins and minerals (no iron).

Wecker and team further observed that trace element imbalances in the human body can disrupt neurotransmitter function and produce marked changes in behavior—many of which are consistent with symptoms of autism. Deficiencies of mineral nutrients can make a child more susceptible to heavy metal absorption, and conversely, heavy metals can create mineral deficiencies. Furthermore, one genetic difference found in animals and humans is cellular retention differences for metals related to the ability to excrete mercury. For example, it has been found that individuals with genetic blood factor type APOE-4 (apolipoprotein E) do not excrete mercury readily and bioaccumulate mercury, resulting in susceptibility to chronic autoimmune conditions such as Alzheimer's, or Parkinson's, as early as age 40, whereas those with type APOE-2 readily excrete mercury and are less susceptible. Those with type APOE-3 are intermediate to the other 2 types. **Many have puzzled about where excessive levels of arsenic are coming from. It may come from wool carpets and underlays that are treated with arsenic! Yes, and from your playpen mattress and sand box! Data show that cereals are a major source of arsenic during infancy and that changes in hair arsenic levels during infancy correspond to the introduction of cereals into the diet. This may relate to the fact that much arsenic comes from drinking water, including that used in making that cereal. You must have a heavy metals check, and detoxify your child at the earliest time. My book "Self-help to Good Health" (50 Chapters, $29.95 US) has a Chapter on detoxifying heavy metals naturally.**

Heavy-metal overloads can effectively be treated using oral supplements of zinc, manganese, cysteine, serine, and vitamins B_6, C, and E (also cilantro, iodine, selenium, and melatonin - Willis). The initial treatment must be gradual to avoid a sudden dumping of metal toxics from tissues, which could cause kidney damage and a worsening of symptoms—Dr. Wm. Walsh.

Inexperienced doctors trying to detoxify mercury with DMSA, and possibly DMPS, may damage these children

irreparably! Natural medical physicians throughout the US have reported MS symptoms in adults and intractable seizures in pediatric patients with high dose and extended use of DMSA (2, 3-dimercaptosuccinic acid), Chemet, or Succimer. Irresponsible use of these toxic drugs will damage the sulfoxidation system of PST children beyond repair. One reason to be careful is that DMPS takes the metals out in a certain order: zinc, tin, copper, arsenic, mercury, plumbum (lead), iron, and cadmium, creating damaging deficiencies in necessary metals (minerals). DMSA does not chelate aluminum, one of the problem metals for the kids. Magnesium in glycinated form is said to reduce aluminum as will malic acid (apple cider vinegar). In addition to folic acid, vitamins B_6, and B_{12}, and molybdenum, DMPS takes considerable glutathione (GSH) to metabolize it. Furthermore, "Urinary values, without looking at the cellular mercury/low weight, free-thiols, and therefore susceptibility to the metal, are useless. One who has 1 mcg/l coming out in the urine, due to depleted thiols, can be more toxic from mercury than one with 50 mcg/l coming out who has normal or high cellular thiols. Thus, it would be very important to test cellular thiols in some cellular samples OTHER THAN BLOOD. Since red cells are renewed every 120 days, the red cell pool is not usually affected by the chronic mercury that accumulates in thiol-richer and/or more stable cells of the organs of the kidneys, liver, brain, colon surfaces, oral cavity gums, and alveolar bone. Unless you check those cells, and look at mercury/low weight, free-thiol ratios in those, and get some real indicators of toxicity and susceptibility, the urine measurements are useless."—Ray Saarela, Biochemist who has experienced DMPS damage, and developed a safe protocol for detoxifying mercury. Ray has this to say about DMPS and DMSA: "You may want neither of the two, as both worsen the kidneys (DMPS horribly, and DMSA does also cause kidney pain and worsening each time I take even just very small doses in 25-150 mg range)." **It is important to realize that DMSA triggers the inflammatory mediator Tumor Necrosis Factor [TNF(a)], so it would be important to actively use agents that reduce inflammation when using this protocol.** Dr. Yasko has been able to accomplish that with an RNA-based, oral, liquid product that is easily added to the food (www.holisticheal.com or www.longevityplus-ma.com).

These are the recommendations of the DAN! Mercury Detoxification Position Paper (May 2001): "DMSA should be given in doses of no more than 10 mg/kg/dose and no more than 30 mg/kg/day with a maximum dose of 500 mg (1500 mg/day maximum). Exceeding these limits has been associated with a significantly higher incidence of side effects and toxicity. The dosing interval can be any convenient period, as long as the dose limits are not exceeded. There is no convincing evidence to suggest that dosing intervals shorter than eight hours provide any inherent benefit, although a lower dose given more frequently may help to reduce troublesome side effects. In addition, the subset of children who experience improvement only while receiving DMSA may benefit from more frequent dosing. Clinical experience supporting 3- or 4-hour dosing intervals is matched by equally good results with 8-hour dosing. As always, the dosing interval should be based on the clinical response of the individual patient."

Phase II of the DAN! protocol calls for adding Alpha Lipoic Acid to the treatment: "Start with 1 to 3 mg/kg/day of alpha-lipoic acid and increase to 10 mg/kg/day as tolerated. Alpha-lipoic acid is a natural product of human cells and so has minimal toxicity; doses of up to 25 mg/kg/day given over more than three years have been studied in adults with no detectable toxicity. Nevertheless, there is frequently an explosion of Candida overgrowth that is limiting its use. There is also a theoretical concern that alpha-lipoic acid may bind to DMSA and reduce the availability of both, but this has not been seen clinically. Another concern is that alpha-lipoic acid reduces the removal of methyl-mercury by glutathione, which is a reason why it should be given with DMSA. [Lipoic acid apparently is metabolized in the liver by glutathione as large doses of lipoic acid have been shown to literally drain the liver's glutathione stores as lipoic acid - glutathione conjugates are excreted into bile. This is not, per se, toxic, but it is surely an undesirable side effect! It also depletes molybdenum and vitamin B_{12}—WSL.} There is also evidence that alpha-lipoic acid reduces copper excretion (Dr. Russell Blaylock, MD, in "Excitotoxins", says it chelates iron and copper). Since DMSA increases copper excretion (it has been used to treat the copper intoxication of Wilson's disease), this should not be a problem if alpha-lipoic acid is used with DMSA" (nevertheless, it can contribute to the cysteine pool potentially increasing the risk of cysteine toxicity if this pathway is messed up —WSL).

The DAN! protocol continues: "A serious concern with alpha-lipoic acid (ALA) is that it can facilitate the movement of mercury out of and into the cells. It can be very useful in mobilizing mercury from within the cells and making it available for DMSA to chelate. Without the DMSA to 'grab' the mercury from lipoic acid, it may readily enter other tissues." Dr. Holmes reports that it appears that adding glycine to every dose of DMSA increases mercury excretion. She further states that younger patients excrete much more mercury than the older patients accounting for their more rapid favorable response. Iif you choose to use DMPS, this doctor's note may be of interest: "Hyaluronic acid (HA) is a major carbohydrate component of the extracellular matrix and can be found in the skin, joints, eyes, and most other organs and tissues. HA is utilized in many chemotherapy protocols as a potentiating agent. HA is also being utilized for many novel applications in medicine. Personal experience has shown that the addition of 2 ml with the DMPS tends to improve the excretion of mercury by two- to four-fold with virtually no toxicity".

A more real concern has developed in that when ALA is added to the DMSA, a tremendous overgrowth of Candida occurs. As a result, several DAN! Doctors have looked for an effective chelator to use in conjunction with or separate from DMSA. They have settled on TTFD. In the August issue of Neuroendocrinology Letters, Lonsdale and associates report on the use of a supplemental nutrient known as thiamine (vitamin B_1) tetrahydrofurfuryl disulfide (TTFD or Allithiamine) in treating 10 autistic spectrum children between the ages of 3 and 8 years. This synthetic disulfide derivative of the vitamin is manufactured in Japan where the original, naturally-occurring substance was discovered in garlic. Since it has never been approved for use in the U.S.A., Dr. Lonsdale holds an Independent Investigator License from the FDA. The patent in Japan expired years ago and no drug company in the U.S. has undertaken the rigorous testing required for its use here. The study reported by Lonsdale and associates showed that 8 of the 10 children improved with two months of continuous treatment with TTFD. There was evidence of biologic disturbances that may be an important part of the environmental factors involved. For example, it is known that it is not uncommon for many of these autistic children to suffer from various vitamin deficiencies and three of the children in this study were shown to be deficient in vitamin B_1.
This is a serious as a lack contributes to kidney disease, and many other symptoms. Since TTFD provides high concentrations of this vitamin as part of its metabolic action, later tests showed this deficiency to be much improved. Six of the ten children had unusually high concentrations of arsenic in their urine that increased after 30 days of treatment with TTFD and decreased after 60 days, thus providing evidence that this toxic metal was being removed from the child thus affected. There were also sporadic appearances of mercury, cadmium, lead, and nickel in the urine of some of the children. TTFD blocks taurine production causing a light-colored stool; thus, taurine needs to be supplemented.

Another form of vitamin B_1 looks most promising, that is Benfotiamine, an oil-soluble metabolite of thiamine. It works to enhance the enzyme transketolase that transforms glucose into useable forms in the cell, and minimizes conversion of glucose to harmful sorbitol. Tests show Benfotiamine to be 15 times more effective than vitamin B_1 in increasing the activity of transketolase. It blocks Nuclear factor-kappa beta that regulates cellular proliferation and suicide and that is implicated in inflammation, tumor formation, macular degeneraton, and retinal disease. Benfotiamine has shown to benefit the diabetic in prevention of both retinal damage and peripheral neuropathy.

Kidney side effects and lowering of neutrophils are both documented DMSA side effects. Extended use of DMSA can cause mild to moderate neutropenia with increased SGOT, SGPT, Platelet count, Cholesterol, Alkaline Phosphatase, and Blood Urea Nitrogen (BUN). Adverse reactions to DMSA include ataxia (inability to coordinate muscular movement that may indicate a copper deficiency), convulsions, rash, nausea, diarrhea, anorexia, headache, dizziness, sensorimotor neuropathy, changes in urination, arrhythmia, infection, redness of the face and

extremities, heartburn, vomiting, loose stools, metallic taste in mouth, hemorrhoids, stomach and abdomen cramps, flu-like symptoms, tremors and twitches (magnesium depletion), and headache. Based on experiences and literature studies and studying people's reactions to chelators, red itchy skin, swollen faces and hands are most probably reactions to DMSA, that is, metabolic or immunological intolerance to it, rather than an ACTION of cleansing. Those people who tolerate DMSA OK have not developed itches or swollen body areas.

According to the DAN! protocol, these are the common side effects of DMSA: "nausea, diarrhea, anorexia, flatulence, and fatigue. If these become serious enough, reducing the dose will usually make the symptoms tolerable. Occasionally, patients develop a maculopapular rash during treatment; this should not to be confused with an allergic reaction. Some autistic children are reported to experience a transient regression in language and behavior during and shortly after treatment. Reducing the dose may also make these symptoms less bothersome. Clinical experience suggests that most children who experience regression at the start of therapy will have less regression with each subsequent cycle of treatment." Beneficial "side-effects" reported with DMSA therapy in autistic children include rapid progression of language ability, improved social interaction, improved eye contact, and decreased self-stimulatory behaviors ("stimming"). Children with motor problems have experienced significant improvement in both strength and coordination. If intestinal dysbiosis (particularly Candida) is not adequately treated prior to starting DMSA, any improvement from the DMSA may be masked when the intestinal dysbiosis worsens on exposure to a rich culture medium such as DMSA, cysteine, cystine, or NAC. Additionally, the detoxifying pathways will be overloaded, leading, in my humble opinion, to recirculating of the heavy metals! It is interesting to note a report that NAC can stimulate lymphocytes or inhibit them, usually the later in the limited tests done. Consult your physician if there are bothersome effects.

DMSA induced Erythema multiforme (Stevens-Johnson syndrome) is a self-limited inflammatory disorder of the skin and mucous membranes. It is thought to be induced by immune complexes and mediated by lymphocytes. Distinctive target-shaped skin lesions, sore throat, mucous ulcers, and fever characterize it. It usually begins a week or more after therapy starts and will usually resolve spontaneously if the inciting medication is stopped. Toxicepidermal necrolysis (TEN) is the most serious cutaneous drug reaction and may be fatal if not recognized. Its onset is generally very acute and characterized by epidermal necrosis without significant dermal inflammation. Its pathology is poorly understood, but it also usually resolves when the inciting agent is stopped. TEN and Stevens-Johnson syndrome are absolute contraindications to continued DMSA therapy. There are no specific treatments other than supportive therapy and symptom relief. It is reported that some are using DMSA in liquid form. This may be an expensive mistake as DMSA in liquid is said to lose up to 20% of its potency each 24 hours!

Zinc excretion doubles during the administration of DMSA. This can cause kidney dysfunction where the hair zinc/copper ratio is less than 5:1. Patients must be kept hydrated as renal function can be compromised. DMSA removes mercury from the "extracellular compartment," which is about half the body. DMSA is completely useless for detoxifying the brain, and if not used on the every 4-hour schedule may increase brain mercury levels according to Andy Cutler and others. Your child may also show an increase in autistic symptoms (may become more "stimmy" or show more oppositional behavior). If the side effects are severe or difficult to deal with, stop the cycle and allow a rest time, then start the next cycle with a lower dosage. You may also want to try a shorter, chelation cycle, with a larger rest period in between. The main target for mercury is the kidney. **Mercury has been shown to cause a 50% reduction in kidney, filtration function after just two months with new amalgam fillings in the mouth.** It would be wise to support the kidneys by supplying kidney, glandular supplements and other nutrients. Dietary fiber and apple pectin can aid the organs of elimination.

Regarding challenge tests with chelating agents (administration of appropriate agent followed by mercury urinalysis),

Dr. Dietrich Klinghardt, long-experienced chelation therapist, has this to say; "Our clinical experience has shown that when a patient is mineral deficient (especially sodium, calcium, or potassium), the body is unable to effectively mobilize toxic metals with a challenge test! The patient's mineral status needs to be corrected before successful mobilization [via a challenge test or actual detoxing] for mercury should be attempted." A failure to ensure that adequate copper, molybdenum, zinc, selenium, manganese, magnesium, and glutathione stores exist before chelation can induce a dangerous lack of these essential nutrients. Selenium binds mercury, cadmium, and arsenic and assists in reducing the amount of zinc and copper excreted through the urine in the presence of mercury. Seleno-methionine is more readily incorporated into the system than are other forms of selenium. This is particularly evident in the kidney. In workers who are occupationally exposed to mercury, their mean urinary selenium was lowered. **By increasing their selenium through the diet, urinary mercury excretion increased and blood levels of mercury reduced.** Most children are dehydrated, and efforts to rehydrate them should be made before chelation is begun.

The DAN! protocol states, "Selenium supplementation should be limited to 1-4 mcg/kg/day. Magnesium, molybdenum, manganese, vanadium, and chromium are all among the minerals that are deficient in autistic children; these can be supplied by a multi-mineral supplement. Be sure that this supplement does not contain copper. Copper is the one mineral that autistic children often have in excess and additional supplements will only worsen the excess." The exception would be for those children who have been tested low in copper, in which case it must be supplemented for vitamin C, zinc, molybdenum, and DMSA will dangerously deplete it. It would be valuable to monitor red-cell, copper levels. I further venture to say the amount of selenium recommended here is far too low, and should be in the 5 mcg/kg range for mercury has already depleted the child's stores of selenium, and chelating will reduce it the more. The presence of adequate selenium will bind mercury, preventing recycling in the gut and increasing release through the urine.

Urgent warning: Mothers are posting that their kids' responses to DMSA are exactly reverse of what should be occurring. The kid feels great "on" DMSA, but have regression and undesirable behaviors when in the resting or "off" phase. This is encouraging some to put the child on longer "on" periods and shorter "off" periods, even using some DMSA during the "off" period. These children are being poisoned and depleted of vital minerals! Some are reporting back (kidney) pain, which is a sure sign of kidney damage from mercury. One mother acknowledged that the child became progressively worse during off periods, but felt great while "on", but when the child developed back pain, she stopped chelation. In conversation about the experience, she acknowledged the child was depleted of selenium and molybdenum, but she allowed the chelation anyway. What you don't know can hurt you! This damage is occurring because panicked mothers are rushing to chelation without knowing the mineral/glutathione/sulfur levels, or they are ignoring known, low-mineral/glutathione levels. Chelation sucks minerals such as zinc, copper, calcium, selenium, magnesium, and molybdenum out of the kid, so if he is short to begin, he becomes dangerously deficient using DMSA. This damages kidneys in particular. Kids with sulfation problems (PST) are the ones being damaged. The only protection from this damage is to know that his molybdenum, selenium, and other mineral levels are high normal going in, and remain normal during chelation. Another mother reports that she knew the child was low on selenium, but she chelated anyway. The result was a dangerously high T3 thyroid hormone reading. This is damaging to the thyroid, liver, and other organs. If anyone is experiencing this reversal of usual response, or has any complaint of kidney pain, they must immediately cease chelation, and never touch it again until all mineral levels are normal to high normal. Doctors who are not monitoring mineral levels should be made aware of this problem, and the serious damage this can cause.

There is confusion over continued supplementation during "on" periods. Mr. Andy Cutler states that supplementation should continue daily whether "on" or "off". He feels there will be no significant difference in chelation results, and the child's mineral stores will be better protected. The one exception appears to be zinc. Zinc should probably not be supplemented at a higher level than is in a daily multiple during the "on"

days. During "off" days, supplement added zinc in the evening apart from meals, with a bit of oil to aid assimilation. Zinc dipicolinate has been shown to have substantially greater absorption than zinc sulfate or amino acid chelates, but liquid, ionic zinc is best. I suggest Eidon (tm) Ionic Minerals Zinc Liquid Concentrate, which I found at The Vitamin Shoppe. Taking zinc with lecithin may enhance assimilation and sleep, preventing that 2 AM awaking.

The additional thoughts: "It is the author's continued experience that a 'healing crisis' means that more toxins are being pulled out of the tissue than the organs of elimination and the binding capacity of the chelator can cope with, causing the toxins to be redistributed in the body and to produce symptoms. If the choice of chelator, method of administration, dosage, and metabolic support are correct, the patient only feels better. If the patient's individual priorities and ability to utilize the protocol have not been established, the patient will feel, and be, worse. Depending on the size of the dose, massive amounts (up to a 750% increase from pre-challenge levels) of toxic metals can be mobilized via the liver and dumped into the bowel and or kidney using either SH (DMSA/DMPS) or P-SH (clathration type) chelators. Without proper drainage support, this can cause problems. If the patient is intolerant of or allergic to sulfur there will be additional complications—Timothy Ray, O.M.D., Lac.

A harmful side effect of any detoxification is the production of massive amounts of free radicals. Normally, a healthy body's antioxidant defenses (especially glutathione, the principle antioxidant in the liver) will neutralize most of the free radicals and protect not only your liver and kidneys, but all the cells threatened. However, when mercury and other poisons are being chelated, and the glutathione stores are depleted, as in autism, then great damage can be done. An interesting sidelight here, studies show that a 30% caloric restriction significantly increased lifespan (50% in some mammals). Additionally, a researcher in San Diego suspected that the life-extending effects of calorie restriction might be the result of a decreased intake of toxins. He removed the toxic, heavy metals from foods and found that the animals that ate a normal amount of food lived as long as the semi-starved animals. More recent studies show that some antioxidant supplements tend to give the same benefits. So, enhancing the body's ability to detox and to destroy free radicals by using antioxidants, such as the Ambrotose AO™, Phyt•Aloe®, vitamins C and E, selenium, and melatonin can offer vital protection against the damage inherent in all stresses including chelation therapy. Recent studies show that calorie restriction can extend the life of old mice, so it's never too late to start a good, dietary program supplemented with carefully selected antioxidants.

Mothers looking for a safe, gentle alternative to DMSA/DMPS have found several suggestions for binding and removing heavy metals herein. This is the latest research to come to hand and seems very exciting:

Modified Citrus Pectin Decreases the Total Body Burden of Mercury: A Pilot Human Clinical Trial
By Isaac Eliaz, M.D., M.S., L.A.c. Medical Director, Amitabha Medical Clinic & Healing Center, Sebastopol, CA
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Introduction:
Modified Citrus Pectin (MCP) is a dietary supplement that is derived from the peel and pulp of citrus fruit. MCP is mostly known for its effects on inhibiting cancer metastasis, and reducing tumor growth and development, but also has beneficial effects on cholesterol reduction, digestion, and possibly immune stimulation. It may also play an important role as a safe and effective heavy metal chelator. In a previous study, we demonstrated that MCP increases urinary secretion of heavy metals such as lead, mercury, cadmium, and arsenic. This pilot clinical trial was conducted in order to determine if MCP is able to reduce the total, body burden of mercury.

Methods:
Five patients were recruited in this pilot human clinical trial. The total body mercury burden for each individual was determined for baseline measurements using DMPS (2,3-Dimercapto-1-propanesulfonic acid) challenge of 250 mg i.v., followed by 6 hours of urine collection. Individuals were then given MCP (Pectasol®, EcoNugenics, Santa Rosa, CA) in

the dosage of 15 grams daily. The determination of the total body mercury burden was then repeated after MCP intervention, using an identical DMPS challenge test.

Results and Discussion:
The DMPS data of the participants was recorded and analyzed as in Table 1. The results showed a significant decrease in total body mercury burden for all participants after treatment with MCP (see Chart 1).

The decreases in total body mercury burden became more significant over time, and the smallest decrease in total body mercury burden was found in subject #3 who had the shortest duration of treatment, fourteen weeks. Four months was indicated to be the treatment time needed in order to obtain significant decreases in total body mercury burden.

These results demonstrated that MCP is capable of significantly decreasing the total body mercury burden in individuals after approximately four months. Statistical evaluation showed that the mercury burden for the group dropped from a mean average of 52.22 mcg / g creatinine to 16.02 mcg / g creatinine after dietary intervention with MCP, a 69.32% drop for the population ($p=0.0313$). Individual decreases ranged from 38.13 to 74.83%. No significant side effects were noted. A possible mechanism of action may be that MCP exerts its heavy metal detoxification through gradient changes between the tissue and the blood stream. Although DMPS specifically evaluates mercury, results from a previous study with MCP increasing the urinary excretion of other toxic heavy metals (lead, cadmium, arsenic) indicate that MCP may be able to decrease the body burden of other heavy metals as well.

This new role of MCP in the chelation of heavy metals may also help in the treatment of cancer, a therapeutic area for which MCP has shown promising results. All the individuals completed the study, and there were no side effects reported.

Conclusion:
These results are promising for the therapeutic use of MCP in significantly decreasing the total body mercury burden, and in cases of heavy metal toxicity. We propose a mechanism of action for MCP acting as a gentle chelator in the blood stream. MCP's gentle nature allowed for safe chelation with no side effects, and so it may be a promising alternative to the harsher intravenous chelating therapies currently offered as primary therapy for heavy metal toxicity. Additional studies are warranted to optimize the application and benefits of MCP in heavy metal toxicity. Pectasol Chelation Complex (tm) by Advanced Bionutritionals provides one gram of MCP with 500 mg modified alginate complex.

Get the Lead Out

These are the symptoms of lead poisoning—do they look familiar? **Chronic infection in children, loss of appetite, weight loss,** chronic fatigue, cramps, **insomnia**, alopecia (hair loss), **colic and abdominal pain, indigestion, constipation,** nausea, **headache**, weakness, metallic taste, anemia, pre-eclampsia, miscarriage, sterility, kidney damage leading to elevated blood pressure, peripheral neuritis, arthritis, **anxiety, mood swings, nightmares, hyperactivity, aggressiveness, delinquent and disruptive behavior, depression, mental retardation,** delirium, coma, and death. **General cognitive, verbal, and perceptual abilities decrease as lead in the system increases.** These brain functions are impaired by lead significantly reducing zinc, copper, and iron in the brain, interfering with the zinc, copper, and iron-dependent enzymes that regulate mental processes. Lead also interferes with calcium, magnesium, and zinc, the sedative elements, leading to convulsions. **Hyperactivity and epilepsy are among the first presenting symptoms of lead poisoning.**

Addition of silicofluoride to the water of many communities causes people to absorb more lead. The lead blocks the action of calcium atoms in fostering the production of neurotransmitters in the brain—such as dopamine and serotonin. As a result, mental processes are seriously interfered with, and nerve reactions throughout the body depressed ... this sort of toxicity is shown by research to play a role in epileptic seizures

and other convulsions." [Ref: Fluoridation and Truth Decay, 1974, p.93] We will pick up the lead thread following the abstracts.

In one study, after seven months of fluoride treatment, the protein content of brain with fluorosis decreased, and the total brain phospholipid content (the stuff brains are made of) decreased by 10% and 20% in the 30 and 100-ppm fluoride groups, respectively. The main species of phospholipid influenced by fluorosis were phosphatidylethanolamine, phosphatidylcholine (both found plentifully in lecithin), and Phosphatidylserine. **The results demonstrate that the contents of phospholipid and ubiquinone (CoQ-10) are modified in brains affected by chronic fluorosis and these changes of membrane lipids could be involved in the pathogenesis of this disease.** Most physicians do not recognize fluoridation's adverse health effects, but they are documented in blind and double-blind studies. Allergy, hypersensitivity, gastrointestinal, and skin irritation are known side effects of fluoride ingestion. It impairs memory and concentration and causes lethargy, headache, depression, and confusion. Fluoride accumulates in human and animal pineal glands where it impairs melatonin production. The toxicity of fluoride is increased in people with inadequate nutrition (substandard vitamin-mineral-amino intake, especially iodine, the only thing known to remove it from the body), or who are immune-compromised (e.g., diabetics, renal disease, etc.). When inorganic fluoride compounds combine with gastric HCl, hydrofluoric acid is formed which exerts an irritating action upon the mucous of the stomach and the upper gastrointestinal tract. All these effects can be antagonized by giving calcium and magnesium combined (50 mg/kg each). Rather than giving such a rediculously high amount of these minerals, you must remove all fluoride from your drinking and bath water (or neutralize it with borax as outlined elsewhere in this paper), toothpaste, and prepared breakfast cereals that (due to use of fluoridated water in manufacturing) have up to three times as much fluoride as is legal for drinking water. Supplementing the above-mentioned phospholipids may be wise.

These two abstracts are quoted in full because of their import:

A hypothalamic digoxin-mediated model for autism.

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Abstract:
The isoprenoid pathway and its metabolites—digoxin (similar to digitalis – both from the fox glove plant), dolichol (long-chain, unsaturated, isoprenoid alcohols found within the mitochondria) and ubiquinone (CoQ-10)--were assessed in autism. The isoprenoid pathway and digoxin status was also studied for comparison in individuals of differing hemispheric dominance to determine the role of cerebral dominance in the genesis of autism. There was an upregulation of the isoprenoid pathway as evidenced by elevated HMG CoA reductase activity (a liver enzyme that produces cholesterol - indicating an excess) in autism. Digoxin, an endogenous Na+-K+ ATPase inhibitor secreted by the hypothalamus, was found to be elevated and RBC membrane Na+-K+ ATPase activity was reduced in autism (reducing energy generation). Membrane Na+-K+ ATPase inhibition can result in increased intracellular Ca2+ and reduced magnesium levels (an excitotoxic condition). Hypothalamic digoxin can modulate conscious and subliminal perception and its dysfunction may lead to autism. (This excess) Digoxin can also preferentially upregulate tryptophan transport over tyrosine resulting in increased levels of depolarizing tryptophan catabolites—(that includes) serotonin, quinolinic acid (NMDA agonist), strychnine (blocks glycinergic inhibitory transmission), and nicotine and decreased levels of hyperpolarizing tyrosine catabolites--dopamine, noradrenaline, and morphine--contributing to membrane Na+-K+ ATPase inhibition. Increased nicotine levels can produce increased dopaminergic transmission in the presence of low dopamine levels. NMDA excitotoxicity could result from hypomagnesemia induced by membrane Na+-K+ ATPase-inhibition and quinolinic acid, an NMDA agonist, acting on the NMDA receptor (as an excitotoxin).

(This) Hypomagnesemia and increased dolichol level can affect glycoconjugate metabolism and membranogenesis leading on to disordered synaptic connectivity in the limbic allocortex and defective presentation of viral antigens and neuronal antigens contributing to autoimmunity and viral persistence (common in autism) important in the pathogenesis (development of disease). Membrane Na+-K+ ATPase inhibition can produce immune activation, a component of autoimmunity. **Mitochondrial dysfunction consequent to altered calcium/magnesium ratios and reduced ubiquinone levels can result in increased free-radical generation and reduced free-radical scavenging and defective apoptosis leading to abnormal synaptogenesis (look this one up on Google).** Autism can thus be considered a syndrome of hypothalamic, digoxin hypersecretion consequent to an upregulated isoprenoid pathway. The biochemical patterns including hyperdigoxinemia observed in autism correlated with those obtained in right hemispheric chemical dominance. Right hemispheric chemical dominance is a predisposing factor for autism. END

This note is of interest here: Many proteins pertinent to normal cell physiology are glycosylated (have sugars attached), and variations in their glycosylation pattern often lead to changes in their function. Most major diseases are associated with a change in the glycosylation pattern of a central protein structure. These diseases (e.g., cancer, rheumatoid arthritis, heart disease, diabetes, infectious diseases and neurodegenerative diseases) directly involve glycoconjugates. Acidic glycohydrolases sequentially cleave sugar molecules off the glycoproteins (probably to meet their varying needs) and excrete them in small amounts in normal urine, **but in increased amounts in individuals with diabetes and/or renal (and probably other) disease.** - John S. Axford, BS, MD, FRCP

Hypothalamic digoxin deficiency in obsessive-compulsive disorder and Tourette's syndrome
Int J Neurosci 2002 Jul;112(7):797-816, Kurup RK, Kurup PA.
Department of Neurology, Medical College Hospital, Trivandrum, Kerala, India.

Abstract
The isoprenoid pathway related cascade was assessed in 15 patients with obsessive-compulsive disorder (OCD) and Tourette's syndrome (TS). The pathway was also assessed in right hemispheric dominant, left hemispheric dominant, and bi-hemispheric dominant individuals to assess whether hemispheric dominance has any correlation with these disease states. The levels of serum digoxin, HMG CoA reductase activity, and dolichol were found to be decreased in OCD and Tourette's syndrome as well as in left hemispheric dominant individuals with a corresponding increase in RBC Na(+)-K+ ATPase activity, serum ubiquinone, and magnesium levels. There was an increase in tyrosine and its catabolites, and a reduction in tryptophan and its catabolites in the serum (possibly reducing niacin and serotonin). The total and individual glycosaminoglycan (GAG) fractions, carbohydrate residues of glycoproteins, and the concentration of glycolipids decreased in the serum. The activity of GAG degrading enzymes and glycohydrolases were decreased. The RBC membrane glycoconjugates (glycoproteins, glycolipids, oligosaccharides, polysaccharides, proteoglycans) were increased while the membrane cholesterol:phospholipid ratio was decreased. The activity of free-radical scavenging enzymes increased while the concentration of free radicals decreased significantly. On the other hand, there was hyperdigoxinemia and the reverse biochemical patterns in those with right hemispheric dominance (as stated in the previous abstract). **Membrane Na(+)-K+ ATPase stimulation can result in decreased intracellular Ca2+ and increased magnesium levels. Increased levels of dopamine can lead to a tic syndrome, while reduced levels of serotonin and increased dopamine can both lead to obsessive-compulsive disorder. A decrease in fucose and sialo-ligands (two vital sugars), (along with) increased immunosuppressive morphine levels, decreased T-cell calcineurin (an iron-zinc enzyme also called protein phosphatase 2B) signal transduction related to decreased intracellular calcium, reduced free radical production, and altered presentation of bacterial glycoconjugate antigens can lead to a hypoimmune response and recurrent respiratory infection in OCD patients.** OCD and Tourette's syndrome are associated with left hemispheric chemical dominance. END

Thus, we see that an excess of digoxin contributes to autism and possibly high cholesterol, whereas a lack contributes to OCD, Tourette's, and possibly low cholesterol (a serious condition affecting hormone production and possibly the formation of cancer). The Fox Glove plant is too poisonous to recommend as an herbal, but it seems that a doctor could administer Digoxin to these suffering children who show a lack. It would appear that chelation of lead, diligent removal of all fluoride exposure and its removal from the body with a high intake of iodine and borax, action to increase serotonin and decrease dopamine, treatment of copper-zinc imbalances, and a supplement of Advanced Ambrotose complex to provide the missing sugars, would be very productive in overcoming OCD, tics, and Tourette's; whereas, action to reduce serotonin and increase dopamine (by a supplement of tyrosine or a nicotine patch), treatment of a copper-zinc imbalance, and a supplement of CoQ-10, magnesium, and Ambrotose AO to provide for the missing sugars and antioxidants would be indicated in Autism not commingled with OCD/Tourette's.

A challenge test for lead will only reveal what is in the blood, and blood tests may be nil. Lead is quickly stored in tissue, bone, and brain, and only found in testing if something has stirred it up. The best test for lead is hair analysis, often reading 10 times higher than in the blood. Nevertheless, it may take a year or more of nutritional therapy before lead is released from tissue storage and becomes detectable on hair tests. During chelation, it may appear to all be gone, only to be released from another reservoir and show high readings again a year later! It is of importance to note that children retain up to 50% of lead ingested, probably 5 times higher than adults, and they retain much more of that ingested between meals or with high fat or low casein diets, or when iron deficient. Lead can displace manganese and copper, both required for optimal adrenal function. Lead and fluoride are frequently associated with hypothyroidism, impairing the uptake of iodine by the thyroid. Lead is frequently associated with low zinc levels, and this low zinc is frequently associated with hypoglycemia and hypothyroidism. A low calcium/phosphorus ratio causes more lead to be incorporated into the skeleton, and adequate calcium, magnesium, zinc, vitamins B and C, and alginate must be present to eliminate lead. Since too much phosphorus interferes with calcium absorption, do not take your calcium supplements or high calcium foods with soft drinks or orange juice. Additionally, fluorine, chlorine, and bromine can and will, if given half a chance, replace iodine in any and all chemical reactions. “We even reverse hypothyroidism by simply getting rid of the lead poisoning.”—Dr. Garry Gordon, MD.

Additionally, today's “bromine problem” is particularly insidious because it causes “hidden hypothyroidism,” a condition in which “brominated thyroid” masquerades as thyroid hormone, fooling your doctor and robbing you of this energy-producing hormone. That’s right; excess bromine could be producing a “false read.”

If any heavy metal readings are “high normal” or more, they must be detoxified—preferably by nutritional means (see my Chapter “Heavy Metals Poisoning?” from my Electronic Book “Self-help to Good Health” ($29.95 US). Reducing lead from “high normal” will remove a number of the above listed symptoms. Do not use the chelators DMPS or high dose DMSA as these will likely further damage the gut, and they will impair Phase I liver enzyme function causing a further buildup of toxins. They (especially DMPS) can also further damage the sulfur oxidation system by draining the body of copper, molybdenum, zinc, and other mono-oxidase Phase I liver catalysts. The Physician’s Desk Reference™ documents that DMSA can cause neutropenia as a side effect. Neutropenia is a deficiency in neutrophil cells, the immune cells that kill foreign organisms, like fungus. Under no circumstances use DMPS and then Tylenol™ for pain. Tylenol™ toxicity from such a combination is a very real danger.

EDTA may not be the best choice for chelating mercury, or for removing lead, for it removes 8 to 12 essential minerals (EDTA and the dithiol complexing agents have affinities for Cu, Zn, Mn, Cr and Mo, and can indirectly result in Mg depletion), and it only chelates what is in the blood and on arterial walls. It does not reach into the body

tissues, and by removing calcium, it encourages deposition of lead. In addition, studies have found that use of EDTA by patients with high levels of mercury can cause serious side effects, so calcium EDTA should be used only when mercury levels have been found to be low. Nevertheless, Dr. Boyd Haley says EDTA "in excess" totally prevents toxicity of cadmium, lead, and copper, though it does make mercury more toxic. "Toxicity of Hg2+ is synergistically increased by the presence of other heavy metals such as Pb2+, Cu2+, Ag2+, Zn2+, etc. For example, an LD-1 kill rate of Pb2+ added to an LD-1 of Hg2+ gave a solution with an LD-100. If it were additive, it would have been and LD-2 solution. Now, consider what would happen if you added EDTA to this mixture of Pb2+ and Hg2+. The EDTA would chelate the Pb2+ removing its synergistic toxicity, which is major. Also, the EDTA could make the Hg2+ more toxic. However, the increase in Hg2+ toxicity caused by EDTA would be much less than the decrease in toxicity caused by removal of the Pb2+ by EDTA. Therefore, even though I know that EDTA cannot be expected to pull Hg2+ off protein thiol groups (a covalent bond), it could reduce the 'effective toxicity' of Hg2+ by removing Pb2+, Cd2+, etc., freeing up reduced glutathione to bind and remove Hg2+."

It seems to me that there are safer ways to remove lead, cadmium, and copper, and thus minimizing the toxicity of mercury. For example, in addition to the nutrients listed above, battery manufacturers found zinc with vitamin C very helpful. While using 2000 mg vitamin C and 60 mg zinc, the blood level of lead dropped 25% in 24 weeks, even as they continued working in the high-lead atmosphere. (This much vitamin C and zinc should be balanced with 8 mg copper - unless copper toxic - and 20 mg manganese.) Vitamin B_1, 50–100 mg (in form of a B–complex supplement), detoxifies lead also. One urgent reason to remove these heavy metals is the fact that they harbor bacteria, viruses, and yeast and protect them from antibiotics!

Alpha Lipoic Acid (ALA) is a medium-chain, fatty acid that is a powerful antioxidant, soluble in both water and fat, and an effective metals chelator. It regenerates both vitamins C and E, keeping them effective longer. A deficiency of lipoic acid results in reduced muscle mass, brain atrophy, failure to thrive, and increased lactic acid and pyruvate accumulation. Supplemental ALA enhances glutathione production, and regenerates glutathione and CoQ10 giving cells a double dose of antioxidant protection. It inputs nutrients (glucose) into the cells to improve the mitochondrial function (so those suffering hypoglycemia may find it lowers blood sugar adversely) and increases plasma ascorbate, plasma sulfur, and T-helper lymphocytes/T-helper-suppressor cell ratios. A supplement seems desirable, but do not use more than one milligram per pound of body weight in any one serving (it may be better to use only half that). Its short half-life indicates it should be taken several times a day. If any adverse responses are observed, cut that amount in half. Alpha-lipoic acid is very safe at these recommended dosages, although occasionally it causes mild stomach upset, and in rare cases it can trigger an allergic skin rash (detoxication?). If you experience any of these reactions, reduce the dose or stop taking the supplement. It is reported that large amounts can significantly alter thiol (sulfur) metabolism, distribution, and excretion—significantly increasing plasma cysteine levels, and by increasing bile excretion of glutathione, it may result in depletion of the liver stores of glutathione. Opioids have been shown to decrease hepatic glutathione also. This lack of GSH will seriously affect the availability of the thyroid hormones T3 and T4, and of the enzyme, aconitase that is dependent upon glutathione. A deficiency of aconitase will allow citric and aconitic acids to build up.

The human body can make enough alpha lipoic acid to prevent a recognizable deficiency disease, though not enough to perform all its functions. The optimal level of alpha lipoic acid varies with each person depending on biochemical differences, lifestyle, exercise, and how much oxidative stress they experience. The requirement of NADH and NADPH as cofactors in the cellular reduction of alpha-lipoic acid to dihydrolipoate in various cells and tissues has been reported. These cofactors can be lacking and block effectiveness of ALA. Certain diseases, environmental conditions, and age can cause a deficiency in lipoic acid, and thus the body often doesn't make enough to meet all its metabolic and antioxidant needs.

When sugar is metabolized in the production of energy, it is converted into pyruvic acid. **An enzyme complex that contains lipoic acid, niacin, and thiamine breaks down the pyruvate.** Pyruvic acid can be elevated for a number of reasons, but mercury is notorious for interfering with the mitochondrial, pyruvate dehydrogenase complex, where it binds to and deactivates the lipoic acid coenzyme, resulting in elevated pyruvic acid. Since the human body tends to have only the minimum amount of alpha lipoic acid to prevent recognizable disease, supplementation may help improve energy metabolism. This is particularly applicable in people with lower than normal levels, for example, individuals with diabetes, liver cirrhosis, heart disease, mercury toxicity, and HIV.

Nevertheless, there is compelling scientific evidence that high and constant doses of lipoic acid have the potential to seriously disrupt a number of key minerals including copper, zinc, and molybdenum, possibly elevating copper or zinc to potentially toxic levels. More than the recommended amounts will compete excessively with biotin, creating a deficiency of this vital B-complex vitamin. It may also impair a vital enzyme, Carboxylase. It is thought to deplete copper stores of the liver and distribute it to other tissues, creating a potential toxicity. Do not use ALA if known to have high (or low) levels of these minerals, or high levels of cysteine. Large supplemental amounts can also deplete the liver of vital glutathione, defeating the very thing for which it is being used. **A German study reports that six months of lipoic acid causes a vitamin B_{12} deficiency** [M Siepmann, W Kirch]. It decreases lipoic acid serum levels of vitamin B_{12} [Aktuelle Neurologie, 2000, Vol 27, Iss 1, pp 33-35. www.drmirkin.com/diabetes/8310.html]. It would thus be wise to supplement vitamin B_{12}, molybdenum, and biotin with the lipoic acid. It might be helpful to supplement reduced (hydrogenated) glutathione, except where there is high cysteine. One of the concerns is the capacity of ALA to chelate mercury. If one has high levels of methyl-mercury (inorganic mercury from fish), ALA can hurt. This freed mercury will attach to available selenium. Unless adequate selenium is being supplemented, the mercury may not be promptly excreted, and a selenium deficiency could be induced. Hepatic GSH is a primary substrate for organic-Hg clearance from the human; and intraneuronal GSH participates in various protective responses against Hg in the CNS.

Many of the "backfires" from using DMPS indicate a loss of the sulfur-oxidizing enzyme "sulfite oxidase", a molybdenum-histidine containing enzyme, and a dose dependent reduction of cellular, low-weight thiols including that vital antioxidant glutathione. This will compound the PST/sulfate problem. Antibiotics should be avoided for the same reason, and steroids will do more harm than any long-term good. Giving steroids might reduce the rate of demyelination, if that exists, or "cool" an inflamed gut, but giving steroids can also further disrupt the immune function and exacerbate an underlying infection such as HHV-6 or blood-brain-barrier, localized measles. Save the drugs until all else recommended herein fails (it won't).

The best detoxifier of all in this instance is glutathione, but don't take the glutathione precursors that contribute directly to the cysteine pool. L-cysteine, ALA, and whole glutathione do this. N-Acetyl-L-Cysteine (NAC) produces glutathione, and it is a mercury chelator in its own right. It should completely clear the body within 24 hours if it is not utilized in making glutathione (according to published pharmokinetics study). NAC does not contribute directly to cysteine toxicity unless you take massive amounts of it. Around 600 mg/day (adult) stands to benefit without significantly increasing risk of cysteine toxicity. NAC should not be used initially or by itself with anyone suspected of having a significant body burden of mercury. Like alpha-lipoic acid, cysteine and cystine, NAC can bind with mercury and carry it across cell membranes. NAC is also a good culture medium for yeast, like its parent molecule, cysteine.

Build glutathione and "cool" the inflamed gut and the autoimmune response with Ambrotose AO®, or Ambro•Start® by Mannatech™. In addition, PLUS and SPORT by Mannatech™ supplies plant sterols that removes mercury. Investigators have revealed that phytosterols block the development of tumors in

colon, breast, and prostate glands. The mechanisms by which this occurs are not well understood, but we do know that phytosterols appear to alter cell membrane transfer in tumor growth and reduce inflammation. PLUS and Ambrotose® also remove lead. PLUS, Ambrotose®, and Phyt•Aloe® protect against organic solvents as well as heavy metals. I should note that Phyt•Aloe® bears several high sulfur, phenol-content vegetables, and may be contraindicated for some PST kids, or to those allergic to any of these foods, and it may be an irritant to Crohn's or Celiac Disease until bowel function is improved (use Ambrotose® and PLUS for marvelous improvements in bowel function).

Dr. Yoshiaki Omura discovered that the leaves of the coriander plant (Cilantro) could accelerate the excretion of mercury, lead, and aluminum from the body. He had been treating patients for an eye infection called trachoma (granular conjunctivitis), which is caused by the microorganism Chlamydia trachomatis. Following the standard treatment with antibiotics, Dr. Omura found that the patients' symptoms would clear up initially, and then recur within a few months. He experienced similar difficulties in treating viral related problems like Herpes Simplex types I & II and Cytomegalovirus infection. (Does this recurrent infection sound familiar?) Dr. Omura found those organisms seemed to hide and flourish in areas of the body where there were concentrations of heavy metals like mercury, lead, and aluminum. Somehow, the organisms were able to use the toxic metals to protect themselves from the antibiotics! (It is interesting to note: "Oral antibiotics inhibit excretion of mercury"—James B. Adams, Professor Chemical and Materials Engineering, Arizona State University.)

Dr. Omura noticed the mercury level in the urine increased after patients consumed a healthy serving of Vietnamese soup containing Chinese parsley, better known as cilantro, or coriander, since it comes from the leaves of the coriander plant. Further testing revealed that eating cilantro also increased urinary excretion of lead and aluminum. When cilantro was used concurrently with antibiotics or natural anti-viral agents and/or fatty acids like EPA with DHA, the above infections could be eliminated for good. (Acupnct Electrother Res. 95:20 (3-4): 195-229.) Further testing with those who had high levels of mercury following amalgam removal, showed that, without the help of any chelation agents, cilantro was able to remove the mercury in two to three weeks. (Acupunct Electrother Res 96;21 (2): 133-60.) I think this removed only the free mercury from the amalgam removal in this short time, however, Cilantro Extract has been shown in clinical trials and research to mobilize mercury, tin, and other toxic metals stored in the brain and spinal cord, and it moves them rapidly out of those tissues. This is a revolutionary discovery and makes cilantro the first known substance that mobilizes mercury from the Central Nervous System (CNS). Dr. Amy Yasko, ND, has discovered that even when all mercury has been removed by extensive DMSA usage, when she drops the viral load, mercury comes pouring out, confirming Dr. Omura's experience.

Be aware that mercury readings from the hair or blood will only reflect a current or recent exposure within approximately three months, or the body's active detoxification of mercury. A negative reading may be meaningless.

In addition to soup, one may use a Cilantro Pesto:

1 clove of garlic;
1/2 cup of almonds, cashews, or other nuts;
1 cup packed fresh cilantro leaves;
2 tablespoons lemon juice;
6 tablespoons olive oil.

Put the cilantro and olive oil in blender, and process until the cilantro is chopped. Add the rest of the ingredients, and process to a lumpy paste. (You may need to add a touch of hot water and scrape the sides of the blender.) You can change the consistency by altering the amount of olive oil and lemon juice, but keep the 3:1 ratio of oil to juice. (It freezes well, so you can make several batches at once.)

Cilantro is a very popular herb in Mexican cooking, and due to their large Mexican populations it is easy to find anywhere from Texas to California. In other areas, you may need to visit an Oriental market or specialty supermarket where is may be called Chinese parsley.

Dr. Klinghardt suggests making this "pesto" to increase your intake of cilantro:

Start with fresh, organic cilantro and wash it thoroughly. Place the cilantro in a blender, along with water, sea salt and olive oil. Blend the ingredients until creamy. Dr. Klinghardt recommends taking 1-3 tablespoons of this cilantro pesto, three times daily with meals. For those suffering from neurological problems, such as Alzheimer's, or brain "fogginess" and difficulty concentrating, the pesto may be taken more often, he says.

The best form of cilantro is a tincture available from Dragon River™ (505-583-2348) www.dragonriverherbals.com. The dose is one dropper applied on the wrists and rubbed in twice a day. The tincture is also particularly useful for any joint pain, and could be rubbed on the joint that is hurting as an alternative. You can also augment the tincture with using the herb. It is not as potent, but certainly will add to the program. However, like with chlorella, many people are sensitive to oral cilantro. So, if you develop any nausea or discomfort after eating cilantro, do not use it orally.

Garlic is one of the best chelators, and Kyolic™ aged garlic (800-421-2998) is a deodorized form that concentrates its chelating ability to 200 times that of a fresh garlic clove. It is shown to increase fecal excretion of mercury to 400%, and to completely protect blood cells against high levels of lead. It provides large amounts of selenium (prevents recycling of mercury into the system), germanium, and sulfur. The liquid extracts of garlic are said to contain less sulfites. Cilantro, garlic, selenium (selenomethionine), zinc, copper, manganese, magnesium, calcium, NAC, and glutathione are all effective mercury chelators, and I.V. vitamin C has been helpful in preventing brain fog. I would play it safe, and skip chlorella.

Acetaldehyde and NAD

Chronic exposure to acetaldehyde from alcohol, cigarette smoke, auto exhausts, and Candida creates a deficiency of vitamin B_1, pantothenic acid, and niacin (resulting in a lack of NAD/NADH). A moderately severe B_1 deficiency leads to a group of symptoms characterized by mental confusion, poor memory, poor neuromuscular coordination, and visual disturbances. The coenzyme form of niacin, NAD, is normally recycled continually during cellular energy production. **Yet, when NAD helps detoxify AH, this recycling of NAD is blocked, and the alternate form of NAD called "NADH" accumulates, impairing cellular biochemistry in many ways.** Thus, chronic AH exposure from Candida will likely produce a functional, niacin/NAD deficiency, but to supplement NAD would seem to exacerbate the NADH buildup.

This partial quotation would seem to give the solution to NADH buildup: "Treatment of the human Wurzburg T-cell line with 0.5 mM alpha-lipoate for 24 hr resulted in a 30% decrease in cellular NADH levels. Alpha-Lipoate treatment also decreased cellular NADPH, but this effect was relatively less and slower compared with that of NADH. A concentration-dependent increase in glucose uptake was observed in Wurzburg cells treated with alpha-lipoate. Parallel decreases (30%) in cellular NADH/NAD+ and in lactate/pyruvate ratios were observed in alpha-lipoate-treated cells. Such a decrease in the NADH/NAD+ ratio following treatment with alpha-lipoate may have direct implications in diabetes, ischemia-reperfusion injury, and other pathologies where reductive (high NADH/NAD+ ratio) and oxidant (excess reactive oxygen species) imbalances are considered as major factors contributing to metabolic disorders. Under conditions of reductive stress, alpha-lipoate decreases high NADH levels in the cell by utilizing it as a co-factor for its own reduction process; whereas in oxidative stress both alpha-lipoate and its reduced form, dihydrolipoate, may protect by direct scavenging of free radicals and recycling other antioxidants from their oxidized forms"—Roy S; Sen CK; Tritschler HJ; Packer L, University of California, Berkeley 94720-3200, USA

Neverrtheless, heavily processed foods are typically low on many nutrients, and NADH is no exception. Vegetarians tend to be quite low on NADH, since they do not eat meat. Stress, old age, fatigue, and disease will lower our natural supplies of NADH making it an important supplement. A deficiency of NAD/NADH produces fearful feelings, apprehension, suspiciousness, and worrying excessively with a gloomy, downcast, angry, and depressed outlook. NADH has been shown to improve mental and physical health by increasing production of a neurotransmitter called dopamine, benefiting Parkinson's disease. Dopamine is needed for our short-term memories to work properly, and it is required for good muscle tone. Without enough dopamine in our bodies, our muscles will get stiff and hands may tremor when used (familial tremor). NADH also helps produce another type of neurotransmitter called noradrenaline. This substance makes us feel alert and leads to better concentration. Both dopamine and noradrenaline are chemicals that can raise our spirits, so if either substance is in short supply depression usually results. NADH leads to increased levels of both of these "feel good" neurotransmitters, so it can be helpful in reducing depression.

It is interesting to note that according to two biochemistry books, "Harper's Biochemistry", twenty-fourth edition (pg 602) and "Textbook of Biochemistry", Thomas M Devlin, editor, Third Edition (pg 560), there are three separate paths for the synthesis of NADH. One starts with niacin, another with niacinamide, and a third involves the conversion of tryptophan to NADH catalyzed by vitamin B_6. I would thus conclude that the best approach would be to enhance all three paths at the same time. This would involve supplementing with niacin, niacinamide, vitamin B_6, and tryptophan at the same time (along with supporting nutrients). I could only guess as to the right distribution between these, but I would expect that by combining them, far less would be needed than the megadoses for niacin (up to 3g/day) or B_6 (up to 1.2g/day) that were used by Hoffer (niacin) and Pfeiffer (vitamin B_6). It would seem reasonable that adding a significant amount of tryptophan as a supplement to the B_6 treatment would greatly enhance the production of NADH.

In this same energy producing circuit is CoEnzyme Q10 (CoQ10). To ensure the body can make adequate CoQ10,

supply adequate tyrosine, pantothenic acid, P5P, and vitamin C. Headaches, insomnia, depression, agitation, and inability to concentrate may also occur unless the vitamin B-complex is supplemented significantly, preferably in its coenzyme form. CoQ10 may need supplementation also for it is usually at barely adequate levels in the diet to begin with (the best form is the oil gel cap. It is three times more bioavailable than the usual forms of CoQ10). Candida produces a harmful toxin, however, its main deleterious effect is avid binding of CoQ10. If fighting Candida, supplement CoQ10. Additionally, you may have normal blood thyroxin levels (T4) even though your basal metabolic rate is low and thyroxin cannot get into cells because of chronic acetaldehyde poisoning, as a result, blood tests are almost always an inaccurate measure of thyroid function with Candida.

Coenzyme A combines with acetate in all cells to form Acetyl Coenzyme A, the active form of Pantothenic Acid, perhaps the most pivotal single biochemical in all cellular biochemistry. Pantothenic Acid (vitamin B_5) is one of the most critical vitamins for normal brain function. It supports the adrenals and the pancreas, and helps the colon grow the beneficial bacteria. The disulfate form of pantothenic acid, pantethine, bypasses cysteine conjugation and decarboxylation. This might account for some of the clinical benefits seen with pantethine supplementation. (The amino acids methionine and cysteine are utilized in the formation of Coenzyme A, heparin, biotin, glutathione, and lipoic acid, and lipoic acid is required to breakdown pyruvate into Acetyl Coenzyme A.) Both sugar and fat must be transformed into Acetyl Coenzyme A to power the Krebs cycle that produces 90% of all the energy used by every cell in the body, including brain cells. Unfortunately, AH has a strong affinity to combine with Acetyl Coenzyme A suppressing its activity in a dose-dependent fashion. The energy-producing activity of cells falls in parallel with the declining levels of Acetyl Coenzyme A as the concentration of AH increases. **Acetyl Coenzyme A is also necessary for the production of acetylcholine, the memory, learning, and concentration neurotransmitter.**

Dr. Werbach's study demonstrated that people with colitis have markedly decreased Coenzyme A activity in the mucosal surface of their colons, even when the blood levels of pantothenic acid are normal. Dr. Atkins concluded, based on his success with these patients, that pantethine bypasses the block in converting pantothenic acid to Coenzyme A. But also, that pantethine is a growth factor for lactobacillus bulgaricus and bifidobacterium that we know help control yeast overgrowth.

By upping levels of a body enzyme, pantethine counteracts brain fog, certain allergic sensitivities, and some consequences of alcoholism. In people with candidiasis, the enzyme fights off a toxic byproduct called acetaldehyde. The pantethine-stimulated enzyme also detoxifies formaldehyde, an all too frequent offender for chemically sensitive individuals.

Acetaldehyde accumulations in tissue are responsible for weakness in muscles, irritation, and pain. Dr. Atkins states, "For all conditions that a doctor might prescribe prednisone—allergies, asthma, rheumatoid arthritis, psoriasis, lupus, and other autoimmune diseases, pantethine can be safely, effectively substituted. I routinely use it for all of those conditions on hundreds of my patients, and it's valuable in weaning them off steroidal drugs, or certainly in allowing a lower dose."

In summary, Dr. Atkins is saying that pantethine, without toxic consequences, can reduce cholesterol, counteract oxidation, stimulate the growth of friendly bacteria, and fight allergies, inflammation, autoimmune disruptions, and alcoholism, however, in long term use, it can drain the system of needed nutrients and adversely affect drug dosage. Of significant benefit would be increased vitamin D supplementation, preferably from two tablespoons of cod-liver oil.

In case you wondered, Dr. Cooter and Dr. Schmtt suggest 300 micrograms of Molybdenum per day in three divided doses, and further suggest staying on it for at least 4 months. Dr. Atkins suggests 450 to 900 milligrams daily of pantethine with an equal amount of pantothenic acid.

There are three major stages of energy-producing metabolism. The first stage is called glycolysis. It is the anaerobic (without oxygen) stage. It degrades glucose (from the blood) into lactic acid, or alcohol, or pyruvate. When the next two, aerobic (oxygenated) stages of metabolism are operating, the anaerobic stage produces pyruvate exclusively which then feeds into the Krebs cycle and the following respiratory chain. The first anaerobic step, glycolysis, produces two ATP molecules (the currency of energy in the cell) per molecule of glucose. The following two aerobic steps produce an additional 36 molecules of ATP. When the aerobic stages are not operating, the primary product is lactic acid and sometimes alcohol, but not pyruvate. Lactic acid buildup and excessive alcohol production are common in ASD. It can be seen that anaerobic metabolism will result in greatly reduced energy available to the cell, and will result in a voracious appetite for glucose just to supply the small amount of energy required for its reduced state of metabolism. This anaerobic metabolism is the process of cancer cell formation. A cancer cell is anaerobic. Toxic metals could be a root cause for genetic damage, causing anaerobic metabolism, and thus cancer. Removing them from the body could help in the prevention of cancer.

Candida converts sugars into ethanol. Unused alcohol converts into acetaldehyde. If you have adequate amounts of glutamine, selenium, niacin, folic acid, B_6, B_{12}, iron, and molybdenum, aldehydes continue to be metabolized into acetic acid, which can be excreted, or converted further into acetyl coenzyme A. If these nutrients are in poor supply, aldehydes begin collecting in the body's tissues. So, when we are fully nourished, Candida furnishes the body with a necessary part of the Krebs energy cycle necessary for the health and maintenance of all cells. When our digestion is unbalanced, we incompletely convert sugars into poisons, and they stay poisons in our human system. When our digestion is balanced, or we give it what it needs in terms of supplements, a potential poison is transformed into a source of energy—aldehyde poison becomes acetyl coenzyme A!

Pyrroluria

Pyrroluria is a common feature of many behavioral and emotional disorders. It belongs to the non-acute porphyrias—large amounts of porphyrins in the blood. It is said that an inborn error of pyrrole chemistry results in a dramatic deficiency of zinc, vitamin B_6, and usually arachidonic acid. More likely it is the result of mercury and other heavy metal toxicity. This observation on porphyrin aberrances brings into consideration other possible effects of mercury toxicity that are secondary to porphyrin depletion. Porphyrins are the precursors to heme synthesis. Heme is the oxygen-binding prosthetic group in hemoglobin, and depletion of heme would affect oxygen delivery to the mitochondria and decrease energy production. Heme is also a component of the electron-transport system of mitochondria and a prosthetic group in the P450 enzymes that are fundamental in the detoxifying of the body from many organic toxicants including pesticides and PCBs.

Just recently, a report was released implying that lack of heme was the major reason why ß-amyloid plaques build up in the brains of Alzheimer's diseased subjects. It seems that heme attaches to ß-amyloid helping it remain soluble and excretable-Boyd Haley, PhD.).

Pyrroluria suppresses Cytochrome p450 (Phase I) liver enzymes, leading to a build up of toxins within the body that accounts for many symptoms. The result is a genetic-stress disorder associated with severe mood swings, high anxiety, and depression. Pyrrolurics are devastated by stresses including physical injury, emotional trauma, illness, and sleep deprivation. A more severe form of Pyrroluria symptoms include explosive temper (rage), poor short-term memory, inability to tan the face, sensitivity to light and sound, a tendency to skip breakfast, dry skin, abnormal fat distribution, little or no dream recall, reading disorders, under-achievement, histrionic behaviors, and frequent infections. They usually respond quickly to supplements of zinc, manganese, vitamin B_6, Evening Primrose Oil, and augmenting nutrients. Selection of high AA-content foods (farmed salmon, tilapia, organ meats, turkey, fat pork, and eggs) can be most helpful in these instances.

There may be a need for a niacin supplement to prevent pellagra because B_6 is required to convert tryptophan into niacin. In porphyrias, there is elevated porphyrin in the urine. The decisive laboratory test is analysis for kryptopyrroles in the urine. You can get a urinary screen for elevated pyrroles for $32 from BioCenter Laboratory in Wichita, 800-494-7785. Collect the urine with the child off all zinc and B_6 supplementation for two days prior. Treatment centers on zinc, magnesium, manganese, and vitamins B_2, B_3, B_6, and biotin supplements together with omega-6 essential fatty acids and saturated fats containing AA.

Pyrroluria or Hemopyrrollactam Uria (HPU) **is a toxin that interferes with liver detoxification (blocks cytochrome p450 – phase I liver enzymes) and with heme production.** Schizophrenia (20%), Autism (53%), and Multiple Chemical Sensitivity (MCS) also has been linked to porphyrin metabolism problems. Many of the children with HPU have low levels of histamine (overmethylated), which may make them more sensitive to allergies. One source of this endogenous pyrrole is thought to arise from an aberrant, breakdown product of hemoglobin. Another source of the elevated hemopyrrollactam (pyrroles) is intestinal bacteria (Irvine and Wilson 1976). Sometimes, a form of the antibiotics tetracycline and kanamycin turn off the production of pyrrole. Porphyrin is the killing chemical inside NK-cells, and when these cells are destroyed, it releases higher rates of the porphyrins in the blood (possibly leading to Pyrroluria -WSL).

Porphirine and porphyrins are diagnostic indicators of toxic-cell damage effects from metals and chemicals. CFS causes lowered NK-cell population, and this is a result of their porphyrin content and RNase L ineffectivity toward viral infections.

(Corroborating insert: Most recently, a study showed that 53% of autistic children had aberrant prophyrin profiles similar to mercury toxic individuals. Treatment of these children with a mercury chelator brought these porphyrins back towards normal levels indicating mercury toxicity was the cause, not genetic impairment. Porphyrin profiles are one of the most sensitive methods of measuring toxic mercury exposures. Recently, in a major advance, it was shown that about 15% of individuals in one population displayed a marked sensitivity to mercury exposure in their porphyrin physiology, again supporting the concept of a genetically-susceptible (?) population that is more sensitive to mercury than the general population.

Heme production is promoted by the enzyme delta-aminolevulinic acid synthase (ALA synthase) that is formed in the mitochondria in the teen years. An essential cofactor is pyridoxal 5`phosphate (vitamin B_6). The reaction is sensitive to nutritional deficiency of this vitamin. **Drugs that are antagonistic to P5P also reduce heme production;** however**,** heme production is stimulated by barbiturates and by steroids with a 4,5 double bond, such as testosterone and certain oral contraceptives (most deplete vitamin B_6--as a result, these drugs exacerbate certain porphyries—a more severe form of pyrroluria). This double bond can be reduced by two different reductases to form either a 5-alpha or a 5-beta product. Only the 5-beta product affects synthesis of ALA synthase encouraging heme production. Since the 5-beta reductase appears at puberty, some porphyrias are not manifested until this age. Thus, we see that hormones play a part in the porphyrias. Dr. Raymond Peat has observed improvements in people with porphyria when they were placed on thyroid and/or natural progesterone—a good reason to support the thyroid as urged herein. This seems to say that in the younger children pyrroluria would likely be bacterial and should be treated with anti-bacterial approaches, especially strengthening the immune function.

About one third of porphyrics accumulate iron, and this is bound in a very tight fashion making it impossible to remove via bloodletting. Therefore, it has to be removed via iron chelation, and this may take 18 months according to Prof Chaim Hershko of the Hebrew University, Jerusalem. The percentage of iron accumulators among pyrrolurics also might be 30% or so, and again, their treatment might necessitate an iron chelator (IP6).

Symptoms of HPU are: paleness of the skin, especially of the face (pallor, a China Doll appearance, in summer the skin is yellowish or golden brown), recurrent ear infections, colds, allergies, hay fever, skin reactions,

hyperreactivity, dermatografy, headache, migraine, easy bruising, anemia; inability to climb a rope, climbing rack, or flying rings; abdominal pain in the upper left side, convulsions, a bad set of teeth, hypermobility of the joints, growing pains, especially of the knee (left), changes in handwriting, white marks on their nails, sensitivity to sunlight and sound, loss of appetite, nausea, stretch marks on the skin, sweetish breath odor, constipation, but more often an excessive stool mucus with bloating and a light colored stool, learning and behavioral problems, and high internal tension. Depression can lead to suicide. Mental symptoms are aggravated when undergoing stress. In fact, pyrroluria flares up when the individual is undergoing prolonged stress, such as during a chronic and debilitating illness. The nutrient dosage usually must be increased when the pyrroluric is under increased stress. Some depression patients have a genetic pyrrole disorder. Many of these persons report benefits from Prozac™, Paxil™, Zoloft™, or other serotonin-enhancing medications. However, similar benefits may be achieved by simply giving these patients sufficient amounts of vitamins B_6 and niacin, with Evening Primrose Oil, magnesium, manganese, and zinc. Actually, most or all these symptoms indicate the vitamin B_6 and zinc deficiencies.

Kryptopyrrole is an avid **aldehyde**-reacting agent that has been shown to combine irreversibly with Pyridoxal 5' Phosphate (a metabolite of vitamin B_6). The resulting kryptopyrrole-pyridoxal complex binds voraciously with zinc, and the combined product is excreted. (I understand the compound is actually hydroxy-hemopyrrolenone and not kryptopyrrole. See Clinical Chemistry 24(11)2069-2070 1978). This condition is termed Pyrroluria (or Malvaria) and affects 20% to 30% of Autistics. It has been identified as a form of psychosis that accounts for about 30 percent of psychotic patients (Pfeiffer, 1975). These patients are vitamin B_6 and zinc dependent and respond readily to zinc and vitamin B_6 therapy, however, experience shows it will take 6-months of supplementation at high levels.

Acetaldehyde (AH) also induces a deficiency of Pyridoxal 5` Phosphate (P5P), the major coenzyme necessary to form virtually all major-brain neurotransmitters. AH is known to strongly combine with the protein portion of P5P enzymes in a way that displaces the P5P portion of the molecule. This subjects P5P to an increased rate of destruction, and results in abnormally-low, blood and tissue levels of this coenzyme that is involved in all transamination reactions whereby cells may convert many different amino acids into each other to satisfy their ever-shifting, amino-acid needs. P5P also is necessary to convert essential fatty acids into their final-use forms, and to turn linoleic acid into the key, nerve-cell-regulating biochemical, Prostaglandin E1. P5P helps regulate magnesium entry into cells, and the ideal level of excitability of nerve cells is strongly dependent upon their magnesium level. P5P is also necessary to convert tryptophan into serotonin and niacin, and niacin/niacinamide into the active, coenzyme-form, NAD. Niacin participates in the enzymatic breakdown of sugar at several places in the energy cycles. A deficiency of niacin slows down brain metabolism to the point of causing what appears to be mental illness. Pellagra can be a result of this lack of vitamin B_6.

Acetaldehydes also unfavorably influence prostaglandin metabolism by deactivating Delta-6-Desaturase, the enzyme that converts the Omega-6 fatty acid, linoleic acid (LA), into gamma linolenic acid (GLA), that is totally absent from a typical diet. GLA is the only material that can be converted into prostaglandin E1 (PgE1), a key regulatory biochemical for both nerve cells and the immune system. Conditions that promote production of PgE1 prevent excessive production of the inflammatory prostaglandin E2 from the dietary fatty acid, arachidonic acid that is plentiful in meat, poultry, farmed salmon, and dairy products.

The first indication of pellagra is depression and perceptual disturbances, which can affect hyperactive and hypoactive, and autistic children. Like people with schizophrenia, affected children may hear voices and foods may taste different to them. Letters appear upside down, and words slip around the page. Children may see objects or creatures among the shadows in the semi-dark. Usually, children are unable to describe these changes in their perceptions without help. Pellagra is characterized by a pigmented rash that develops symmetrically in areas exposed to sunlight. Changes in the digestive tract that are associated with vomiting,

constipation, or diarrhea, and a bright red tongue with a shiny tip; and neurological symptoms including depression, apathy, headache, fatigue, loss of memory, loss of appetite, diarrhea, deficient stomach acid, fatigue, insomnia, apathy, encephalopathy, disorientation, confusion, amnesia, and manic-depressive psychosis.

Dr. Hoffer's "ABC of Natural Nutrition for Children" includes a hundred-question, Perceptual Dysfunction Test that can be completed by young children with the help of a parent. The PD Test was adapted by Dr. Glen Green from the HofferOsmond Diagnostic Test (HOD), which Dr. Hoffer and Dr. Humphrey Osmond developed in 1960 to screen for schizophrenia. The HOD test can be used to evaluate mental health in children over 10 years old although Hoffer says that some children may have difficulty with some of the vocabulary. The HOD test is available as a computer program at www.softtac@islandnet.com.

In addition to these questionnaires, a urine test can identify krytopyrrolle (KP), a substance commonly found in the urine of schizophrenic patients. This substance causes a deficiency of B_6 and zinc by latching onto these nutrients and removing them from the body via urine. Hoffer has noticed that children with positive KP results also respond to B_3. While all of these tests and questionnaires may point to vitamin deficiency, the primary test is to give the child large doses of niacinamide (often starting with 1 gram twice daily) (and B_2, B_6 and zinc). If the child's perceptual and behavioral problems are caused by a deficiency, Hoffer says that improvement will be noticed within months (or sooner).

"If your child has a low arachidonic acid (AA) on the membrane fatty acid test, I would get a urinary pyrrole test. We have good data from the Hormel Institute on consistently low AA levels in autistic children with elevated urinary pyrrole levels. At least a third of autistic and ADHD children have high pyrrole. When you see pyrroles elevated in a child, you know two things right away: 1) very high zinc requirement, 2) very high B_6 (prefer P5P) requirement. The higher the pyrroles, the greater these two are needed. Zinc picolinate may be preferred to other zinc supplements for the lack of B_6 may cause the formation of picolinate to be suboptimal. Manganese (and perhaps copper and iron) will be required to balance the zinc. This is such key information; I always get this urinary screen. Sixty percent of Down's kids have pyrroluria. I have all Pyrrolurics (low AA) on Evening Primrose Oil."—Dr. Woody McGinnis (compressed). Walsh finds biotin very useful in "slender malabsorber group". Those with low levels of Arachidonic Acid may benefit by supplementing DHA that is converted to AA in endothelial cells—PMID 3080955.

In the section of the book, "Gliotoxins, and Other Immunotoxins Produced by Yeast and Fungi", Dr. William Shaw writes:

"A second toxic effect of gliotoxins (an antibiotic that is toxic to higher animals, and that is produced by various fungi—WSL) is probably due to their action on the sulfhydryl (mercapto) group of proteins, which they inactivate. These sulfhydryl groups are necessary for the functioning of a wide variety of enzymes. Supplements of glutathione, N-acetyl cysteine, and lipoic acid might be useful to prevent this toxic action of gliotoxins since they help regenerate free sulfhydryl groups.

"A third way that gliotoxins may be causing their damage is by the generation of compounds called free radicals...Many of these harmful reactions can be counteracted by compounds called antioxidants such as vitamin C, vitamin E, lipoic acid, glutathione, or N-acetylcysteine. Several physicians who treat large numbers of children with autism have indicated to me significant improvement of symptoms in some children with autism after treatment with the nutritional supplements of glutathione or N-acetylcysteine." Dr. Shaw often recommends 500 mg of NAC for thirty days when beginning yeast therapy.

Research indicates that NAC is a selective immune system enhancer, improving symptoms and preventing recurrences of common lung-related illnesses such as chronic bronchitis. It is a vital antioxidant whose beneficial

characteristics include scavenging of potent, hydroxyl radicals and diminished production of hydrogen peroxide. It has been used with observed benefit in neurodegenerative conditions such as Amyotrophic Lateral Sclerosis, Multiple Sclerosis, Diabetic Neuropathy, and Alzheimer's disease. It has been effective in treating liver failure from causes of drug toxicity and hepatitis. Oral NAC reduced 86% of the incidence of kidney damage in people undergoing tests that injected dye into the blood vessels. It thins body fluids that sometimes congeal (as in blepharitis). Nevertheless, see cautions elsewhere in this paper about using NAC.

The petrochemical AH is used in perfumes, flavors, dyes, plastics and synthetic rubber, and is present in fermented products. It has a general narcotic effect with symptoms of chronic intoxication and "hangover". The difficulties discussed above that are caused by chronic AH toxicity should indicate that AH has a significant ability to compromise the brain function. A partial summary of AH's damaging effects on brain function includes: impaired memory, decreased ability to concentrate ("brain fog"), depression, slowed reflexes, lethargy and apathy, heightened irritability, decreased mental energy, increased anxiety and panic reactions, decreased sensory acuity, increased tendency to alcohol, sugar, and cigarette addiction, decreased sex drive, and increased PMS with breast swelling/tenderness in women.

I recite these biochemical effects of acetaldehyde again to stress that allowing Candida overgrowth to continue is a dreadful mistake. To drag out efforts to eliminate it is equally unfortunate for the child. **These effects of acetaldehyde are multiplied many times over when Candida die-off occurs, but they can be minimized or eliminated by adequate supplements of the affected vitamins and minerals, and by use of Alka-Seltzer Gold™ and N-acetylcysteine (as outlined elsewhere in this paper). Charcoal and or bentonite clay orally bind toxins preventing reabsorption also.**

These children likely have a family history of food intolerance, and Candida predisposes to rampant allergies; so, in addition to clearing Candida, they may need Enzyme Potentiated Desensitization (EPD) therapy, or NAET, because allergies can cause many of these children's symptoms, including hypoglycemia that mimics a multitude of diseases. Food allergies and sensitivities can be avoided by changing the foods one eats, thus it would seem relatively easy to eliminate food-related problems. Unfortunately, when one food is removed, other allergies become apparent or develop, until often it seems there are no foods that are safe to eat. Nevertheless, when these foods are avoided, other contributing factors, if present, will be much more easily discerned and addressed. Nevertheless, many, if not all, of these problems will disappear only when healing of the digestion and gut progresses. This is most quickly accomplished by homeopathic vaccine detoxification and mercury removal for these poisons are the root cause of these problems. Whether Pyrroluric or not, if fighting Candida, you must significantly supplement vitamin B_6/P5P and zinc.

The Thyroid: Metabolic Regulator

"We are building a web-site detailing our research into ASD from the last five years. It will contain thousands of studies, tables, and other scientific information documenting that ASD is caused by thyroid hormone dysfunction. We have investigated all biochemical findings involved in ASD and traced them to T3 deficiency. Depending upon when this T3 deficiency occurs (i.e., during gestation, neo-natal period, etc.) one will observe the different aspects involved in ASD"—Andreas Schuld, www.bruha.com/fluoride. He has a newsletter—"Parents of Fluoride-Poisoned Children." Thyroid hormones are closely related to all brain functions and to pancreas function. This common knowledge serves as the basis for the worldwide supplementation program. Healthy humans require iodine, an essential component of the thyroid hormones, thyroxine (T4) and triiodothyronine (T3). Iodine is vital to so many body functions and to the ability to be free of virus. **We have fluoride (in water, toothpaste, and drugs), bromine (in bread), and chlorine (in water) all suppressing/displacing iodine, but according to testing, given enough iodine, these toxins will be displaced and excreted! Lack of iodine causes achlorhydria (lack of**

stomach acid) that results in a host of digestive problems and eventual protein deficiency. If it should happen that your body becomes saturated with iodine, you will find that there is an increase of moisture in the nose. If this occurs, omit the iodine until the nose is normal. Failure to have adequate iodine leads to insufficient production of these hormones (hypothyroidism), which affect many different parts of the body, particularly muscle, heart, liver, kidney, and the brain. The most devastating of these consequences are on the developing human brain (Venkatesh-Mannar & Dunn, 1995). Many studies have shown that attention deficit and/or hyperactivity disorders in children are linked to changes in the levels of thyroid hormone in the blood, and that irritability and aggressive behavior are linked to thyroid hormone levels and hypothyroidism.

"Another organ that can concentrate iodine is the liver. An enterohepatic circulation of iodine has been reported recently. One patient, with liver fatty infiltration, had varicosities of the esophagus with bleeding. Once she started on iodine for FDB (Fibrous Breast Disease), we noticed that her GI bleeding stopped and the varicose veins of her stomach and esophagus disappeared.

"It is now proven that iodine (Iodoral, Lugol's in tablet, up to 50 mg day) detoxifies the body of halide compounds, such as bromine and fluoride, and the heavy metals mercury, cadmium, and lead. The bioavailability of a Lugol tablet (Iodoral) containing 12.5 mg elemental iodine was evaluated by measuring 24 hr urine levels of iodide together with the minerals, trace elements, and toxic metals before and after administration of this preparation. The results obtained following iodine supplementation revealed that in some subjects, the urine levels of mercury, lead, and cadmium increased by several fold after just one day of supplementation. For aluminum, this increased excretion was not observed usually until after one month or more on the iodine supplementation. It is also proven that the body has a built-in safety mechanism for iodine overload. It has been shown that at full-body sufficiency, the excess iodine is excreted in the urine as iodide. Our environment is loaded with toxic halides: bromine, and fluoride. Until now, there was no known way to detoxify these thyroid poisons that suppress thyroid function. Iodine therapy now provides a protocol to remove these poisons and restore thyroid function. As a bonus, mercury and lead are removed from the body. Additionally, iodine is needed to restore (maintain) a smooth heartbeat." - Dr. Bruce West in Health Alert, October 2006.

"Synthroid or thyroid-destructive therapies should never be taken without iodine therapy--something you will never hear from your endocrinologist. If all Thyroidologists and endocrinologists were forced to fluorescence scan their patients' thyroid glands, they would then have to face up to the damages they are causing to these glands and their patients! In addition to thyroid hormone therapy, all thyroid patients should be on iodine therapy, with the goal to reach a whole-body, iodine sufficiency. When this state is reached, the following results (gathered using sophisticated lab testing, fluorescence screening, clinical measurements, and a host of other high-tech medical testing procedures) have been observed:

- Goiter is reduced or eliminated.
- Stress on the pituitary gland with resultant high TSH readings is eliminated.
- Increased excretion of thyroid poisons and heavy metals occurs via the kidneys.
- The liver's detoxification mechanisms are enhanced.
- Obesity is more easily overcome-in fact, iodine therapy may be a critical and unknown factor in obesity.
- Diabetes and high blood pressure are more easily controlled.
- Breast tissue normalizes with decreased occurrences of fibrocystic breast disease.
- Menopausal symptoms are improved.
- Polycystic Ovary Syndrome can be cured.
- Brain function is better, with less brain fog.
- Heart function is better, with reduced arrhythmia problems.

- Cancer rates, especially of the thyroid and breast, are reduced.

"Additionally, through the Iodine Project studies, Dr. Abraham discovered that even patients with complete thyroidectomy (removal of the whole gland) benefited from iodine therapy. Therefore, it became known that iodine not only improved the thyroid gland, but the other target areas of the body where iodine and thyroid hormone are active.

"The doctors in the Project found that patients who achieved iodine sufficiency were often able to resolve diabetes problems without insulin. They could normalize blood pressure without medication. Goiters were resolved. Those taking thyroid hormone medication could greatly reduce or completely eliminate these drugs." Dr. Bruce West's December 2005 Newsletter.

Iodine put onto a mosquito bite would kill all bacteria and viruses at the site of the bite within 10-30 seconds making it impossible for any virus or bacteria to multiply and get started --such as in West Nile Fever. Naturally, this applies to tic bites (Lyme's disease) as well. For many decades in the 1800s, people carried around little bottles of iodine around their necks to use on all occasions. People in mosquito and tic infested areas should think of doing this again. In addition, it has been forgotten vaporized iodine rapidly kills air borne viruses such as polio and SARS viruses.. Used extensively in the forties and fifties it may be of use to explore this approach again. Dr. David Derry, MD.

I, Willis, have suffered palpitations for 30 years. I initially controlled them by supplementing 1500 mg potassium a day, but two years ago, this seemed to not be enough, and I developed "episodes" of frequent palpitations, irregular heartbeat, bradycardia, and tachycardia, some quite frightening. After four months of increasing amounts of *Iodoral*^{R}, using 37.5 mg a day for the last couple of months, I no longer experience these episodes, and rarely notice even a "missed beat". The beat is like a metronome! I urge you to support the thyroid as spelled out herein.

Dr. Raphael Kellman, MD, The Center for Progressive Medicine in New York, finds high rates of thyroid dysfunction in his patients. **He states that, of his patients, 90% of medical problems of both mother and child result from a lack of proper attention to and testing of the thyroid and its functioning.** Concentration of mercury in the pituitary and thyroid glands is usually much higher than that found in the kidney, brain, or liver tissues in humans. Evidence seems to indicate a drastic decrease in the production of thyroid hormones when mercury is in evidence. The problem is that the standard medical tests for thyroid function, even the newer TSH test, are totally inadequate. Low vitamin A status, that is rampant in these children, can lower TSH readings. Furthermore, the child is judged normal by adult ranges! One mother writes, "My son's T4 is normal for an adult. I found a great article in CLINICAL CHEMISTRY (1999 Jul;45(7):1087-91) reporting a study done at Harvard by Zurakowski. It included scatter plots for several thousand kids for T4, T3, and TSH. There were separate plots for boys and girls. When I saw the plots, it became obvious that my son's T4 was quite low, yet the pediatric endocrinologist was unconcerned about my son's T4 being below the 2 percentile for a boy his age."

The American Association of Clinical Endocrinologists (AACE) now says that a TSH level between 3.0 and 5.0 uU/ml should be considered suspect. This is a major reversal of the long held view that a person only has hypothyroidism if their TSH is above 5.0. This is the first time a conventional U.S. medical organization has acknowledged that the upper half of the TSH test's normal range may not be normal, but rather, evidence of developing hypothyroidism, or a level that is potentially able to cause hypothyroidism symptoms in patients. A review of published findings about TSH levels reveals that a reading over 2.0 is a marker for trouble relating to overt hypothyroid disease later, quite possibly autoimmune attacks on the thyroid itself! Administering hormone to those with a reading above 2.0 reduced cholesterol readings, but not for those with TSH readings less than two. Don't take damaging drugs to lower cholesterol, rather

support the thyroid. The British Medical Journal, Lancet, stated, "The emerging epidemiological data begin to suggest that TSH concentrations above 2.0 (mU/L) may be associated with adverse effects". The standard "reference ranges" are adjusted for age, and thus condemn the elderly to a chronic state of Hypothyroidism with no medical help!

The total T4 and T3 measurements, being influenced by protein alterations, may not accurately represent thyroid function. The free or unbound portion (free T4 or fT4 and free T3 or fT3) more accurately represents what the body's true thyroid hormone levels are. Levels of free hormone represent the active hormone available to react with cell receptors in the body, but in no way indicate a normal tissue level. T3 is often "normal", but because of a lack of glutathione, it's not being utilized in the cells! Anyone who is tested for potential thyroid problems MUST have thyroid antibodies checked as a screening test. Often TSH, free T3, and free T4 are normal but thyroid antibodies are high. This may affect thyroid function and cause hypothyroid symptoms with normal thyroid tests for TSH, T4, and T3. Additionally, elevated immune factors of TNF and IL-6 are found in the whole blood of the autistic. TNF and IL-6 can suppress TSH and raise ACTH. This can throw off the normal interpretation of TSH readings. Melatonin is of value here for it metabolizes hydrogen peroxide radicals by stimulating the production of glutathione peroxidase and glutathione reductase. It is known that melatonin binds mercury and it inhibits TNF(a), thus enhancing production of vital sulfates. It enhances growth hormones, reduces blood pressure, and decreases cortisol levels. Recent data indicate that melatonin inhibits brain glutamate receptors and nitric oxide production thus suggesting that it may exert a neuroprotective and anti-excitotoxic effect.

Stressed-out Mothers, please take serious note: all women, in particular those who had shown individual, low night-levels of melatonin in their saliva, had a very remarkable improvement of latent and unsuspected conditions of low thyroid function (hypothyroidism). In fact, a significant increase of the active thyroid hormone triiodothyronin (T3) was observed in all women independent of their night levels of melatonin, and to a minor extent independent of its precursor thyroxin (T4). The effect of melatonin does not depend on pituitary TSH (thyrotropin stimulating hormone), but on the direct effect of melatonin on the thyroid gland (conversion of T4 into T3, the active hormone).

Additionally, in Hal Huggin's book, *Uninformed Consent*, he speaks of mercury binding to iodine and ruining the quality of the thyroid hormone. On page 109, he states, "A person may have adequate levels of T3 and T4, but if the hormones are contaminated, for practical purposes, the person is functionally thyroid deficient." Bilirubin can inhibit the transport of thyroid into the liver (invitro). Phenol-sulfotransferase is the enzyme the body uses to get rid of bilirubin, and PST is not working properly in most autistic children. A buildup of bilirubin will give a yellowish cast to the skin, which a few of the moms have mentioned. So, the one diagnosing must not rely on lab readings alone, but must carefully consider the presenting symptoms. In final analysis, the bottom line is, "Did the patient respond favorably to thyroid support?" "Even though a TSH level between 3.0 and 5.0 uU/ml is in the normal range, it should be considered suspect since it may signal a case of evolving thyroid underactivity." (AACE Press Statement, January 18, 2001) A more recent standard puts "normal" at 0.03 to 3.0. There is a new saliva test for thyroid by Diagnos-Techs, Inc. (425) 251-0596.

Once damage to the thyroid takes place, it affects all the other organs—starting with digestion and absorption. Because the thyroid regulates the metabolism—all of the body's chemical reactions—its malfunction has wide and far-reaching effects. Incorrect diagnosis and treatment results not only in continued physical distress—fatigue, migraines, easy weight gain, dry skin, dry hair, hair loss, fluid retention, brittle nails, and many others—but also leaves one with mental and emotional symptoms such as depression, irritability, anxiety, and panic attacks. Toxins start accumulating in the system. You can have an array of symptoms: Heart disease and its complications, high

homocysteine levels, poor circulation (especially to the skin with as little as 20-40% of normal blood supply. This will give a pale face, weight gain/weight loss (depending on the type of metabolism you had to begin with), no appetite or binge eating, bloating, breast problems (cysts, fibrosis, tendency to cancer), skin problems (itching, eczema, psoriasis, acne, hives, and other skin eruptions, skin pallor or yellowing), aching joints, low blood pressure, high cholesterol, low libido, and sensitivity to cold.

The immune system starts to deteriorate because the necessary nutrients are not being absorbed. Repeated ear and urinary tract infections occur, and colds and upper respiratory infections are frequent. This leads to antibiotic use, creating a "leaky gut", and destroying the essential bacteria, typically causing diarrhea. An extract of Echinacea three times a day in juice will usually enable the body to restore normal function, without the side effects of antibiotics, as will bovine colostrum, Ambrotose AO™, and Phyt•Aloe®. If you must take antibiotics, eat goat yogurt with it or supplement probiotics. That will reduce incidence of diarrhea by half, and protect against a Candida yeast take over. Candida, if allowed to proliferate, creates a multitude of debilitating symptoms. In a child, look for frequent infections, frequent diaper rash, continuous stuffy or runny nose, dark circles under eyes (kids with sulfation problems are prone to get these "allergic shiners"), hyperactivity, or poor attention span. All this results in an IgG imbalance (delayed food allergies), and opens the door to virus and parasite infestation.

As regards hair loss, this is a frequent question. In addition to hypothyroidism, hair loss is one of the prime symptoms of vitamin B_6 deficiency, cadmium toxicity, Aspartame poisoning (drinking Diet drinks), lysine deficiency, zinc deficiency (white spots on nails), folic acid deficiency, hyperammonemia (too much ammonia), and fatty acid deficiency. Take your pick :-(. Supplementing MSM also seems to cause hair loss when there is heavy metals poisoning, particularly mercury.

Other symptoms of an underactive thyroid are: fatigue, constipation, depression, low body temperature, infertility, menstrual disorders—especially excessive and frequent bleeding contributing to iron deficiency, memory disturbances, concentration difficulties, paranoia, migraines, over-sleeping and/or the inability to sleep due to gastrointestinal discomforts, anemia, "laziness" (no motivation), muscle aches and or weaknesses (low muscle tone, and some are born that way), hearing disturbances (burning, prickly sensations, or noises in the head), slow reaction time and mental sluggishness, labored breathing, hoarseness, speech problems, brittle nails, and poor vision and/or light sensitivity. Iron deficiency decreases body temperature by decreasing norepinephrine (as does a lack of tyrosine/dopamine) and decreasing cellular oxygen, which contributes to the low-body-temperature problem in hypothyroidism. Infants and children with thyroid damage may suffer mental retardation, loss of hearing and speech, or deficits in motor skills. Anemia is frequent in hypothyroidism. E**ach degree of low body temperature represents a 13% decline in energy levels.**

There are several selenoproteins formed and a relationship between SelP and motor co-ordination of mice has been pointed out. In one study, the SelP gene knockout mice developed ataxia with a wide clumsy gait at their third week of life (Schomburg et al. 2003). In the other study, only mice fed a selenium deficient diet lost motor co-ordination. This was prevented by feeding diets containing sufficient amount of selenium. (Hill et al. 2003). As stated elsewhere, selenium is necessary to convert T4 thyroid hormone to T3.

All of Dr. Kellman's autistic patient's have a wide variety of these symptoms, and all have malabsorption causing deficiencies in vitamins and minerals. There are problems with the amino acids' balance and stores. **It has been shown that a deficiency of vitamin A and E, the amino acid cysteine, the minerals zinc, iodine, iron, and selenium, and of the antioxidant glutathione (which requires cysteine), and an excess of copper will adversely slow the thyroid function.** Excess copper slows the thyroid while zinc increases thyroid action; however, a copper deficiency will result in low plasma T3. Iron may be low because of blood loss in women and girls, insufficient intake, or deficiencies of minerals such as manganese, copper, or cobalt (vitamin B_{12}), or B-

vitamins, which are essential for iron utilization. Iron and copper work together to form hemoglobin and need to be balanced in a ratio of 5:1. Long-term supplementing with either alone can lead to a deficiency of the other. Iron, manganese, zinc, and chromium are often deficient. Take 30-50 mg of zinc to increase thyroid production. Use of liquid zinc will likely be more effectively assimilated requiring lesser amounts. If rapid heartbeat is felt at night or early morning, decrease the zinc and supplement copper and other minerals. It is known that a vitamin A deficiency (Garcin & Higueret, 1977; Morley et al., 1978; Higueret & Garcin, 1984) or a protein deficiency (see Brasel, 1980) induces adverse changes in thyroid status. Cobalt is necessary for production of thyroid hormone. Those with a slow thyroid have difficulty in converting beta-carotene to vitamin A, so supplement with a preformed vitamin A, such as from cod-liver oil.

Most people with thyroid disease find that they have to supplement calcium and magnesium. Supplementing these minerals in the correct ratio can make a huge improvement in the symptoms. However, supplementing them in the wrong ratio can make symptoms worse. To further complicate the situation, the correct ratio of Ca/Mg changes as you recover from thyroid disease. To balance calcium and magnesium, keep these points in mind: a normal person needs a cal/mag ratio of about 2:1. A hyperthyroid condition needs more magnesium, and a hypothyroid needs more calcium, but these ratios need to be adjusted as you approach normalcy.

An increased heart rate or an irregular heartbeat can be a sign of either too little calcium or too little magnesium; the key to knowing whether you need calcium or magnesium is the strength of the heartbeat, not the speed or the irregularity. It is magnesium and manganese that controls the fate of calcium and potassium in the cell. If magnesium is insufficient, excessive calcium will enter the cell causing spasms and cramps, and it will be deposited in the soft tissues (kidneys, arteries, joints, brain, etc.) leading to calcium and potassium loss in the urine. If the beat is too strong, take more magnesium, and if it's too weak, increase the ratio of calcium to magnesium. It is interesting to note that a potassium deficiency and a vitamin B_5 (pantothenic acid) deficiency may have an effect on heart rate. A vitamin B_5 deficiency has similar effects to a calcium deficiency, and a potassium deficiency can create an irregular heartbeat. Excess zinc can increase the heart rate at night or early morning. Excess copper (as in hypothyroidism) raises sodium and lowers potassium and manganese tissue levels. Excess copper, by displacing zinc and manganese, is often associated with pancreatic dysfunction. Both carnitine and taurine will conserve calcium, magnesium, and potassium, and may reduce heart arrhythmias and fatigue.

Sympathetic nerves release noradrenaline that increases heart rate, and the parasympathetic (vagus) nerve fibres release acetylcholine that slows the rate. Magnesium shuts off the SNS activity, while potassium enhances PSNS activity. Many studies show that magnesium suppresses the sympathetic function, while potassium stimulates parasympathetic activity. Achieving a balance in these minerals would achieve a balance in Autonomic Nervous System function.

A meat diet is loaded with minerals such as phosphorous and zinc, which tend to have the opposite effect. A high-meat diet stimulates the sympathetic system and tones down parasympathetic activity. Furthermore, such a diet is loaded with sulfates and phosphates that in the body are quickly converted into free acid that in turn stimulates the sympathetic nervous system while suppressing parasympathetic activity.

During hyperthyroidism, magnesium is low and calcium is high. This imbalance is the result of other mineral imbalances (copper, zinc, iron, manganese), but the effects on the heart rate are the direct effect of a Ca/Mg imbalance. This can be demonstrated by taking a magnesium supplement. This intake of more magnesium by one who is hyper will slow the heart rate temporarily. However, the body can't maintain normal magnesium levels if copper is low. So, until copper is replenished, extra magnesium is needed to control the rapid heart rate (low copper tends to a hyperactive thyroid).

The key to understanding the effects of calcium and magnesium on the heart is this: calcium is needed for muscles to contract and magnesium is needed for muscles to relax, but depending on whether hyper or hypo, both have the same effect on heart rate. A weak heart beat (perhaps felt as a missed beat) means that calcium is deficient and the contraction phase is weak and short. This results in an increase in heart rate and also an irregular heartbeat because some contractions are missed entirely. Contrast this to a magnesium deficiency where the heart rate is increased and irregular because some of the relaxations are missed. It is the strength of the heartbeat, and not the speed and irregularity that is the key. Remember that balancing calcium and magnesium won't correct thyroid problems. You'll need to correct the other minerals like iodine, copper, zinc, iron, selenium, chromium, and manganese to achieve this. Calcium and magnesium get out of balance because of these other nutritional problems. However, getting your calcium/magnesium balance corrected is essential for normalizing heart rate, preventing dental decay and osteoporosis, and preventing muscle cramps (too little magnesium).

Zinc can have adverse health effects at a daily dosage as low as 50 mg per day. Studies on zinc supplementation show that this or higher levels can significantly lower High Density Lipoproteins (HDL), copper, and super oxide dismutase [SOD] levels in just 14 days resulting in lowered immune function. Calcium significantly inhibits the absorption of almost all other minerals and trace elements by a factor of up to 60-70%. So, you could buy a very good form of chelated zinc and the absorption will be very low because of the calcium filler. Ninety percent of these products contained a level of calcium between 600-1,000 mg that is not disclosed on the label of the bottle. Avoid all mineral tablets that show an excipient of di-calcium phosphate. Take all minerals other than a multivitamin/mineral on an empty stomach for best absorption and effectiveness, and take zinc and magnesium 30 minutes before bedtime, preferably with the EPO/CLO for maximum effectiveness (Wapnir et al. 1988, Lee and Wapnir 1993). If there is early morning waking (3-4 AM), add 400 mg calcium in the evening, but not at the same time as the zinc. In these studies, the addition of certain long-chain fatty acids in the diets reversed zinc malabsorption. Taking zinc will increase the metabolic rate, so if one is hyperthyroid, taking a large amount of zinc just before bed may cause a very restless night. Should this occur take zinc early in the day, and take copper at night.

Restoring zinc once it is depleted is not easy. This may give some insight into how to proceed. Whether it is derived from meat, fish, dairy products, cereals, breads, or vegetables, there is a consistent positive correlation between protein and the zinc content of foods (Held et al. 1988, Wapnir 1990). The ability of an organism to increase its zinc stores with adequate or enriched protein feedings is different if it has previously become zinc depleted. This relationship has been demonstrated in a study with zinc-deficient and zinc-sufficient rats fed varying amounts of protein. Tissue zinc concentration increased linearly with dietary protein in rats fed a zinc-deficient diet. In contrast, rats fed a zinc-sufficient diet accumulated zinc in their organs only as dietary protein increased logarithmically (Oberleas and Prasad 1969, Wapnir 1990). Get some protein into the kid!

Selenium is very important for normal thyroid function. It may become deficient if there are excessive amounts of toxic metals being ingested. The more mercury or other toxic metals ingested, the more selenium you'll need. **Two things tend to deplete selenium stores: increased fatty acid intake, especially; and mercury, cadmium, and arsenic that uses up selenium for detoxification.** Studies show that a deficiency of selenium causes the body to increase the levels of free T3. This has been frequently confirmed in children with autism, and chelating when selenium is already low has driven T3 levels to excessive highs. Remember that arsenic also creates high T3 readings, undoubtedly due to it's depletion of selenium. Adults take 200-600 mcg of selenium per day (Children can use 1/3 to 1/2 as much based on age). Always take selenium with vitamin E. Start by taking 100 mcg per day, and gradually increase the amount as seems right based on amount of mercury in the mouth. Don't take over 600 mcg. Some may be so deficient in minerals that they are close to becoming hyperthyroid. If experiencing nighttime rapid heart beat, then you are close to becoming hyperthyroid and should supplement minerals,

especially copper. Acta Societatis Medicorum Upsaliensis Vol 72, 1-2, 1967 reports a relationship between pyridoxine (B_6) and the thyroid gland. Individual's who are suffering from a condition of hyperthyroidism appear to need more vitamin B_6 than normal people. The result is that there is a derangement in the way the body uses B_6 when the thyroid gland is disordered.

Opioids have been shown to decrease hepatic glutathione. Low levels of glutathione have been demonstrated in autism. Low Glutathione can diminish conversion to T3. Dermorphin and other opioid-like peptides inhibit TSH output tending to hypothyroidism, and change other hormonal output affecting in particular the functional activity of the hypothalamus-pituitary-adrenocortical. This creates chemical imbalances resulting in neurotransmitting problems.

Pancreatic function was significantly reduced in patients with hypothyroidism compared with healthy subjects. Treatment with thyroxine (T4) restored the pancreatic function to normal. It was concluded that the thyroid gland plays an essential role in maintaining the functional integrity of the exocrine pancreas in humans (Gullo et al., 1991). One test of those with autoimmune thyroiditis found twenty-two patients (55%) had positive antigliadin antibodies. Polyglandular Endocrine Syndrome was diagnosed in most of these patients. A study of those with celiac disease found autoimmune thyroiditis in 90 of 343 (26.2%). Hypothyroidism was observed in 28 (8.1%) and hyperthyroidism was diagnosed in four. An abnormal echographic pattern was seen in 37 patients with CD (16.8%). These figures surely indicate that any patient with thyroid problems should be checked for celiac disease and vice versa.

The hypothyroid problem is relatively easy to treat once the doctor is convinced it is malfunctioning, and the results are dramatic; nevertheless, use of thyroid replacement drugs deplete thyroid and tissue iodine levels! Eventually, the initial improvements disappear! You must supplement iodine! Additionally, Sjoberg and others studied monoamine precursors, neurotransmitters, and their metabolites in cerebrospinal fluid (CSF) obtained from nine newly diagnosed hypothyroid patients. Before treatment, the serum TSH correlated positively with the CSF concentrations of tyrosine and phenylalanine. During treatment, the levels of the precursors tryptophan, phenylalanine, and tyrosine decreased significantly, as was also the case with dopamine and the noradrenaline metabolite hydroxy 3 methoxyphenylglycol (HMPG), but not with serotonin, noradrenaline, and the serotonin metabolite 5 hydroxyindoleacetic acid, nor the dopamine metabolites, homovanilic acid and dihydroxyphenylacetic acid. Furthermore, the authors have found an indication that L-thyroxine treatment affects the CSF levels of the precursors as well as dopamine and HMPG, supporting the notion that there is an interaction between thyroid function and CSF disposition of monoamine compounds. (Sjoberg et al, 1998)

Hypothyroidism can be quite effectively regulated, however, by supplying the necessary nutrients, the amino acid tyrosine, zinc, and desiccated thyroid concentrate, all available at your health food store. For adults, I recommend Dr. Jonathan Wright's Thyroplex for Men (Women) that supplies 1/4 grain of the actual thyroid glandular containing all the thyroid functioning hormones: T4, T3, T2, T1, and calcitonin (a hormone that regulates calcium balance), along with other nutrients to nourish the rest of the endocrine network. Order from Life Enhancement Products, www.life-enhancement.com, 1-800-543-3873. Dr. David Williams recommends *Thytrophin*™ from Standard Process Products, along with their liquid iodine supplement *Iosol*™. Lugol's solution (Iodoral™ tablets) would be just as good and more readily available on the Net.

A function of iodine is to calm the body and relieve nervous tension. When nervous tension runs high, there is irritability and difficulty in sleeping well at night, and the body is continually on a combat basis, organized for fight and flight. All these points stress a body's need for iodine to lessen nervous tension, relax the body, and enable it to organize for peace and quiet by the building and storing of body reserves against time of need. I have learned through Vermont folk medicine that it is possible to repeatedly change an irritable, impatient, and restless child under ten years of age into a calm, patient individual within two hours' time by giving one drop of

Lugol's solution of iodine by mouth in a vegetable or fruit juice or in a glass of water made acid in reaction by adding a teaspoonful of apple cider vinegar.

If you are taking thyroid medications, they may not work well at all when you are deficient in iodine, but when you begin giving the above support, you must work with your doctor to reduce or discontinue the medications or you could become hyperthyroid. Should your doctor determine hypothyroidism, he will typically prescribe Synthroid™, a synthetic hormone that supplies only T4. Prescribing thyroid T4 to hypothyroids increases susceptibility to breast cancer. JAMA 1976; 238:1124, induces osteoporosis, suppresses the pituitary, and may shrink your thyroid gland. Insist upon a Natural Hormone from Armour's or other natural source. For those chemically sensitive or with Grave's and Hashimoto's, or with corn sensitivity, do not use Armour's as it contains cornstarch. Bio-Thyroid has no fillers. Naturethyroid is free of cornstarch. Incidentally, iodine supplementation can cause extremely bad breath and gastritis due to the breakdown and release of bromine from bread. This can cause reflux also, but chlorophyll capsules relieve these symptoms, including the bad breath. Lack of iodine causes achlorhydria (lack of stomach acid) that results in a host of digestive problems and eventual protein deficiency.

Iodine therapy continues to be highly beneficial to iodine deficient people (most everybody but native Japanese). It is proven that daily supplement of 50 mg of iodine detoxifies the body of toxic halide compounds, such as bromine (from baked grains) and fluoride, as well as the heavy metals, lead and mercury.

It is also proven that there is a built-in safety mechanism for iodine overload. When deficient, the amount of iodine retained is relative to the deficiency. At full body sufficiency, the excess iodine is excreted in the urine as Iodide. An overload will create a case of prolonged sneezing!

It is now proven that the amount of iodine needed and retained for total iodine sufficiency is 1,500 mg, 50 times higher than reported in medical textbooks. Our environment and diet are now loaded with toxic halides. Until now, there was no known way to detoxify these toxins that accumulate in the body (only about half of the fluoride is normally excreted). Iodine therapy now provides a protocol to remove these toxins that severely depress the thyroid. Mercury and lead are also removed! Viruses are killed. A bonus is to eliminate heart arrhythmias that balancing electrolytes does not clear.

Iodine is needed for a smooth heartbeat, and the medics, as usual, depend on a toxic drug form, Amiodarone. This form of iodine is toxic to the thyroid and can induce severe thyroid abnormalities. One may use Lugol's solution, or Iodoral (Lugol's in a tablet at 12.5 mg each), or Prolamine Iodine (from Standard Process). Do not combine Amiodarone with these iodine supplements.

Most, who are deficient in iodine, reach iodine sufficiency on a serving of between 37 and 50 mgs daily for 3 to 6 months. Iodine intake should be increased slowly, and after 3-to-6 months, the amount should be tapered down to 12.5 mg day. It is suggested that you request a free flyer of Dr. Bruce West's protocol from Health Alert, 100 Wilson Road, #110, Monterey, CA, 93940-5753. Enclose a self-addressed business envelope with two stamps affixed.

The amino acid tyrosine and the mineral iodine are necessary to form thyroid hormone. Lithium (5-20 mg per day) and iodine supplements tend to normalize thyroid function, particularly in Grave's Disease. The liver requires zinc, selenium, vitamins A and B_6, and glutathione (GSH) in adequate amounts to convert the hormone T4 to T3. Glutathione also enables the cell to take up T3. GSH is essential to the immune system, to antioxidation processes throughout the body, to detoxification of mercury and other heavy metals and toxins and their excretion via Phase II liver paths, and for mitochondrial energy production. Typical blood panel tests for glutathione are inadequate for the liver and/or tissue levels can be very low, but the blood may still be normal. This powerful antioxidant is required throughout the body; so, ensure adequate substrates of the amino acids. A pure amino acid supplement of glycine, cysteine, and glutamine would be most helpful. Amino acids are acidic, and in excess will cause a

decrease in the alkaline reserve of the body. Too much protein in the diet upsets the acid–base balance of the body. One should check the pH of the urine and saliva, periodically, to ensure this does not occur without corrective action.

Because the vulnerability of the adult rat cerebellum to the effects of thyroidectomy is commensurate with the known clinical signs of cerebellar dysfunction in adult hypothyroid man, a study investigated the influence of hypothyroidism in the adult rat on brain biochemistry (Ahmed et al., 1993). Hypothyroidism resulted in brain region-specific changes in certain catabolic enzyme activities. Acid phosphatase activity was reduced in the cerebellum (by 34%) and the medulla (by 38%), whereas alkaline phosphatase activity was decreased in the midbrain (by 37%) and the subcortex (by 49%). A differential response was also observed in the case of aryl sulfatase activity: aryl sulfatase A (myelin-degradative activity) was diminished in the cerebellum (by 56%), whereas aryl sulfatase B remained unchanged in all regions. Acetylcholinesterase activity was reduced in the cerebellum (by 45%) possibly allowing an excess of acetylcholine neurotransmitter activity, the medulla (by 34%) and the subcortex (by 45%), whereas monoamine oxidase activity was affected in only one region, the cerebellum, where it was increased by (61%) leading to a waste of neurotransmitters in that area. The compromise of myelin and neurotransmitter degradative enzyme activities may place severe restrictions on normal brain function (Ahmed et al., 1993).

Recently, a study was conducted in France aimed at investigating the repercussions of deficiency in thyroid function, with and without thyroid hormone (TH) replacement, on the neurochemical entities which underlie serotonin (5-HT) neurotransmission, namely 5-HT1A, 5-HT2A receptors, 5-HT transporter, and tryptophan hydroxylase (TPH) in the mature brain. The study reports that the decrease in cortical (cerebral cortex) 5-HT2A receptors is the main neurochemical event underlying the impairing effect of hypothyroidism on 5-HT neurotransmission (Kulikov et al, 1999). Another three-part study explored the basis for an interaction between changes in thyroid status and bulbospinal serotonin (5HT) metabolism, concluding that the interaction between thyroid hormones and 5HT is both more subtle and more complex than previously thought (Hanley et al, 1998).

Diminished acetylcholinesterase activity (inhibition) results in increased acetylcholine in the synapse. For some this may be good, for others it can be the cause of overactivity of thousands of processes, and rigidity of muscles unless balanced by dopamine. MSM is an acetylcholinesterase inhibitor; so, it can increase acetylcholine. It does this by inhibiting the enzyme that breaks down acetylcholine. MSM also protects the body from acetylcholinesterase inhibitors like organophosphate pesticides. In presence of pesticides poisoning, it is hard to tell what will happen to acetylcholine levels when you use MSM. Other prevalent acetylcholinesterase inhibitors are: Mercury, Sage, Huperzine A, Fluorides, Aluminum, the herb, Galantamine, Zinc deficiency, and the drugs Meshinon™ and Aricept™. **Low Acetylcholinesterase levels induce a vitamin B_1 deficiency.**

Failure to have adequate iodine (a common occurrence) leads to insufficient production of thyroid hormones (hypothyroidism), which affects many different parts of the body, particularly muscle, heart, liver, kidney, breasts, and the brain. Chlorine, fluoride, and iodine are chemically related. Chlorine and fluoride not only block iodine receptors in the thyroid gland, resulting in reduced iodine-containing hormone production, but replace the iodine molecule in T4 hormone giving a false TSH/T4 reading. The result is hidden hypothyroidism. Dental fluorosis is now seen to be a direct result of fluoride-induced iodine deficiency during the time of enamel formation. The most devastating of these consequences are on the developing human brain (Venkatesh-Mannar & Dunn, 1995). Iodine deficiency has been called the world's major cause of preventable mental retardation. The damage to the developing brain results in individuals poorly equipped to fight disease, learn, work effectively, or reproduce satisfactorily. Iodine deficiency causes brain disorders, cretinism, miscarriages, winter depression (SAD), Cerebral Palsy, goiter, and many other diseases. A lack of iodine will

also allow radioactive iodine into the thyroid destroying it. This can be prevented when taking radiation, or doing radioactive iodine treatment, or when downwind from a terrorist attack with nuclear weapons by immediately taking at least 10 drops of Potassium Iodide (KI) or Lugol's Solution in water. This also protects against bacterial/viral infection when on a plane. KI is also available in tablets. Keep a bottle (Iodoral) in the first-aid cabinet.

As suggested, most thyroidologists are quick to use radioactive isotopes to scan the thyroid. Why don't they use safer fluorescent scanning of the thyroid instead of isotope scanning? One possible reason is the fact that this procedure exposes the harmful effect of thyroid hormone therapy and radioiodide usage in depleting the thyroid gland of iodine (it measures the amount of iodine in the gland as well as its size). Low thyroid iodine is associated with thyroid hyperplasia and cancer. Could thyroid hormones cause the same iodine depletion in breast tissue? The prevalence of breast cancer is higher in women on thyroid hormones. Thyroidologists use thyroid hormones extensively in their practice without supplementing their patients with iodine. Fluorescence scanning of the thyroid gland should be implemented. Thyroidologists would than have to face the damages they are causing to the thyroid gland and consequently to their patient.

A simple test to determine if adequate iodine is available for proper thyroid function, and to improve stores if needed is this: obtain a bottle of standard Tincture of Iodine (sodium iodide, 2.4%) from the drug store. Paint a 3-cm–sized spot (1.25 inches; twice that on adults) on the tender skin of the belly or thigh where clothes will not rub heavily. Watch that stain for 24-hours. If it disappears in less than 24-hours, there is a need of iodine, and the thyroid is likely sluggish. **If the stain disappears in less than 24-hours, paint more iodine on a different spot, and continue to paint a new spot until one remains visible for 24 hours. This will help restore normal thyroid function but is not adequate to restore full body iodine levels.** Interpretation of the 24-hour stain: Color almost as strong as when it was applied (minimally adequate iodine); Color turns red (this usually indicates chemical sensitivities that are normally helped by selenium supplementation); Color turns black (usually associated with food sensitivities); Color stays several days (usually indicates an iodine excess). If the nose becomes more than normally moist, discontinue painting iodine as you have adequate stores. One should supplement selenium, and kelp (unless there is excess iodine), but do not use the drugstore Tincture of Iodine internally. Use Lugol's Solution, Iodoral, or KI for internal purposes. For the autistic, a supplement of tyrosine would likely be necessary for T4 is a tyrosine/iodine substance. Tyrosine will improve dopamine levels that are often low in the autistic. As stated, iodine and selenium are very essential to proper thyroid function, but supplementing iodine in the absence of adequate selenium may do more harm than good! **You must supplement at least 200 mcg of selenium when doing this iodine replenishment.**

To determine if there is still a problem, perhaps as an aid to persuading the doctor to give the only effective, medical, thyroid test, the TRH test, do this: For five days, on awakening, without moving around except to reach the thermometer prepared the night before (shake down below 96.0^0 F), measure the underarm temperature for ten minutes. Average the results for the five days. If that average reading is below 97.6^0 F (normal underarm temperature), you likely have a problem. Below 97.2^0 F, you definitely have a problem. Remember, if you take the temperature orally, normal is 98.6^0 F, and rectally it is 99.6^0 F. Women still menstruating get the best readings on the second and third day after menstrual flow starts. Supplement kelp and the thyroid glandulars recommended above, and supply a wide range, multivitamin/mineral formula. Other supplements recommended in this article would be appropriate, especially the selenium, zinc, and glyconutrients. If that doesn't correct the body temperature reading in reasonable time, demand the TRH test.

Fluoride, taken in from water, toothpaste, mouthwash, soft drinks, fruit juices made from concerntrate, prepared breakfast cereals, and coating of the teeth, is a major cause of hypothyroidism, especially in autistic

who cannot break down such chemicals easily. Sluggish liver enzymes, common to autism, can cause accumulation of this deadly poison, and produce many symptoms. Fluoride interferes with metabolism of calcium and phosphorus and with the function of the parathyroids that control the utilization of calcium. Additionally, in 1948, Dr. Benjamin P. Sandler revealed that soda pop contains phosphoric acid that absorbs phosphorus and sulfates in food before natural metabolism can get it to the nervous system causing the nerve trunks to fail to function properly. Sandler said that dairy products and sugared, soft drinks that produced hypoglycemia were aggravating the incidence of polio.

Although Moolenburgh expected to find an allergic basis for the adverse effects associated with fluoride, he considered that the symptoms represented poisoning with inhibition of the immune system by a toxic substance in sensitive persons. Where an exacerbation of illnesses with an allergic component such as eczema and asthma occurred, his view was that immune system inhibition by fluoride had resulted in a loss of the ability to cope with the allergy. Double blind testing with 60 patients showed that certain individuals were intolerant to fluoride and that exposure to this could reproduce gastrointestinal symptoms, stomatitis, joint pains, excessive thirst, extreme chronic fatigue, and general hives. This study further indicated a potential for motor dysfunction, IQ deficits, and learning disabilities in humans. Neurological problems like headache, vertigo, spasticity in extremities, visual disturbances, and impaired mental acuity can result. It displaces iodine in the thyroid, inducing hypothyroidism, a condition largely responsible for many problems outlined above. Muscles and elements of connective tissue, particularly collagen fiber and bone tissue, undergo degenerative changes. It diminishes the immune function significantly. One child's chronic diarrhea cleared straightaway he ceased drinking fluoridated water, and most "autistic" symptoms were diminished or disappeared. Fatty acids were brought into better balance, resulting in better hair, nail, and skin condition. Stop using fluoridated water for drinking, cooking, and bathing (it is absorbed through the skin), and stop using fluoridated dental products. Check to see if fluoride appears naturally in your water. If so, drink filtered water.

We usually think of fluorosis as a permanent damage to bones or teeth. Fluoride can also damage the liver, kidneys, and reproductive organs. However, the effects are reversible with vitamins. Fluoride accumulates in ovaries. In laboratory experiments with mice, fluoride damaged the tissues and cellular structures of ovaries and uterus. Scientists showed photographs of the tissues they studied. The sequence of photographs showed the tissues being progressively damaged as the mice became intoxicated with fluoride. **When the mice were given vitamin C and calcium supplements and fluoride was not put in their water anymore, the tissues almost returned to the original state of good health.**

Fluoride interferes with male fertility as well. In an experiment with male mice, a larger proportion of the sperm became abnormal when they ingested fluoride. The sperm lost their motility or died. When the same mice were given vitamin C and calcium and no fluoride, their sperm significantly recovered. Fluoride impairs the production of free radical scavengers such as glutathione and melatonin. Fluoride impairs the function of enzymes that prevent lipid peroxidation. These enzymes include glutathione peroxidase, superoxide dismutase, and catalase. This suppression of Glutathione and Glutathione peroxidase by fluoride and mercury diminishes the immune function significantly by diminishing Th1 activity by Killer Cells. A lack of killer cell numbers or activity will permit normally harmless viruses to mutate and possibly cause serious sickness and even death! It is vital that all suggestions herein be utilized to build the Th1 function and balance Th1/Th2 functions.

In another experiment with mice, Vitamins E and D repaired the damage that fluoride did to liver and kidneys. Fluoride caused the glomeruli, those tiny blood vessels in the kidneys for removing waste, to atrophy. In the liver, fluoride caused fatty deposition and the death of cells. Vitamin E was beneficial because it is an antioxidant.

Vitamin D promotes the absorption of calcium and phosphorus so that their optimal concentrations will be maintained in the blood. This optimal concentration supports the metabolic activity of various tissues. Vitamins E and D were effective after fluoride was removed from their diet.

In an experiment with rats, fluoride impaired the growth rate, but the rats that were given beta-carotene and superoxide dismutase supplements had a faster growth rate. Fluoride causes damage to the fat in your body (lipid peroxidation), which is counteracted by the antioxidants beta-carotene and superoxide dismutase. Avoid fluoride like the plague, but if unable to do so completely (it's in all prepared foods and drinks), then supplement vitamins and minerals to offset as much damage as possible.

Loss of appetite or picky eating is a common occurrence with "our" kids. Studies have shown that food consumption of zinc-deprived rats decreased 30% compared to controls, and that force-feeding of these zinc-deprived animals rapidly induced signs of ill health. Some of the things to consider are: medications (for colds, heart disease, asthma, tumors, epilepsy), vitamin deficiencies of B_1 (Beri Beri), niacin (Pellagra), B_{12} (Pernicious Anemia), zinc deficiency, lead poisoning, copper toxicity, constipation, ammonia buildup from inadequate digestion of protein, vaccine reactions or chronic infections therefrom, and diseases like hypothyroidism, Addison's (a deficiency of adrenal cortical hormone), hepatitis, celiac, acute nephritis, kidney failure, heart disease, and cancer. It is reported that too much vitamin A and D can cause loss of appetite. Animals responded to zinc supplementation within 1-2 hours with increased food intake. Also, it has been known that zinc deficiency in humans lead to mental depression, neurosis, sleep disturbances as well as to a reduction in appetite. Some things to improve appetite: supplement the above nutrients and improve levels of acetylcholine with nutrients such as lecithin, CDP choline, phosphatidylcholine, or the drug, Bethanechol. See a list elsewhere in this paper. Additionally, relieve constipation, address a thyroid deficiency, remove the toxic elements, and supplement alpha-ketoglutarate to remove excess ammonia. Some tonics available at the health food store are effective in improving appetite.

Forskolin: Poor Man's Secretin?

Coleus Forskolin is a blood-vessel-dilating compound that stimulates increased production of thyroid hormones T4 and T3 greatly assisting in overcoming sluggish thyroid activity. It also increases the activity of an enzyme Adenylate Cyclase (AC) that resides in the membrane of all cells, enabling greater cAMP production and activity within the cell. It is of note that there are at least 3 different opioid receptors—mu, delta, and kappa. When an opioid molecule attaches to a receptor in which it "fits", adenylate cyclase is inactivated, leading to a decrease in intracellular cAMP. If intracellular cAMP levels have been lowered because of constant (inappropriate) stimulation of opioid receptors on the cell surface, less tryptophan hydroxylase is phosphorylated, and therefore more of the enzyme is inactive. When this happens, tryptophan is not converted into serotonin, but is shunted down alternate pathways, eventually leading to urinary IAG (indolyl acryloyl glycine) and 3-indoleacetate. In the pancreas, studies show forskolin increased amylase secretion that is often low in these kids. In fact, it increased AC pancreatic activity 26-fold, and potentiated the increase induced by Secretin. Its activity is weak compared to that of Secretin, but forskolin also potentiates the activity of CCK-8 that affects the redistribution of cellular calcium. It would seem that forskolin could offset some of the effects of casein and gluten produced opioids, but is this an appropriate route?

In one study, **Secretin** increased cAMP activity up to 10-fold, which mediated the enzyme Tyrosine Hydroxylase (TH) activity up to three-fold. Forskolin also increased cAMP and TH activity. In fact, forskolin stimulates TH activity in the hypothalamus, hippocampus, and frontal cortex of the brain, whereas Secretin activated TH only in the hypothalamus and hippocampus. Use of forskolin (2 mg twice a day) improved speech and induced sleep more quickly in one child. Additional dosage may be needed, and seems

to be dependent on body weight. A small, 4-year-old child with distinct hypothyroidism, using 10 mg daily, had adverse reactions, regressing into stimming and screaming.

Forskolin, especially in conjunction with lecithin, phosphatidylcholine, or choline supplementation, may greatly improve the action and effectiveness of vitamin A from cod-liver oil, in the fashion that Dr. Megson has used the drug, Urecholine™ (Bethanechol), by supplying a constant and adequate supply of acetylcholine to the brain. She talks about a problem in absorbing CoA. (Truss says CoA is depleted by the yeast toxin acetaldehyde.) However, Dr. Megson asks this question: "Mucosal cell integrity is also important for absorption of CoA. That is the critical enzyme when choline is converted to acetylcholine. The precursor for this reaction is s-adenosyl methionine (SAMe)…If the CoA pathway is blocked, choline is diverted to production of homocysteine. Are we effectively blocking G-alpha inhibitor of G-stimulatory alpha pathways **increasing cAMP cells causing lipolysis, and blocking production of acetylcholine?"** To increase the effectiveness of vitamin A, our desire is to increase acetylcholine, however, this may be contraindicated for children struggling under the burden of a PST/sulfoxidation disorder. Kane found choline and inositol were disturbing to children with autism due to their stimulation of nitric oxide (autoimmune response) and the Arachidonic Acid cascade. "Furthermore, the mineral endings contained in many multiples were worthless (Mg oxide), or irritating to the CNS (aspartates) or urea cycle (picolinates). The children responded beautifully to alkaline salts such as Buffered C, and to the glandular pancreas (porcine derivative), or digestive support," she says.

Michael Murray, prominent naturopath, has this to say about forskolin:

> It has a long history of use in Ayruvedic medicine for treatment of cardiovascular disease, eczema, abdominal colic, respiratory disorders, painful urination, insomnia, and convulsions. The basic mechanism of action of forskolin is the activation of an enzyme, adenylate cyclase, that increases the amount of cyclic adenosine monophosphate (cAMP) in cells. Cyclic AMP is perhaps the most important cell-regulating compound. Once formed it activates many other enzymes involved in diverse cellular functions.
>
> Under normal conditions, cAMP forms when a stimulatory hormone (e.g., epinephrine, or Secretin) binds to a receptor site on the cell membrane and stimulates the activation of adenylate cyclase. This enzyme is incorporated into all cellular membranes, and only the specificity of the receptor determines which hormone will activate it in a particular cell. **Forskolin appears to bypass the need for direct hormonal activation of adenylate cyclase via transmembrane activation.** As a result of this non-specific activation of adenylate cyclase, intracellular cAMP levels rise.
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> The physiological and biochemical effects of a raised intracellular cAMP level include the following: inhibition of platelet activation and degranulation, inhibition of mast cell degranulation and histamine release, increased force of contraction of heart muscle, relaxation of the arteries and other smooth muscles, increased insulin secretion, increased thyroid function, and increased lipolysis (fat burning).
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> Recent studies have found forskolin to possess additional mechanisms of action independent of its ability to stimulate adenylate cyclase and cAMP dependent responses directly. Specifically, forskolin inhibits a number of membrane transport proteins and channel proteins through a mechanism that does not involve the production of cAMP. The result, once again, is a transmembrane signal that results in activation of other cellular enzymes.
>
> Forskolin also antagonizes the action of platelet activating factor (PAF) by interfering with

the binding of PAF to receptor sites on cells. PAF plays a central role in many inflammatory and allergic processes, including neutrophil activation, increasing vascular permeability, smooth muscle contraction (including bronchoconstriction), and reduction in coronary blood flow. After treatment of platelets with forskolin prior to PAF binding, a 30-40% decrease in PAF binding was observed. The decrease in PAF binding caused by forskolin was concomitant with a decrease in the physiological responses of platelets induced by PAF. However, this forskolin induced decrease in PAF binding was not a consequence of cAMP formation, as the addition of a cAMP analog could not mimic the action of forskolin. In addition, the inactive analog of forskolin, dideozyforskolin, which does not activate adenylate cyclase, also reduced PAF binding to its receptor. Researchers speculate that the action of forskolin on PAF binding is due to a direct effect of this molecule and its analog on the PAF receptor itself, or to components of the postreceptor signaling for PAF.

These are some of the things they say forskolin may be helpful and useful for: eczema, psoriasis, asthma, hypertension, congestive heart failure, angina, cerebral vasodilator indicating that it may prove to be useful in cerebral vascular insufficiency and post stroke recovery, increasing intraocular blood flow, weight loss programs (due to its lipolysis stimulation), hypothyroidism, malabsorption and digestive disorders, depression, prevention of cancer metastasis, and immune system enhancement.

This is what Murray says about hypothyroidism, malabsorption, digestive disorders, and immune system enhancement that are our concerns here:
Hypothyroidism—forskolin increases thyroid hormone production and stimulates thyroid hormone release. **Malabsorption and digestive disorders**—forskolin stimulates digestive secretions including the release of hydrochloric acid, pepsin, amylase, and pancreatic enzymes. Forskolin has been shown to promote nutrient absorption in the small intestine. Coleus forskohlii extracts may prove useful in treating dry mouth, as forskolin increases salivation. **Immune system enhancement**—forskolin exhibits potent immune system enhancement (primarily through activation of macrophages and lymphocytes) in several models.

My reservations, and that of others more qualified than I, is that forskolin bypasses the G-protein "switch" to activate adenylate cyclase and raise cAMP levels. Apparently, since there is no "off" switch, this will keep these cells running "full bore" without a brake. This seems to stimulate the sympathetic nervous system to greater activity. This would not be desirable, obviously, for those with an overactive sympathetic system (most autists). Conversely, in low dose, it would probably be beneficial to one with a sluggish sympathetic nervous system (while one gives the sympathetic glands—the thyroid, adrenal medulla, anterior pituitary, and andric [male] hormones—needed nutritional support), and possibly to one with the G-protein dislocated from its retinoid receptors by the DPT vaccine as postulated by Dr. Mary Megson, however, she asked if **increasing cAMP cells could be causing lipolysis, and blocking production of acetylcholine needed to enhance the activity of vitamin A.** (See my paper "Notes on pH Balance and Metabolic Types"). Increasing cAMP phosphodiesterase may cause a problem with getting adequate sleep. Additionally, Cyclic AMP inhibits the migration rate of white blood cells, as well as the ability of the white blood cell to destroy pathogenic (disease-causing) organisms. Reference: Journal of Dental Research, Vol. 55, Sup B, p. 523, 1976, "Effect of Inorganic Fluoride Salts on Urine and Tissue Cyclic AMP Concentration in Vivo".

Demyelination

At birth, relatively few pathways have myelin insulation. That is why a baby's movements are

uncoordinated. Myelination in the human brain continues from before birth until at least 20 years of age. Up until the age of 10 or so, vast areas of the cortex are not yet myelinated, and up to the age of 20, large areas of the frontal lobes are not yet myelinated.

The brain's highly active cells, with high rates of oxygen consumption, produce many free radicals or reactive oxygen species (ROS). Normally, these free radicals are neutralized by antioxidant small molecules (that is, vitamins C and E, urate, glutathione, selenium etc.), as well as protein defense molecules (e.g., superoxide dismutases, catalases, peroxidases, metallothioneins, etc.). Today, especially in stressed-out children and their parents, a wide variety of insults (e.g., sleeplessness, worry, anxiety, hypoglycemia, dysbiosis, hyperactivity, EMF exposure, cell phones, heavy metal toxicity, trauma, seizures, etc.) set in motion a cascade of events that can lead to an excess of free radicals that overwhelm defense mechanisms resulting in tissue and DNA damage unless significant antioxidant supplements are supplied. Without a doubt, the best choice is Mannatech's Ambrotose AO and additional selenium. The brain is extremely vulnerable to free-radical-induced damage because it has high oxygen consumption, relatively low defense capability, and large amounts of unsaturated lipids.

Myelin is highly enriched in iron (LeVine, 1991; Erb, Osterbur and LeVine, 1996), which can catalyze the formation of hydroxyl radicals, cause secondary initiation of lipid peroxidation, and/or react with some proteins and EMF radiation, particularly cell-phone usage, to promote oxidative damage, including DNA single and double strand breaks. In lesion sites of multiple sclerosis brains, iron has been found in macrophages and microglia (LeVine, in press). Products of free-radical damage also have been identified in lesion sites (LeVine and Wetzel, in preparation). In one study, high antioxidant intake stopped the damage, including that to the DNA!

The history of studies on vaccines began in 1922 when a smallpox vaccination program caused an outbreak of encephalitis, with a secondary result of Guillain-Barre Syndrome, an ascending paralysis ending in death. The poliovirus produces a breakdown of the myelin sheath, called poliomyelitis, which results in paralysis. Encephalitis, whether caused through disease or because of vaccination, can cause demyelination of the nerves. In regions in which there is no organized vaccination of the population, general paralysis is rare. It is impossible to deny a connection between vaccination and the encephalitis that follows it.

In 1935, Thomas Rivers discovered "experimental allergic encephalomyelitis (EAE)". Until then, it was assumed that encephalitis was caused by a viral or bacterial infection of the nervous system. Rivers was able to produce brain inflammation in laboratory monkeys by injecting them repeatedly with extracts of sterile normal rabbit brain and spinal cord material, which made it apparent that encephalitis was an allergic reaction. EAE can explain the association of allergies and autoimmune states with encephalitis.

In 1947, Isaac Karlin suggested that stuttering was caused by "delay in the myelination of the cortical areas in the brain concerned with speech." In 1988, research by Dietrich and others using MRI imaging of the brains of infants and children from four days old to 36 months of age found that those who were developmentally delayed had immature patterns of myelination.

In 1953, it was realized that some children's diseases, measles in particular, showed an increased propensity to attack the central nervous system. This indicated a growing allergic reaction in the population to both the diseases and the vaccinations for the diseases. There is a "cure" for measles. It is called vitamin A, specifically, cod-liver oil. As early as 1932, doctors used cod-liver oil to reduce hospital mortality by 58%, but then antibiotics became the treatment of fashion (Clin. Infect. Dis., Sept. 1994, pg. 493), and vitamin A was ignored until 1980. A 1993 study showed that 72% of hospitalized measles cases in America are vitamin A deficient, and the worse the deficiency the worse the complications and the higher the death rate (Pediatric Nursing, Sept./Oct. 96). I mentioned earlier that many also lack vitamin C with similar negative results. Yet, doctors and hospitals typically do not use vitamins A and C!

In 1978, British researcher, Roger Bannister, observed that the demyelinating diseases were getting more serious "because of some abnormal process of sensitization of the nervous system." Some investigators believe that vaccination programs are enhancing this increased sensitization of the population.

Dr. Vijendra Singh (now at the Utah State University, Logan; singhvk@biology.usu.edu; 435-797-7193) and his coworkers have identified several autoimmune factors, in particular, the presence of brain-specific autoantibodies (antibodies to myelin basic protein, neuron-axon filament proteins, and serotonin receptor protein). Recently, they also found important changes of virus serology; for example, measles virus and human herpes virus-6 antibodies. Moreover, they showed that autistic children have marked increases of two key cytokines, namely interleukin-12 and interferon-gamma, which are known to play a significant role in the induction of autoimmune diseases.

Dr. Singh stated, "We found evidence of brain, serotonin-receptor antibodies in Obsessive Compulsory Disorder patients who were not on any therapy. Those who were on serotonin re-uptake inhibitor therapy did not have these autoantibodies. In other words, the therapy was actually altering the autoimmune response which resulted in improved symptoms."

Among 33 autistic children (less than or equal to 10 years of age) compared to 18 age-matched, normal children, antibodies to myelin basic protein were found in 19 of 33 (58%) sera (blood serum samples) from autistic children as compared to only 7 of 50 sera from control children. Myelin sheath (the fatty acid complex that surrounds the axons of nerves) is derived from the amino acid serine (with the help of vitamin B_{12}). **A serine deficiency is seen in candidiasis and hypoglycemia. Defects in serine synthetic pathway can lead to neuropathy, neuritis, or behavioral disorders, and can mimic folate or vitamin B_{12} neurological deficiency symptoms.**

Dr. Singh stated in part: "Let me touch on the various autoimmune treatments being used for autism. I think they have implications for other neuropsychiatric disorders such as COD (sic - OCD?), and perhaps Torero's (Long Distance Runner's) Syndrome. At least two seem particularly promising. One is IVIG—intravenous, immunoglobulin therapy. IVIG is used in immune disorders to replace antibodies that are low in number, as in bone marrow transplant patients where everything is wiped out, or it is used to modulate the immune system. It is expensive and requires treatment on a regular basis, perhaps every 6 or 8 months. IVIG was originally designed for patients with viral infections and severe combined immune deficiencies. The purpose of this treatment is to reconstitute the immune response. It is generally done by bringing immunoglobulin levels to normal status.

"IVIG can be administered at a hospital or a medical center. Even though it is a very safe procedure, there is always a rare chance of adverse reactions especially after long-term use. This was noted in a couple of patients with the neurological disorder Guillain-Barre Syndrome, and there was one case report where after ten years of treatment the patient in his late 40s had an acute reaction. Aside from that, it is a reasonably safe treatment.

"For autistic children, IVIG was first used by Dr. Sudhir Gupta at the University of California, Irvine. Some children with autism have experienced a significant reduction of symptoms; some have had moderate or mild improvement, and still others have shown no benefit at all. In a double-blind fashion, we have found, at least in a handful of patients that the IVIG therapy not only improved behavior of the children, but it also produced change in the antibody levels. We have found that after the IVIG therapy the antibody titers to myelin basic protein and neurofilament protein actually went down below the detection limit. This exciting finding documents the therapeutic result of IVIG, and should be explored further.

"You will not find the therapy available everywhere. Remember, it is an experimental treatment. Not every physician who deals with autistic children is familiar with this research. Physicians dealing with autism may not get involved in the autoimmune function with autism unless they have been to a conference on the topic or decided to review the literature."—Dr. Vijendra Singh. Ph.D.

Actually, the results are not all that exciting for nine out of ten (at a cost for four infusions of about $8000.00, and prospects of having to use it indefinitely to maintain any gains) as this abstract shows: Intravenous immunoglobulin treatment of children with autism. J Child Neurol 1998 Feb; 13 (2): 79 – 82.

"Ten autistic children with immunologic abnormalities, demonstrated on blood tests, were enrolled in this study. Intravenous immunoglobulin, 200 to 400 mg/kg was administered every 6 weeks for an intended treatment program of four infusions. In five children, there was no detectable change in behavior during the treatment program. In four children, there was a mild improvement noted in attention span and hyperactivity.…in one child there was a very significant improvement, with almost total amelioration of autistic symptoms over the time period of the four infusions."

IVIG, or intravenous immune globulin, is a mixture of immunoglobulins (antibodies), and is prepared from pooled, human-blood plasma. Donors are screened for potential viral infections like AIDS and Hepatitis A and B, but there is a significant risk of occult (hidden) viral infection, especially Hepatitis C, from IVIG. Additionally, "This IgG therapy can be used with patients with low IgA values, but if the IgA values are so low that they cannot be detected, giving IgG therapy is too risky. It is possible the deficient person's body would produce antibodies against the IgA in gamma globulin, causing potentially fatal anaphylactic shock."—Dr. William Shaw. For this reason, either Bovine colostrum or Transfer Factor™ (both rich in IgA) should be used before using the IVIG method of restoring the immunoglobulins.

Dr. Singh continued, "There are two other approaches that I think are important, but I must emphasize the clinical treatment is not well established. One is the use of immune-suppresser, anti-inflammatory agents, namely steroids such as ACTH or prednisone. This is a conventional approach to treating autoimmunity. I have heard from a number of parents of autistic children that their child was given steroids soon after the diagnosis, and symptoms improved. The treatment was later discontinued because they were concerned there could be toxicity on a long-term basis, and I understand that. But if an autoimmune factor for autism is determined through research, then there may be some room for treating children with steroids. There was one study from Europe that supported this approach. The idea is to first identify what is wrong before pursuing the treatment.

"The other treatment is based on anecdotal reports: Sphingolin™ is a trade name for a bovine, brain-myelin preparation. This commercial product is sold as a nutritional supplement, and can be used to correct the immune response against the myelin-basic protein. So, if the child is found to have antibodies to myelin-basic protein or neurofilaments, which are rich in myelin components, then you may think about giving this treatment. Many of those who have done so are noticing very positive responses. Dosage should be quite low to have this benefit to the patient. I'm not a physician and don't prescribe treatment, but from a research standpoint, the adult dose is generally two capsules per day, hence the child would take only one or one-half. I have parents who insist they would not consider taking their autistic child off this treatment. The important thing is to first check whether the child has antibodies to myelin-basic protein or neurofilament. If there are no antibodies, don't do this treatment."—Dr. Vijendra Singh. Ph.D. Interestingly, one study using red-blood cells found that a deficiency of magnesium appeared to alter the fluidity of the cell membrane changing its permeability and making it more susceptible to destruction. This was caused by a significant reduction of a vital membrane lipid (sphingomyelin) apparently resulting from the magnesium deficiency; just one more reason to supplement this vital mineral.

Dr. Hugh Fudenberg had this to say, "With IVIG, **only about 15% were helped. T**hese turned out to be the same types in whom we found autoantibodies to myelin-basic protein and other Central Nervous System tissue constituents." Dr. Jane El-Dahr says, "My concern was always that unless we got to the bottom of why these children had the brain auto-antibodies to begin with, high-dose IVIG would be only temporarily effective and not a long-term solution. Once I began reading about mercury and autoimmunity, especially about brain autoantibodies in workers exposed to mercury, things started to make sense."

To all this I ask, "Shouldn't we use Sphingolin™, or better, a combination of Colostrum, Ambrotose AO™, and Lauricidin™ first?" Though slower acting, they accomplish the same basic purposes as IVIG without the risk or the prohibitive costs and the results can be sustained.

In 1993, Vijendra Singh, PhD, published a study in which they found antibodies to myelin-basic protein in 50 to 60% of autistic children tested. In 1988, research by Dietrich and others using MRI imaging of the brains of infants and children from four days old to 36 months of age found that those who were developmentally delayed had immature patterns of myelination. Sphingolin™ (Myelin-sheath, protein supplement that is the exact component of the sheath), is available from Terrace International (909-307-2100), $10.95 (1-month's supply), or from L & H VITAMINS at (800) 221-1152. The Web page for stories of people with MS that have used Sphingolin™ is www.2cowherd.net .

In 2001, Dr. Singh published an abstract stating in part, "Considering MBP autoantibodies as an index of autoimmunity to myelin, an open-label trial of oral Sphingolin™ is under assessment—preliminary results are encouraging with significant improvement of behavioral characteristics in the autistic people."

Since antibodies persist for a much longer period of time than antigens of nucleic acids, the detection of antibodies may be a reflection of past infection no longer active. Caution needs to be applied in the interpretation of antibody studies. The need for caution derives from the fact that some infectious and autoimmune diseases can result in polyclonal B-cell activation with subsequent secretion of antibodies directed at a range of infectious and host-derived antigens. **For example, infection with Epstein-Barr virus can result in the development of antibodies to a number of other viruses including measles, rubella, adenoviruses, enteroviruses and varicella-zoster virus.** Similarly, infection with human immunodeficiency virus results in the development or augmentation of antibodies to a range of viral antigens as well as to host-derived antigens such as DNA, myosin, and ovalbumin. **It is thus possible that the detection of antibodies to a range of viral agents may reflect infection with a more limited repertoire of infectious agents.** Similarly, the presence of antibodies to host-derived proteins, noted in previous studies of schizophrenia, may reflect infected cells, as well as autoimmune pathogenic mechanisms. (Pathogenetic Aspects of Infectious, Immunological, and Chronobiological Processes in Psychiatric Diseases, Henneberg AE, Kaschka WP (eds): Immunological Alterations in Psychiatric Diseases. Adv Biol Psychiatry, Basel, Karger, 1997, vol 18, pp 1-12.) Nevertheless, I believe that a high to very high antibody level indicates a chronic, active infection.

This recent study adds significant new input into the myelin discussion:
A new view of multiple sclerosis (MS) may arise from the first extensive study of brain tissue from the earliest hours during a bout of the disease. The results, published February 23, 2004, in the advance on-line edition of the Annals of Neurology, suggest that the earliest event is not, as previously believed, a misguided, immune-system attack on a brain substance called myelin. Instead, the first event appears to be the death of the brain cells that produce myelin, triggering a subsequent immune system mop-up operation to clean up the cells and the myelin, said author John W. Prineas, MBBS, of the University of Sydney in Australia. Several years ago, a fellow neuropathologist in Manhattan asked whether Prineas and his colleagues would be interested in examining brain tissue from a 14-year-old girl who died unexpectedly 17 hours into a relapse.

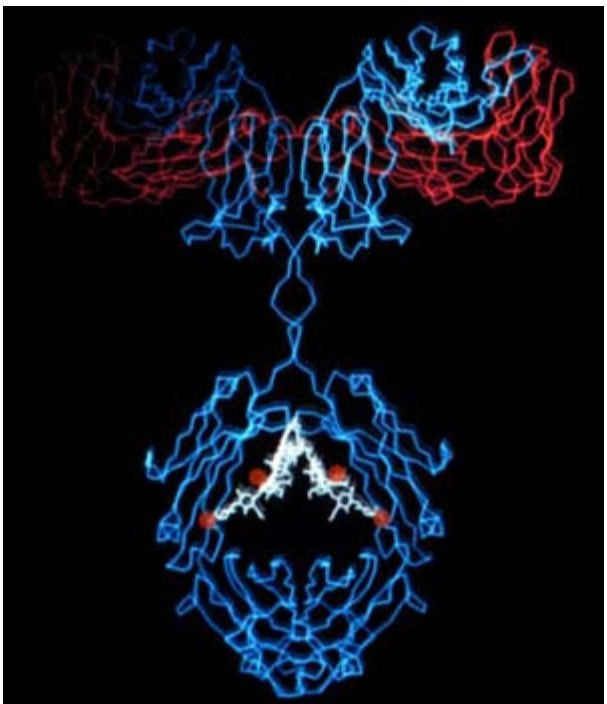
"This patient proved to be unique in the history of multiple sclerosis in that there was lesion available for study that was less than a day old," said Prineas. Prineas and Barnett noticed that the myelin in the lesion was still intact, and there was no evidence that the typical armada of immune system cells and molecules had moved into the area yet. Instead, oligodendrocyte cells, which produce the myelin, were dying. Myelin is, in fact, an extension of oligodendrocytes that wrap themselves around nearby nerve fibers.

"This encouraged us to re-examine other early MS cases in our brain bank," said Prineas. "Similar lesions, albeit extremely rare, were identified in a number of other early MS cases, which allowed us to conclude that the changes observed probably occur at the onset of any typical new lesion." The results could have significant consequences for MS research, much of which is focused on understanding why the immune system attacks myelin. The focus needs to shift to understanding why the myelin-producing cells begin to die.

As to steroids, a personal view is that at no time, except to save a life is steroids justified for a child. If continued, as would be necessary for any long-term benefit, the side effects will be worse than the condition treated. Furthermore, with IVIG, a human blood product goes directly into the veins. It must be prepared and processed differently than IMIG (Intramuscular). Some people will get a little better from IVIG, because a dysfunctional immune system is the culprit for these children's problems, and this product can help the immune system. The trouble is that it is not a sustained gain. There is a very real danger of passing hepatitis and/or any number of unidentified retroviruses with this type of therapy. Presently we have no reliable screens for hepatitis C, D, E, F, or G. If there is an allergic reaction in a child with low IgA, the possibility of either getting very sick, or even dying is very real. Mentioned in this paper are a number of safer ways to restore the immune function. These should be used before resorting to the very expensive, potentially dangerous, IVIG.

This interesting snip from a recent study that determined that a tiny amount of a "sugar" attached to the IgG molecule accounts for the beneficial results of IVIG:

> A small fraction of the IgG antibodies in the IVIG solution carry a sugar called sialic acid that is required for its protective ability. This accounts for the large amounts of"IVIG needed.
>
> "This is a very interesting condition that's set up," Jeffery Ravetch, Leonard Wagner Laboratory, says. "IgG can shift from a state that is quite inflammatory to a state that is actively anti-inflammatory by just changing this sugar." This switch occurs during a normal immune response to a foreign substance, shifting the IgG antibodies from an anti-inflammatory state to one that is pro-inflammatory and able to efficiently dispose of the foreign challenge.



> They found that just enriching IgG species with this sugar increased IVIG activity by a factor of ten, while removing it wiped out the therapeutic activity altogether! It is interesting to note that a molecule of galactose (mostly found in milk) missing from the end of these IgG molecules will cause arthritis. (Advanced Ambrotose® contains significant amounts of both these sugars.)
>
> The four red dots are the sialic (neuramenic) acid within the IgG molecule in its anti-inflammatory mode.

It is recognized that many of the ASD children do indeed have

myelination problems probably from vaccine damage. **Strong evidence that these vaccines cause myelin sheath damage (multiple sclerosis) has caused France to discontinue all vaccination for hepatitis B.** Apparently, zinc binds with and stabilizes the myelin sheath. Mercury increases urinary excretion of zinc (resulting in zinc deficiency). Mercury also interferes with zinc's binding with MBP and impairs MBP aggregation. Myelin sheath (the fatty acid complex that surrounds the axons of nerves) is derived from the amino acid serine and involves vitamin B_{12}. A serine deficiency is seen in candidiasis and hypoglycemia. Serine is required for the growth and maintenance of muscle. Serine, with P5P, forms cystathionine that with P5P forms a-ketobutyrate and Cysteine. The amino acid glycine is a precursor to serine, and the two are interconvertible. Histidine is said to be necessary for maintenance of myelin sheath. Its supplemental use should be approached with caution for it is a powerful chelator, and can deplete essential minerals.

One variation of serine, namely Phosphatidylserine, serves several important functions within the central nervous system, including development of the myelin sheath. Phosphoserine, a modification of serine, is a good predictor of vitamin B_6 deficiency, in particular the form of vitamin B_6 called Pryidoxal-5-Phosphate (P5P). If plasma Phosphoserine levels are abnormally high, that is a clear indication of P5P deficiency. P5P is critical in amino acid processes. Tyrosine, for example, cannot be converted into the neurotransmitter norepinephrine if there is not enough P5P. Likewise, tryptophan cannot be converted into the neurotransmitter serotonin if there is not enough P5P. An excess of serine and threonine, however, is seen in vitamin B_6 deficiency. Vitamin B_6 often is not being converted to P5P because of a lack of magnesium!

This MBP damage can be ameliorated, further damage prevented or repaired through nutritional intervention and the removal of heavy metals. Specifically, by supplementing lecithin, and using the other nutritional interventions mentioned herein. Lecithin, though from soy, does not have the negative qualities of soy for it does not contain those negative substances of soy protein, copper, diadzen, and genistein. Lecithin has proved useful in the following conditions:

1. It prevents cholesterol from congealing in fatty clumps in the blood and attaching to the vessel walls. It lowers the "melt" point from something like 180 degrees Fahrenheit to somewhere in the range of 65-75 degrees, fully liquid in the blood.
2. Exhibits good antioxidant properties.
3. Supplies choline that is so necessary to proper use of fats, and which increases available acetylcholine in the brain. A lack of acetylcholine produces urinary retention, gastric reflux, reduced cognitive function, and myasthenia gravis. Manganese, methionine, and inositol work with choline to produce lecithin in the body.
4. Detoxifies lead, mercury, various drugs, and counteracts the effects of radiation and DDT, and neutralizes many poisons. It protects and repairs myelin sheath of nerve fibers damaged by heavy metals and toxins—neutralizing or minimizing the effects of nitrates and nitrites.
5. In cancer treatment, it prevents melena (blood in the stool from radiation damage).
6. Dr. Minea achieved improvement in 80% of MS patients with injections of lecithin. Copper is also needed for myelin sheath.
7. With the B-vitamins, rutin, calcium, magnesium, and unsaturated fatty acids, it gives relief of shingles.
8. With vitamin E, it reduced insulin requirements of diabetics in several patients.
9. Aids in protecting the eyes.
10. Lecithin and antioxidants should accompany supplemental fatty acids.
11. Being high in phosphorus, it can imbalance calcium if coupled with an intake of soft drinks, meats, and phosphate additives in processed foods. Studies in Germany (Hafer, 1979) related high levels of phosphate to troublesome behavior and hyperactivity in children, with marked

> improvement when the excess phosphate was removed from their diet. It is very easy to get excess phosphate from soft drinks, processed foods, and baked goods where it is used as an additive. Calcium, magnesium, zinc, iron, aluminum, and beryllium all react with dietary phosphates to form insoluble precipitates. Most phosphates are slightly soluble in water or acid solutions. However, the intestine tends to become alkaline which reduces the solubility of the phosphates when introduced into that environment.

Suggested: up to four tablespoons of granules in cancer and MS. Good food sources: eggs, seeds, and cold-pressed oils. See www.centralsoya.com/CENSOYA/LECITHIN.NSF for additional information on lecithin.

While it is not my purpose to study diets in detail, I would like to observe that one should not concentrate on one food such as soy, rice, or nut milk, but use as great a variety as is available, for all of these have definite deficiencies as the perfect food. Soy infant formula, for example, raises blood levels of estrogen thousands of times higher than breast milk (Alternatives Vol. 8, No.3, Dr. David G. Williams), and contains enzyme inhibitors that can affect the thyroid adversely. It is also high in copper that slows the thyroid. Dr. Jonathan Wright's "Nutrition and Healing", April 2001 states; "One ounce of soy a day for one month can result in a significant increase in 'TSH' (the hormone that increases with hypothyroidism). The FDA subsequently found that diadzen and genistein (two of the most 'hyped' soy isoflavones) are responsible for this hazard." In fact, scientists Daniel Sheehan and Daniel Doerge, from the National Center for Toxicological Research presented findings from rat feeding studies indicating that genistein in soy foods causes irreversible damage to enzymes that synthesize thyroid hormones. The majority of children with ASD have hypothyroidism already!

The frequency of feedings with soy-based milk formulas in early life was significantly higher in children with autoimmune thyroid disease (prevalence 31%) as compared with their siblings (prevalence 12%). It can also decrease the ability of red blood cells to absorb oxygen according to Dr. David Williams and Dr. John R. Lee in their newsletters. There's concern about the fluoride level, the estrogen level, the manganese level, and the glutamate level in these soy infant formulas. Its phytoestrogens require sulfate to solubilize them to remove them from the body; thus, **a PST child should avoid soy products that are unfermented**. Soy is also highly allergenic. Soy infant formula is high in both fluoride and aluminum, far surpassing the "optimal" dose, and has been shown to be a significant risk factor in dental fluorosis. If the formula is combined with fluoridated local water, the problem is compounded. Aluminum greatly potentiates fluoride's effects on G-protein activation, the on/off switches involved in cell communication and of absolute necessity in thyroid hormone function and regulation. Both organic and inorganic fluoride compounds have been shown to inhibit zinc-containing enzymes, such as carbonic anhydrase (Dugad et al., 1988,1989; Gelb et al., 1985) that is also now used as a marker for thyroid dysfunction (Hori et al., 1998). Additionally, fluoride bonds with magnesium in the blood into the insoluble magnesium fluoride. This means that the magnesium cannot be assimilated by the pituitary, with the consequent failure of the pituitary to function properly that leads to the symptoms of magnesium deficiency. Harvard Medical School has discovered that fluoride accumulates in brain tissue where it can damage the central nervous system. Lead and fluoride are frequently associated with hypothyroidism, impairing the uptake of iodine by the thyroid creating a deficiency of this vital mineral. Thus, fluoride inhibits digestion, thyroid function, and Phase I liver enzyme function.

Soy is lacking also in the essential, sulfur-bearing, amino acid, methionine. Methionine is a critical nutrient for infants and children for growth and tissue development. They require 22 mg/kg per day for proper growth and development. Adults need only half that! D-L-methionine is an anti-inflammatory and an antioxidant, and it metabolizes into several other sulfur, amino acids (Cysteine, Glutathione, and Taurine) that support the body's natural detoxification pathways. Adequate methionine, if metabolized into these amino acids, ensures detoxification of mercury, arsenic, and lead. It is an anti-inflammatory aid to arthritis, fibromyalgia, headaches,

migraines, and other chronic pain syndromes. Both Asian and Western children who do not get enough meat and fish products to counteract the effects of a high phytate diet, frequently suffer rickets, stunting, and other growth problems due to a lack of methionine and an induced zinc deficiency.

This induced deficiency of zinc will cause children to absorb more aluminum into their systems, because aluminum competes with zinc in binding sites on ligands, organic molecules in the body that attach to a single metallic ion. Systemic reduction of zinc is especially prevalent in infants fed with soy formulas. [Settle et al., "Effect of phytate: zinc molar ratio and isolated soy bean protein on zinc bioavailability", Journal of Nutrition, Vol 111, 1981, p.2223-2235.] Methionine is a critical nutrient for infants and children for growth and tissue development. They require 22 mg/kg per day for proper growth and development. Adults need only half that! D-L-methionine is an anti-inflammatory and an antioxidant, and it metabolizes into several other sulfur, amino acids (Cysteine, Glutathione, and Taurine) that support the body's natural detoxification pathways. Adequate methionine, if metabolized into these amino acids, ensures detoxification of mercury, arsenic, and lead. It is an anti-inflammatory aid to arthritis, fibromyalgia, headaches, migraines, and other chronic pain syndromes. Both Asian and Western children who do not get enough meat and fish products to counteract the effects of a high phytate diet, frequently suffer rickets, stunting, and other growth problems due to a lack of methionine and an induced zinc deficiency.

Rice, in many of its forms, is a high-glycemic food that elevates insulin in an undesirable fashion, and when coupled with the plethora of other high-glycemic foods found in the American diet, is very detrimental to blood sugar control and fatty acid metabolism. Furthermore, different brands of rice milk vary widely in sugar/carbohydrate content. Shop carefully, and rotate these foods to minimize blood sugar problems and allergic potential. "While I agree with the anti-milk stance, it is important to remember that people should NOT switch to soy milk or rice milk"—Dr. Joseph Mercola. His reasons, in addition to those listed above, is that some soy milk products do not have sufficient vitamin D for toddlers, and some rice-based milks do not have enough protein. Look into Hemp milk.

When one ingests sugar or high glycemic foods, insulin is released from the pancreas to assist the sugar into cells and to control blood sugar levels. Balancing this action, the adrenal glands release catecholamine hormones (epinephrine and norepinephrine) to keep the sugar levels from dropping too low. Studies have revealed that ADHD children (and autistic who are ADHD) release only half as much of the catecholamines as normal children. Norepinephrine plays a vital role in attention and ability to focus. We also know that dopamine plays a vital role in performance and memory. Serotonin deficiency appears to play a vital role in violent and antisocial behavior. This drop in neurotransmitter activity will allow a drop in blood sugar that creates a significant decrease in brain activity in these children. Sugar is poison to these children, and a removal of sugar and high glycemic foods will make a great difference in their behavior. Avoiding these poisonous foods, and strengthening the adrenals will often correct the problem. One aid in supporting the adrenals that is recommended by Dr. David Williams is *Drenamin*™ by Standard Process Products™ (800-848-5061). Other adrenal glandular products are available at your health food store, and the nutrients needed are listed herein.

Acetyl L-carnitine (ALC) is the acetyl ester of carnitine (an amino acid) that transports fats into the mitochondria. In the mitochondria these fats are converted to energy. ALC not only increases the synthesis and release of acetylcholine, it now appears that it has neuroprotective and neuroenhancing properties as well. We've noted that the enzyme CoA is needed to convert choline to acetylcholine. S-Adenosylmethionine (SAM) is also an enzyme that is important in acetylcholine synthesis. Stimulation of the parasympathetic nervous system releases acetylcholine at the nerve endings. Loss of gut mucosal integrity (common in ASD) would decrease by 85% gut absorption of CoA, shunting choline into

homocysteine production that folic acid, vitamin B_6, and B_{12} metabolize back into usable aminos. TMG helps make SAM.

Dimethylaminoethanol (DMAE) is a safe, natural substance that easily crosses the barriers in the brain and nerve cells where it is converted first to choline and then to acetylcholine. It is an MAOI, and requires special consideration when using dopamine enhancement. DMAE, often referred to as a Smart Nutrient, is a very efficient antioxidant and free-radical deactivator. It stabilizes lysosome membranes preventing leakage of collected toxins and protein-damaging enzymes. Increased production of acetylcholine may explain why a continuous dietary source of SAM or DMAE makes people with multiple disorders feel better. Many will profit from this increase of acetylcholine, but observe the earlier mention of where too much, or an imbalance with norepinephrine, can cause adverse effects. Kane has observed bad effects of multiple vitamins containing choline. The affected group would likely be those unable to absorb CoA, and those suffering allergies, yeast overgrowth, and PST/sulfoxidation disorders.

Not to be confused with carnitine or acetyl-L-carnitine is the dipeptide, Carnosine, sometimes presented as N-Acetylcarnosine. Doctor Chez finds most beneficial a dosage of 400 mg Carnosine in combination with 50 IU vitamin E and 5 mg zinc, twice a day. "It affected language, receptive language, eye contact, communication, which are things children with autism have big gaps with (sic)," Chez said. It is interesting to note that, at least for adults, the dose is 1000 mg spread through the day, "for the body automatically metabolizes lower amounts of Carnosine into an inert substance, but the body cannot neutralize the 1000 mg" (Life Extension Directory).

Carnosine is the dipeptide of the amino acids histidine and alanine, and functions primarily as a pH buffer in muscle tissue. Unfortunately, muscle levels are reduced 63% between ages 10 and 70 (Stuerenburg). High Carnosine levels are associated with an increase in physical performance especially anaerobic performance. Carnosine is best known for its ability to buffer lactic acid in muscle tissue and for its multiple antioxidant capabilities. When cells were exposed to 90% oxygen, only Carnosine exerted significant protection. It reduced the level of chromosomal damage by two-thirds! It boosts levels of free IGF1, a hormone necessary to maintain youthful cellular function throughout the body. Aging cells in contact with Carnosine regain a more youthful appearance (McFarland 1999). The present findings would indicate an immunoprotective role of Carnosine, although definitive conclusions must await the results of future studies. A study by Florida State University reported that it helps modulate and protect essential nerves and membranes from excessive zinc and copper toxicity. Since many autistic kids are copper toxic, this may be why some are benefiting.

In some children, too high a dose of carnosine may overstimulate the frontal lobes which can cause increased irritability, hyperactivity, or insomnia which was observed in hyperactive autistic children. Other than that, there were no side effects, Dr. Chez says. Carnosine can accumulate as a result of high intake with insufficient zinc availability, from excess buildup of beta-alanine (due to unusual bacteria activity in the gut upon aspartic acid, ingestion of high amounts of pantothenic acid (vitamin B_5), or due to a lack of vitamin B_6. Elevated beta-alanine inhibits the breakdown of anserine and carnosine and impairs the renal conservation of taurine and beta-aminoisobutyric acid. This can be detrimental for taurine is an important antioxidant and a neuroinhibitory neurotransmitter, and it is essential for the retention and homeostasis of intracellular magnesium and potassium. Excess beta-alanine is a neurotoxic substance that suppresses development in the brain and spinal cord, and interferes with metabolism of the other neuroinhibitory neurotransmitter, GABA.

Actually, Dr. Pangborn, Ph. D. biochemist, has some serious reservations about this usage of carnosine:

> In body tissues, carnosine is split into histidine and beta-alanine. Beta-alanine can be a real troublemaker, and I'll get to that shortly. Histidine is the Dr. Jekyll and Mr. Hyde part.

Histidine becomes formiminoglutamic acid (FIGlu), and FIGlu (an intermediate metabolite in histidine catabolism in the conversion of histidine to glutamic acid, with the formimino group being transferred to tetrahydrofolic acid) pushes the formation of 5-formiminotetrahydrofolate. A build up of FIGlu usually indicates a folic acid deficiency. (A test of vitamin B_{12} deficiency, folic acid deficiency, liver disease, or genetic deficiency of glutamate formiminotransferase, based on urinary excretion of FIGlu).

This is good, even though it often raises FIGlu levels in the urine and blood of autistics. It's good because: (a) it helps remove a potential folate trap, and (b) it leads to two forms of folate that are required for purine and purine nucleotide synthesis. One of these forms, 10-formyltetrahydrofolate, comes in just after the adenylosuccinase step and helps "pull" the process along at a documented sticking point for some forms of autism.

However, histidine and Carnosine are powerful carriers of copper. They transport copper from the intestinal milieu into the portal blood, and from there to organs and tissues in the body. And don't think you can displace copper with zinc once the copper is on histidine - you cannot. The equilibrium constant for copper II chelated to histidine is 18.3; for zinc it is 6.7 to 12.9, depending on chelate structure (Ref. Chaberek and Martell, Organic Sequestering Agents, John Wiley & Sons, p.549). Because these are exponential relationships, the real difference in the constants is 10 to the 5th up to 10 to the 11th. Only glutathione, cysteine, and thionein can intercept this Carnosine-copper transport, but that's one of the big problems in autism, isn't it? These sulfur players have gone AWOL, and copper is excessive at the expense of zinc. Dr. Bill Walsh has made excellent presentations on this. You might think that Carnosine plus zinc will act to put zinc in and take copper out. With these equilibrium constants and with the natural copper content of food, that's very unlikely. You need a million or more zinc atoms for each copper atom to be competitive in this game! Histidine/Carnosine-copper wisdom has graduated into medical textbooks. We're not talking about research papers; we're talking what you should and shouldn't do per medical texts. Copper homeostasis with histidine and histidine-albumin complexes are well discussed by David Danks, Chapter 58 of Stanbury et al, The Metabolic Basis of Inherited Disease, 5th Ed, p.1252-1254.

For Carnosine, the publicity is a bit worse. Carnosine is a threat to worsened Wilson's disease because it and its sister anserine are such good importers of copper to body tissues. Ref: Scriver CR and TL Perry, Chapt 26 in Scriver et al eds, The Metabolic Basis of Inherited Disease 6th ed McGraw-Hill (1989) 765.

Now, let's go to the really bad guy here, beta-alanine. To be concise: beta-alanine blocks renal conservation of taurine and causes hypertaurinuria - loss of taurine in the urine. This, in turn, causes urinary loss of magnesium, which worsens sulfotransferase activity as well as lots of other necessary enzymatic processes. If you give Carnosine, you lose taurine and magnesium. There are lots of references, but you can start with Dr. Charles Scriver's work referenced above, because all of this biochemistry (Carnosine, beta-alanine, taurine, etc.) is closely related.

Histadine is a powerful chelator and can quickly deplete nutrients already in short supply. Nevertheless, carnosine has been used very successfully in protecting against radiation damage by boosting immune function in cancer patients. So, it is not my purpose to recommend for or against Carnosine usage, but to

bring you the pros and cons. I will say that it is touchy enough that it should not be used except under a knowledgable doctor's supervision.

Fibroblast Growth Factor

This from a doctor with an autistic child points to an area of which I know nothing. You may want to investigate it with your doctor or contact Dr. Aguilar for further information. "Out of pure desperation in January, I made an appointment with Dr. Luis Aguilar for FGF2 (Fibroblast Growth Factor 2) for Mike. He gave an address to the 1997 DAN! conference in which he presented his results using FGF2 in autism. They were very impressive in younger children (ages 3 to 5). Mike got his first FGF2 injection on April 19th; he gets an injection every 10 days. His response has been remarkable with major improvement in EEG with VEP's that Dr. Aguilar uses for assessment, and with big improvements in language, especially expressive (he was nonverbal)."

FGF-2 is a growth factor with receptors present on cells in specific areas of the brain damaged in autism, such as the hippocampus, amygdala, hypothalamus, mesencephalic trigeminal nucleus, and cerebellum. FGF-2 normally acts to stimulate neuronal cell growth from stem cells (the "progenitor" cells that can turn into the various types of cells present in a normal brain) and blood vessel regeneration (necessary for carrying nutrients into the brain). FGF-2 also stimulates the bone marrow, which produces immune stem cells, and the thymus, which contributes to immune cell development. This growth factor is also present in the intestines to regulate healing and repair. Homeopathic dilutions of FGF-2 are theorized to help autism by stimulating brain, stem-cell regeneration, blood-vessel growth, bone-marrow functioning, and intestinal healing without the side effects and expense of injectable FGF-2, such as increased inflammation and disordered astrocyte (brain immune cell) turnover. "The greatest strength of growth factors and CSE-homeopathic growth factors of Biomed Comm (www.biomedcomm.com) is their ability to bring 'abnormal' cells working out of control back into normal homeostasis"—Barbara Brewitt, Ph.D., Chief Scientific Officer.

Scientists at the Michigan School of Medicine have found that rats that had experienced a stoke or had epileptic seizures responded to these injuries by sending primitive neuronal cells into the damaged areas, attempting to form new neurons. In culture dishes, these precursor cells have been shown to normally generate only glial cells (housekeeping cells that provide support and nutrition to nerve cells). What these scientists discovered is that when these cells are exposed to FGF-2, they seemed to have the ability to generate neurons!

In tests, aloe vera extract stimulated fibroblasts that grow and repair tissue (*Sugars That Heal*). Mannose (Aloe Vera) has been shown to stimulate the production of mucopolysaccharides (GAGs) in fibroblast cells. This may contribute to the enhanced, wound healing associated with aloe vera. [Chithra P, Sajithlal GB, Chandrakasan G J. Influence of aloe vera on the glycosaminoglycans in the matrix of healing dermal wounds in rats. Ethnopharmacol 1998 Jan;59(3):179-86]. Recent research showed a dose-related, positive effect of blueberries, green-tea catechins, carnosine, and vitamin D_3 on the proliferation of human bone marrow. Combinations of these nutrients stimulated bone marrow proliferation by as much as 83% compared to only 43% in the control group which received a growth factor called "granulocyte colony-stimulating factor". Additionally, supplementing with the omega-3 fatty acid, DHA favorably influences adult stem-cell repair. Mannatech's Ambrotose Complex (includes an aloe vera component and other mannose sources) also has been observed to increase stem-cell production by the bone marrow. These nutrients, coupled with support for the thymus (a multivitamin/mineral plus a thymus glandular extract), should provide many vital improvements at a fraction of the cost of FGF-2 injections that are available only in Mexico.

A 24-year study of 11,384 people by James E. Ensrom of The University of Southern California found that those

taking supplements cut their death rate in half! **Deaths from cancer and heart disease were less than 10% of those who did not take a supplement. A Harvard study (Annuls of Internal Medicine 10/1/08) of 89,300 women found that daily multivitamins reduced the risk of colon cancer by as much as 75%! A British study (Br j Psychiatry 2002;181:22-8) of adult prisoners found that those given a multivitamin/mineral with essential fatty acids had 26.3% less violent acts and antisocial behavior!**

Summary and Miscellaneous

In summary, ensure adequate production of hydrochloric acid by restoring zinc levels, or supplement Betaine hydrochloride. Supplement with digestive enzymes (SpectraZyme™, EnZym-Complete™, Peptizyde™/Hn-Zyme Prime™, or GI-Zyme™ by Mannatech™. This will improve nutrient status. Next, supplement a good multiple/vitamin mineral. I suggest GlycoBears® (chewable) for children (Mannatech, Inc.). It contains 26 vitamins and minerals (no iron) in a base of 30 fruits and vegetables and rice syrup. Most basic to the child's recovery is the glyconutrient, Ambrotose AO™, and the Phytonutrient Phyt•Aloe® in the form of Manna•Bears™, a delicious, pectin gummy in bear form. These would be the basic five. Additionally, a high intake of vitamin B_6, magnesium, and zinc with balancing amounts of vitamins B_1 and B_2 would be strongly recommended. The anti-viral/bacterials Lauricidin™ and Colostrum would be welcome additions with additional supplements as indicated: fatty acids and amino acids to meet the need.

The foremost thing you should attempt here is to restore thyroid function that controls enzyme production of the pancreas. That will require you restore iodine, selenium, zinc, vitamin A, glutathione, and tyrosine to high-normal levels. Reduction of fluoride, excess copper, mercury, and other heavy metals may be needed. Make the Iodine and the Barnes' Morning Temperature tests, and if these indicate, follow the suggestions to restore the thyroid function. These kids are highly stressed, and need adrenal support as indicated. It is imperative that you give any nutritional intervention at least three month's time, faithfully followed, before judging it ineffective. Six months is more realistic for some may not show visible improvements any sooner. No attempt to increase nutrient level is wasted. The body will use these nutrients to some benefit whether you "see" it or not. Coincidentally, you should use digestive enzymes, Yeast Avenger™ or other antifungal, and high-count acidophilus: GI-Pro™ (Mannatech™), ProCulture Gold™ (Kirkman) to control Candida and trash bacteria that have overrun the "Good Guys" in the gut. If your child is PST, however, you should not attempt to clear Candida and bacterial overgrowth until you have reduced his toxic load by unloading the donkey, otherwise, your child may suffer Kyle's experience. Do a homeopathic, vaccine detoxication that removes mercury and aluminum as well as other poisons pumped into your child with vaccines. Medically, of first importance, test for heavy metal poisoning and chelate as indicated, however, do not chelate unless you are sure the mineral levels are normal, especially, do not chelate medically if selenium, zinc, magnesium, manganese, and/or molybdenum are low.

The Specific Carbohydrate Diet (SCD) or a casein/gluten free diet has been of great help to many; however, the problem with the SCD is that it makes some artificial distinctions that end up limiting its effectiveness while complicating it unnecessarily. Although the basics of this diet are sound, it is best adjusted for each individual case. In some instances, the complete elimination of all grains is simply unnecessary, while for others, foods that are freely allowed in the SCD, such as honey, fruit, or nuts, should be restricted to achieve optimal results. Similarly, the GF/CF diet tends to become another high-carbohydrate diet when the need is for protein. In eliminating casein, you eliminate the child's major protein source. This is one reason a change to SCD works better for some; it restores a source of protein. Additionally, selenium supplied through breakfast cereals, cakes, and biscuits, and in view of its high bioavailability, wheat-selenium (Se) probably supplies around half the Se one intakes, this being so, a gluten free diet is a selenium deficient one.

If on a gluten free diet, the following is pertinent:

It is important to know that Lactase enzyme supplement (Dairy Ease™) had gluten in both their tablet and drop forms. Furthermore, Gas-X™ (simethicone), Pepcid™ (Famotidine), Tagamet™ (Cimetidine) also contained gliadin. Karoly Horvath, M.D., Ph.D. Associate Professor of Pediatrics, University of Maryland at Baltimore Tel: 410-328-0812 Fax: 410-328-1072. Prilosec™ is reported to contain lactose.

I have other suggestions for controlling parasites and yeast. Feel free to send me any questions you may have, there is no obligation, and the counsel is free.

I have not charged for this extensive work, or for hours and hours of counsel, because I know so many cannot afford this needed help, but for those of you who can, please send a gift so that I may continue this needed work. OK? You may also wish to purchase my e-book, "Self-help to Good Health", 50 Chapters, over 1000 Pages, $29.95 US. A list of Chapter Titles may be seen at www.yahoogroups.com/group/Williss/files. To access it you will need to join my Autism List. **Payment or contributions to PayPal: WillissL@aol.com**

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www.willishealthpage.com My Health Page blog (under construction)
www.callpne.com (Pharmacists trained in glyconutritionals and drug usage/interactions, diabetes counseling. etc.)
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I am not a medical professional. Nothing herein is intended to prescribe for, or to treat disease, but is intended to inform, and to recommend certain courses of action that may be viable to investigate further. In every instance, it is advised that these actions be undertaken with the advice and consent of your medical professional. **Feel free to share this paper with him.** Email it to him or put it on CD.

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others have contributed bits and pieces. Credit is given to the following who were not interviewed, but the quotes are faithfully taken from their published literature: Susan Owens for her valuable contributions to my understanding of GAGs, CCK, and Motilin. (From the 1998 Durham Conference "Psychobiology of Autism": Explorations of the New Frontier between Gut and Brain: A look at GAGs, CCK and Motilin by Susan Costen Owens, University of Texas at Dallas, http://osiris.sunderland.ac.uk/autism/owens.html); to Patricia Kane, BodyBio Centre, 45 Reese Road, Millville, NJ 0833 for her information on fatty acids; to Dr. Robert J. Sinaiko, MD, for quotes from his paper "The Biochemistry of Attentional/Behavioral Problems", to Henry Osiecki, B Sc (Hons) Grad Dip Nutr Diet, to Dr. Woody McGinnis. MD, formerly of Tucson, Arizona, to Dr. Mary Megson, to Bernard Windham, Chemical Engineer, to Dr. Doris Rapp, MD, and to Vijendra Singh, Ph.D., Utah State University, Logan, Utah for the quotes herein; however, none of these may agree with the final product :-). I thank also Jon and Polly Tommey of England for publishing an earlier version of this paper as a bound insert in the third edition (Spring 2000) of their remarkable magazine, "The Autism File" (www.autismfile.com). My contribution was to put it all into a useable format as an aid to suffering mothers who have been left largely without guidance in this troubling malady.

These additional sources are recommended:
From a compilation by Dr. Woody McGinnis formerly of Tucson, Arizona.

- **Gastrointestinal Abnormality:**

- Malabsorption (J. Autism/Childhood Schizo, 1971 1(1):48-62)
- freq. reports acholic stools (lack of bile), undigested fibers, positive Sudans (undigested fat test).
- 85% of autistic meet criteria for malabsorption (B.Walsh, 500 pts)
- Maldigestion--elevated urinary peptides:
- P Shattuck (Brain Dysfunct 1990; 3: 338-45 and 1991; 4: 323-4)
- KL Reicheldt (Develop Brain Dys 1994; 7: 71-85, and others)
- Z Sun and R Cade (Autism 1999; 3: 85-96 and 1999; 3: 67-83)
- Microbial Overgrowth--fungal, bacterial and viral: William Shaw, Biological Basis of Autism and PDD, 1997. E Bolte on Clostridium (Med Hypoth, 1998; 51: 133-144). P. Shattock and A. Broughton: IAG elevations. W. Walsh and W. McGinnis: pyrrole elevations. Andrew Wakefield, (Lancet 1998; 351: 637-4), TJ Borody, Center for Digestive Diseases, New S. Wales, Australia.
- Abnormal Intestinal Permeability: P D'Eufemia (Acta Pediatr 1995; 85; 1076-9) GI. Symptoms reported by parents: diarrhea, constipation, gas, belching, probing, visibly undigested food, and need for rubs.
- **Compromised immunity:**

- Recurrent Infections:
- Euro Child/Adolesc Psych, 1993:2(2):79-90
- J Autism Dev Disord 1987; 17(4): 585-94

- **Abnormal Indices:**

- T-cell Deficiency (J Autism Child Schizo 7:49-55 1977)
- Reduced NK Cell Activity (J Ann Acad Chil Psyc 26: 333-35 '87)
- Low or absent IgA (Autism Develop Dis 16: 189-197 1986)
- Low C4B levels (Clin Exp Immunol 83: 438-440 1991)
- Skewed ("elevated") Viral Titers increasing grass-roots reports V Singh University of Michigan

- **Detoxification Weakness:**

- Phase II Liver Enzymes, Depression (S. Edelson, DAN Conference Sept, 1997, and Toxicology and Industrial Health 14 (4): 553-563 1998)
- Sulphation low in 15 of 17 (mean 5 vs. nl 10-18)
- Glutathione Conjugation low in 14 of 17 (mean 0.55 vs 1.4-2.9)
- Glucuronidation low in 17 of 17 (mean 9.6 vs. 26.0-46.0)
- Glycine Conjugation low in 12 of 17 (15.4 vs. 30.0-53.0)
- Sulphation Deficit (Biol Psych 1; 46(3): 420-4, 1999)
- Peroxisomal Malfunction (P Kane, J of Orthomolec Med 1997; 12-4: 207-218 and 1999; 14-2: 103-109)
- Higher blood lead levels in Autism and documented response to EDTA Chelation (Am J Dis Chld 130: 47-48, 1976)
- Apparent temporal association autism onset and lead exposure (Clinical Pediatrics 27: 1; 41-44 1988)

- **Abnormal Nutritional Profile in Children with Autism:**

- Lower serum Magnesium than controls (Mary Coleman, The Autistic Syndromes 197-205, 1976)
- Lower RBC Magnesium than controls (J. Hayek, Brain Dysfunction, 1991)
- Low activated B_6 (P5P) in 42%. Autistic group also higher in serum copper. (Nutr. and Beh 2:9-17, 1984)
- Low EGOT (functional B_6) in 82% and all 12 subjects low in 4 amino acids (tyrosine, carnosine, lysine, and lysine hydroxylysine).
- Dietary analysis revealed below-RDA intakes in Zinc (12 of 12 subjects), Calcium (8 of 12),
- Vitamin D (9 of 12), Vitamin E (6 of 12) and Vitamin A (6 of 12) (G. Kotsanis, DAN Conf., Sept, 1996) B_6 and Magnesium therapeutic efficacy--multiple positive studies (start with Am J Psych 1978; 135: 472-5)
- Low Derivative Omega-6 RBC Membrane Levels 50 of 50 autistic assayed through Kennedy Krieger had GLA and DGLA below mean. Low Omega-3 less common (may even be elevated) (J Orthomolecular Medicine Vol 12, No. 4, 1997)
- Low Methionine levels not uncommon (Observation by J. Pangborn)
- Below normal glutamine (14 of 14), high glutamate (8 of 14) (Invest Clin 1996 June; 37(2): 112-28) Higher Copper/Zinc ratios in autistic children. (J. Applied Nutrition 48: 110-118, 1997)
- Reduced sulphate conjugation and lower plasma sulphate in autistic. (Dev. Brain Dysfunct 1997; 10:40-43)
- B_{12} deficiency suggested by elevated urinary methylmalonic acid (Lancet 1998; 351: 637-41)
- Hypocalcinurics Improve with Calcium Supplementation, Lower Hair Calcium in Autistics Reported (Dev Brain Dysfunct 1994; 7: 63-70).