

Sensikit ® is a non pharmaceutical, non intrusive approach to eliminate a lot of causes of autism, mentioned in this document. Information is currently only available in dutch.



A Comprehensive Guide to Managing Autism

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Slightly changed by Kees de Vries, Drunen, Holland (june 2004)

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Warning: Do not scan and read this paper piecemeal. It must be studied to avoid mis-steps.

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. Some autistic children can be helped dramatically by medical procedures such as an infusion of the intestinal hormone secretin. The need and the beneficial response to secretin, I think, are dependent upon the amount of damage to the duodenum and small intestine from whatever cause, and on the stomach’s ability to produce adequate hydrochloric acid (HCl) for proper digestion. Since proper functionality of these two things largely determine proper digestion, it is vital that both be operative. Without adequate HCl, secretin infusion can, at best, be only partially effective in restoring digestion and proper physical and mental function. Release of secretin is dependant on adequate HCl in the chyme. Secretin is reduced in hypothyroid rats (Robberecht et al, 1981), so first support the thyroid. HCl production is also very dependent on adequate zinc levels, usually lacking in these children. **With support for the thyroid, adequate zinc and vitamin B₆, and possibly supplemental betaine hydrochloride, 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 while 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 also hypothyroid.) Supplementing their thyroid levels was largely curative. Visual and auditory hallucinations may result from altered perception and have been misdiagnosed as schizophrenia or psychosis. 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.

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 too can be symptoms of hypothyroidism! 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. 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, 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:

- a. Zinc deficiency exists in 90% of autistic children
- b. Copper excess exists in 85%
- c. Calcium and magnesium deficiencies are common, with 75 % of Americans lacking Mg
- d. Omega 3 fatty acid imbalance exists in nearly 100%
- e. Fiber deficiency exists in nearly 100%
- f. Antioxidant deficiency exists in nearly 100%

Additionally, there is heavy metals poisoning: 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 J. 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. Of 23 autistic children who had serum ferritin measured, 12 were iron deficient (serum iron tests were not as efficient is detecting

iron deficiency). “In addition, these sufferers are unusually sensitive to lead, cadmium, mercury, and other toxic metals so that they tend to accumulate rather than eliminate them. This is 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%).

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 and iron are administered in excess, iron absorption is inhibited because of the preferential binding of copper to the transferrin. Supplement copper and zinc, and iron and copper, at different times of day.

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, impaired synthesis of GSH, toxic metal overload, a pyrrole disorder, 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.

Treatment for this imbalance 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 B₆, A, C, D, E, glutathione, genistein and biochanin A (both from soy), 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.

Mercury adversely affects detoxification systems such as metallothionein, 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 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). “Glyconutrients have proven to enhance glutathione, glutathione peroxidase, and superoxide dismutase”—“Sugars that Heal”, by Emil I. Mondo, MD, Page 191.

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 22 children who had their serum ferritin measured, only three (13.64%) were iron deficient. Iron deficiency, with or without anemia, can impair cognition, and is associated 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"). Eighty percent suffer mitochondrial disorders (lack of energy production) according to Dr. Coleman, George Washington University Hospital. Ninety percent suffer some degree of hypothyroidism despite "normal" TSH readings (Raphael Kellman, MD). Eighty-three percent suffer dysfunctional Phase I and II, liver-enzyme activity (causing a build up of toxins and heavy metals), and 85% of autistic 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 zinc, selenium, magnesium, and calcium, and the vitamins A, B₆, C, and D, and E. This compromises immune function, and provides inadequate antioxidant protection to offset the high oxidative stress these children suffer, thus causing significant damage to cells throughout the body and brain. It is interesting to note that uric acid plays a key antioxidant role in the plasma: uric acid, a peroxynitrite scavenger, 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 causes the body to use magnesium, and the resulting lack of magnesium can cause depression, anxiety, sensitivities to light, sounds, temperature, and touch, and to heart problems. The lower levels of magnesium within the cell can not only double the generation of free radicals, but greatly lower glutathione, 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 and vitamin D, and get him in the sun.

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 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. A population of plant workers with average mercury excretion of 20 ug/g creatinine was found to have long-lasting impairment of neutrophil function.

Another study found such impairment of neutrophils decreases the body's ability to combat viruses such as those that cause heart damage, resulting in more inflammatory damage. 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. (Attenuated vaccines contain live viruses that don't usually cause overt disease.) HHV-6 induces synthesis of a broad range of host cell proteins, including interferon alpha, CD4, interleukin-1 beta, and tumor necrosis factor alpha. 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."

HHV-6 is a commensal inhabitant of brains. 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 CFS.

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.

Their 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. It is not uncommon for infants to run fevers and show other signs of acute inflammation after receiving multiple vaccinations. 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 polio virus. 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.

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

Endoscopy Findings:

- Ø Esophagitis in 23 out of 111 (20%)
- Ø Gastritis in 14 out of 111 (12%); 4 had Helicobacter pylori
- Ø 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.)
- Ø Eosinophilic Inflammation in 5 out of 111 (5%)

Pancreatic Function Testing: Duodenal collection of pancreatic enzymes:

- Ø 10 out of 90 (11%) had low enzyme activity (This is a very high finding compared to the general population.)
- Ø 2 out of these 10 (20%) had total pancreatic insufficiency, 5 with multiple enzyme defects

Carbohydrate Digestion:

- Ø Lactase deficiency was found in 55% of ASD children tested, especially in black children
- Ø Combined deficiency of disaccharidase enzymes was found in 15%
- Ø 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.

Colonoscopy Findings:

- Ø Colitis was found in 11 of 89 patients (12%), none with features of Ulcerative Colitis or Crohn's
- Ø Histologic (biopsy reviewed) lymphoid nodular hyperplasia was found in 15 of 89 patients (16%)
- Ø 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.

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.** IgG antibodies 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. 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.

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. 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. Zinc deficiency is widespread among our children and parents. This has very negative aspects on the immune function.

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) virus (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 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 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 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.

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. 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 the excitotoxicity of excess glutamate. These should supplement GABA.

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.

A test of thirty-six children revealed grade I or II reflux esophagitis in 25 (69.4%), 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 secretin administration (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 than children without autism. During the progression of Mg deficiency in a rodent model, dramatic increases of inflammatory cytokines were observed: interleukins 1 and 6 (IL1, IL6) and tumor necrosis factor (TNF) (known to reduce vascular blood flow, increase oxidative stress, reduce glutathione levels, and induce cell death). An increased production of nitric oxide and of various inflammatory peptides—such as substance P, CGRP, and VIP—is observed in Mg-deficient rats. Sadeghi, et. al., has demonstrated that coconut oil in combination with fish oil (preferably 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). Vitamin A supplementation in patients with low vitamin A levels resulted in increased interleukin-10 (IL-10) and decreased TNF(a) levels. 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. Autoimmune diseases associated with vitamin A deficiency include

rheumatoid arthritis, juvenile arthritis, Lyme disease, systemic lupus, and insulin dependent diabetes mellitus.

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. **He also showed that high levels of stress alone could produce these same immune responses and make you sick!**

When cellular immune function is decreased, antibodies are greatly increased. Conversely, when cellular immune function is restored, antibodies decrease. The pattern of antibody response 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.) In children with these abnormal antibody patterns, selenium 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 antibodies are associated with intractable seizures. Selenium and vitamin E supplementation has overcome intractable seizures that were resistant to drugs.

In workers exposed to fluorine, those with subclinical hypothyroidism [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!

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). 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. 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.

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 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).

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 B₆, zinc, and magnesium.

"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, perturbing factors of the magnesium status. Magnesium depletion requires more or less specific correction of its causal dysregulation. 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, 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 (-amino butyric acid and taurine, mainly) (magnesium acts as an inhibitor of neurotransmitter destruction—WSL)...Neuromuscular **hypoexcitability due to hypermagnesemia** 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.

This whole series of metabolic problems in the autistic child causes a homeostatic alteration that produces endogenous biological stresses that starts from within the child. The level of stress controls many variations of behavior, and these children are stressed to the breaking. Animals fed high levels of excitotoxic glutamate have lower thyroid hormone levels and higher cortisone levels than normal. Glutamate is presently excessive in restaurant, prepared, and frozen entrees. Aspartame (NutraSweet™) has the same effect. Additionally, stress reduces 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—studies show 47% reduction of the stress hormone cortisol that in excess severely depresses the immune system and kills neurons by the millions). [Corticosteroids and endogenous cortisol suppress cellular immune responses and cortisol destroys immature T-cells](#), and poor immune response is something found in all autistic children.

"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 neuroability, 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. 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. This produces a condition in which the brain suffers from magnesium depletion while the rest of the body may have normal magnesium!

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), or 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, amphetamines) damage. Additionally, excess glutamate lowers the glucose allowed into the brain by 35%! One must restrict the amount of MSG, flavor enhancers, and aspartates 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 B₆, magnesium, zinc, the amino acid theanine, glutathione, NADH, CoQ10, vitamin E, alpha lipoic acid, N-acetylcarnitine, the drug Deprenyl (an MAO-B inhibitor), vitamins C and K, Melatonin, the amino acids glycine and taurine, omega-3 oils (CLO), and lithium.

When the pituitary is not getting the magnesium it needs, it fails to control the adrenals that then overproduce adrenaline (a major stress hormone). It is known that danger incites the activity of the adrenal glands, but anxiety or worry 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.

Magnesium protects the cell 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. Taurine increases bilirubin and cholesterol excretion in bile, critical to normal gallbladder function and fat digestion. Additionally, in Parkinson's, specific damage found in Substantia Nigra 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. 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 autism, typically, glutathione levels are 1/3 normal! 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 in Platelets as much as 42%!

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 nutrition, leading to 'leaky' blood-brain barrier and thereby to increased transfer of aluminum and other toxins (including mercury) into the brain. Autistic children are universally lacking in zinc and magnesium, and show toxic levels of aluminum and mercury. 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.

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. Additionally, there are many deficiencies such as vitamin B₆, zinc, and magnesium.

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 medical 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 β) 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.

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. The 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.

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 ratio of these two is determined by the balance of adrenal steroids, notably cortisol and DHEA. 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. The chronic viral infection, whether measles or other, cannot be cleared as long as this bias exists. Furthermore, Candida can enhance Th2. This increases IgE, causing Candida to really flourish. The Th1 (cellular) response is the most important in controlling candida. 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. 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® and Phyt•Aloe® from Mannatech, Inc., the use of a thymus glandular and a good multivitamin/mineral supplement to support the thymus, and the use of Transfer Factor all support the return to Th1 dominance and control of candida and viruses. Direct action against the candida, viruses, and bacteria to reduce their load is also highly desirable.

One of the things primarily responsible for maintaining the balance is healthy, gut microflora. When 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 B₆ 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. 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 are indicated where there is asthma and allergies.

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 it can damage and kill neurons. 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 which includes cortisol, epinephrine, and insulin and create a 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 B₆ 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, B₆, 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 this may cause your body to accumulate too much sulfite, creating a wheezing symptom, among others. For an appointment with a physician at Tahoma Clinic, call (253) 854-4900. For a doctor in your area, inquire at (800) 532-3688.

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® 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® 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. Mondoia, MD.

The sulfhydryl-reactive metals (mercury, cadmium, lead, arsenic) are particularly insidious and can affect a vast array of biochemical and nutritional processes. The pro-oxidative effects of the metals are compounded by the fact that the metals also inhibit antioxidative enzymes and deplete intracellular glutathione. The metals 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. Methyl mercury has a high affinity for sulfhydryl groups, which contributes to its effect on enzyme dysfunction.

One enzyme that is inhibited 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. Short-term memory disturbance 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 of the pre-treatment concentration—Abnormal Deposits of Al, Pb, 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. The result of this loss of acetylcholine is to create a relative excess of dopamine. The result being an out-of-control, panic-stricken child suffering Environmental Anxiety. This behavior is often dramatically controlled by ¼ to ½ mg Risperdal™. It's better to build acetylcholine. Elsewhere, in this paper, I have indicated how to increase acetylcholine production.

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 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) intragastrically 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.

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, 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 over-methylation 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.

Acemannan® (Manapol®), and reishi mushrooms among others, have been shown to increase the enzyme glutathione synthetase, which in turn produces glutathione (providing the substrates glycine, glutamine, and cysteine are available—WSL). Additionally, in a series of human trials, 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. Mondo, MD. This aloe extract that is found in Ambrotose® by Mannatech™, also significantly inhibited 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 B₆, 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 of inflammation that often tends to cancer.

It is vital to note that MMR vaccine, and the chronic measles infection so often following, depletes the body of vitamin A. 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 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, Archibald Kalokerinos, M.B., B.S., Ph.D., noted for his work among the Australian aborigines in which he reduced an infant mortality rate approaching 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 minor infections. As a result of this work he was awarded the Australian Medal of Merit in 1978.

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, one of these being cytochrome p450 (Maines, M.D., 1984). Mercury has been shown to diminish and block sulfur oxidation thus reducing 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. 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 nutrients, particularly vitamins A and C. Use of AlkaSeltzer 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 polio virus.

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)]. The extra Virgin Olive oil, that contains oleic acid: four tablespoons a day of fresh oil that’s been refrigerated is very supportive of Th1 (but has phenolic acids that may be adverse for PST), as is Vitamin A, 25,000 IU (adults), with a lot of carotenoids, a lot of vegetables, carrots, and things like that. In addition to that, L-glutamine, 10 to 20 grams (adult) a day, will strengthen Th1. Use Lactobacillus, two or three different kinds, and Bifidus, and magnesium, zinc, chromium, and silica. Those who may become pregnant should limit vitamin A to 10,000 IU to avoid fetal damage in the first eight weeks of pregnancy.

Hepatic glutathione is a key substrate for reducing toxic oxygen metabolites and oxidized xenobiotics in the liver enabling their clearance from the body. Depletion of hepatic glutathione is a common occurrence in mercury and cadmium toxicity and Leaky Gut Syndromes contributing to liver dysfunction and liver necrosis. It has also been demonstrated that 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. 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. Additionally, one must supplement antioxidants vitamins C and E, selenium, and glutathione, and attempt to enhance the body’s production of glutathione. Some foods, such as avocado and asparagus, supply GSH.

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). 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 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 no 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."

Cysteine is deficient in a majority of Autistic children, especially younger than six, and especially before vitamin B₆ 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 NAC or cysteine 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 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 NAC or cysteine. 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!

Methionine, betaine, and choline enhance liver function and increase the levels of SAME and glutathione. In addition to the above supplements, use these that build glutathione: garlic, dandelion, Colostrum, Schizandra, Vitamins A, C, and E, wheat grass, whey, shark-liver oil, rice-bran extract, lysine, SAME, and Mannatech Products. All are totally nontoxic. 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. You must eat low Glycemic-Indexed foods to avoid sharp rises to insulin levels, and strive to reverse insulin resistance. Strength training is more effective than aerobic exercises in this endeavor.

Vanadyl Sulfate is an insulin mimic, so that it can basically do what insulin does by a different mechanism. 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 25 mg (?) 3 times a day.

Thyroid hormones, along with the retinol form of vitamin A, is needed to create progesterone and pregnenolone, so it may be better to support the thyroid and use cod-liver oil as suggested herein than to supplement DHEA. Chromium 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 (enhance 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. Dr. Michael Currier, 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.

Additionally, it is known that Vitamin C 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 control subjects (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).

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), trans fatty acids, a diet high in the Omega-6 fatty acids like linoleic acid (cut Canola™, use olive). 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 two conditions undiagnosed: hypoglycemia 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 and pancreas, including desiccated, whole-adrenal glandular. If not needed, the adrenal tablets may make you feel weak. The doctor may wish to offer whole, adrenal-cortex extract injections for faster results. **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), and it drains the lungs and liver of their supply of glutathione within 30 minutes! Tylenol™ is the leading cause of liver failure! Do not fail to heed what you have just read! Should you feel a NSAID is necessary, use Ibuprofen™.**

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 B₆, B₁₂, 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), for adults, will support the pancreas. The bioflavonoids will reduce allergic reactions to foods and other substances. Specifically, magnesium and MSM reduce allergic responses. Add stinging nettles (*Urtica dioica*) for great relief of hay fever and allergies (do not use long term for it is potentially harmful to the liver). Ensure that all these nutrients are being supplied in adequate quantities.

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, especially from 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.

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

Insufficient cortisol output is associated with many 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. Too much cortisol (common in people in adrenal exhaustion) increases the rate at which bone and muscle mass is lost (among the first symptoms of physical aging), cognitive impairment and 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.

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).

Dr. Wm. Shaw reports instances of severe yeast overgrowth (indicted 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 poisons your child and quite possibly yourself, and it must be addressed aggressively.

A "Journal of Allergy and Clinical Immunology" at McGill University and the Institute Pasteur in France article 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) 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 weight loss, and malnourishment. 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—WSL). Moreover, cytokines strongly influence the dopaminergic (dopamine), noradrenergic (noradrenaline), and serotonergic (serotonin) neurotransmission. There are indications that the cascade of cytokines can be activated by neuronal processes. 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 sulfate is as low as reported above, it seriously limits the production of Glutathione and Metallothionein, both dependent upon available Cysteine. This results in increased oxidative stress, lowered immune function, neurotransmitter dysfunction, vagal nerve dysfunction, accumulation of heavy metals, especially lead and mercury, and viral persistence, all commonly seen in autism. Repairing this damage is key to recovery—Dr. Jeff Bradstreet.

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, structures 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", adenylylate

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 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 percent 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 also working because a formic acid source is removed? Is Gf/Cf also removing exposure to calcium propionate (An Australian study recently proved to cause hyperactivity and irritableness) used in breads?" Formaldehyde is a cause of 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 candidiasis, the enzyme fights off a toxic byproduct called acetaldehyde.

Recurrent infections are an indication of deficient IgAs. Secretory IgA (sIgA) levels are elevated in the presence of infection or overgrowth of unwelcome germs, and 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. 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. IgA is found at very high levels in colostrum. The use of Bovine Colostrum should be very productive in overcoming these chronic infections, 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, blistering 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.

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). It is the children who have had three or more antibiotic courses who 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. This lack of B-vitamins, particularly vitamin B₆ will interfere with the production of serotonin, melatonin, and other important neurotransmitters that controls behavior—so normal brain chemistry in the presence of yeast overgrowth is unlikely. 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. Komulain and Tuomisto, in 1981, found that methyl mercury, even in low concentrations, inhibited the uptake in synaptic nerve endings in the brain of the neurotransmitters dopamine, noradrenaline, and serotonin. This would be 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.

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. In addition, autistic children lose more homovanillic acid (a metabolite of dopamine) in their urine than typical children. Autistic children, particularly those with severe hyperactivity and stereotypes, were found to have excess dopaminergic activity as measured by high levels of homovanillic acid in the CSF (Cohen et al 1977). Thus, it seems sensible that the administration of a dopamine antagonist such as 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 glutathione and Alpha Lipoic Acid offset the loss of NADH activity. A high intake of vitamin B₆ 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?

Dopamine can be controlled by diet and supplements. When anxious and fearful, the sympathetic nervous system kicks in and or having been made predominant, anxiety is the result. It's sort of a Chicken or egg question. The Sympathetic

Nervous System is balanced by the Parasympathetic Nervous System. The overactive Sympathetic is suppressed by magnesium and the diminished Parasympathetic function is stimulated by potassium. Here we see a need for magnesium and potassium supplementation. Magnesium and Vitamin B deficiencies cause a reduction in the production of dopamine. 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 B₆ will tend to reduce the loss. Excess dopamine is a vitamin B₆ antagonist. Active Vitamin B₆ increases the cellular absorption of magnesium and therefore works in concert to increase the production of 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. Since homovanillic acid is one of the neurotransmitters cleared by PST enzymes, supplementing tyrosine by a PST child might be counterproductive.

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, it's 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. That sort of thing. 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.

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 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. 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.). Potassium and calcium also will be lost in the urine. It is important to note that magnesium may test normal in the blood, 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.

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. They lower the pressure (in the gut) at which peristalsis begins; thus, peristalsis is increased in the intestine 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 increase smooth muscle contraction leading to hypertension (High Blood Pressure), asthma, painful menstruation, and Irritable Bowel. 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.

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, and by 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 is 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.

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. I.V. 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 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, high carbohydrate, high glycemic diets 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. These kids desperately need a digestive enzyme supplement, but may first need Bromelain, an effective anti-inflammatory enzyme shown to reduce inflammation by 60%.

Your doctor has probably forgot 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 the essential amino acid tryptophan is fermented by harmful bacteria in the bowel. 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 both protein 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. Sucrose (table sugar) leaks into the blood, and this abnormal sugar in the blood stream causes a host of problems. Particles [especially from milk (casein) and grains (gluten/gliadin)] called peptides pass through the "Leaky Gut", and activate the immune system 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. This is why digestive enzymes are so vital to break down these protein and starch particles before they reach the gut.

Shan and her colleagues found that gliadin is not broken down completely by pancreatic enzymes, but a proline-rich fragment (a large molecule) is left that still adversely affects the bowel in celiac patients. When they looked more closely at the fragment, they found that it was made up of even smaller fragments already known to induce human T-cells to attack the intestine. The team in Norway then measured the ability of the gliadin fragment to induce autoimmune activity. "The response by T-cells was about 10 to 20 times higher than to the smaller peptides themselves," 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 now shown that this is the case in test tubes and in rats. DPP-IV digests proline-rich peptides (www.kirkmanlabs.com).

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 7 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 soy milk 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, 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 digestive juices. Secretions of the parietal cells into the stomach create the acid necessary to the breakdown and digestion of proteins. 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 affect the amount and timing of HCl production. Stress and emotions, then, also affect HCl production. These same cells, also release "Intrinsic factor" necessary to utilization of vitamin B₁₂. Sodium and potassium 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.**

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 stress on fish and fowl and 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 B₆ by binding B₆ dependent enzymes as does insecticides, Theophylline (asthma drug), benzene, and hydrazine. Vitamin B₆ 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, and 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, 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 nutrition has been linked with a variety of immune deficiency disorders, including cancers in both animals and in humans.

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 (CO₂) 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 autistic is maniacal laughter.

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. 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, 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.

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 CO₂ causes much havoc. Dr. Robert Fried found that hyperventilation (low CO₂, 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. 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/or **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 CO₂ 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. CO₂ 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.

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.” 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 and hypoxic state (low serum bicarbonate = low oxygen levels). 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. (Potassium Bicarbonate from Emerson Ecological, Inc., www.emersonecologics.com.) **(These normally alkaline minerals release the carbonate raising carbonic-acid levels, acidifying the system. As CO₂, it acts as an anticonvulsant, and also reduces glucose metabolites, which accumulate around the foci of convulsion. Blood flow is increased to the brain—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 (picolinate raises uric acid or BUN, and disturb the urea cycle), but the children responded beautifully to alkaline salts such as Buffered C, the carbonates, and 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. "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, along with lipid consumption, electrolyte stability, and mineral density and balance. Those with organic acidemias or amino acidemias 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 B₆, B₁₂, and folic acid. Copper deficient rats also showed high uric acid, higher sugar levels, and a weakened immune system. 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 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. 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.

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. 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 to uric acid, a molybdenum dependent step. A supplement of moly may help.

Purine is needed for energy production. It 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. When BUN, Creatinine, 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. A 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. Lowering carbon dioxide in the lungs by hyperventilation also shifts the body's pH towards alkalinity, which slows the rate of activity of all body ferments, enzymes, and vitamins. 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. 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.

If the above condition is suspected, one should obtain a roll of pH paper and check the pH of saliva and urine. Details of this testing are found in my electronic book "Self-help to Good Health", (34 Chapters, 535 Pages, \$24.95 US) in the Chapter "Digestion and Utilization". Saliva pH when not eating should be 6.5 to 7.5. The higher readings would likely be better. While eating, it should rise one full number, 7.5 to 8.5. An excessively acid condition would likely signal a too high CO₂. 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 CO₂, or too little glutathione, yet the cells will be starving for oxygen. Electrolyte levels, particularly of calcium (or perhaps more accurately, of vitamin D 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 first 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 bicarbonate can cause the system to become overly alkaline. 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.

If suffering hyperammonemia, or over alkalinity of any cause, calm the child's breathing in whatever manner you can in order to raise CO₂ levels, and use these carbonate buffers to restore CO₂ and body acidity. One quick way to restore acidity is to drink a teaspoon of raw, unfiltered, apple-cider vinegar 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—quite common in ASD. 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 (bi)carbonate 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™, AlkaSeltzer Gold™, and AlkaLime™, or alkali salts (from health food stores, usually a combination of sodium and potassium and sometimes calcium carbonate) 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.** A word of warning: in using sodium bicarbonate excessively, potassium can be excreted producing a potassium deficiency that can cause heart palpitations and reduce HCl production. 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.

ButyrEn™ (butyric acid) by Allergy Research Group/Nutricology, Inc (800-782-4274) is a short-chain, fatty-acid, dietary supplement in the form of an enteric-coated formulation of calcium and magnesium salts of butyric acid (2 tablets crushed, 2x daily, mixed in food). It supports the integrity of colonic mucosa by acting as primary fuel for the colonic epithelium. Colonic bacteria normally produce it, but when these bacteria are disrupted this supplement will support colon health as you rebuild colon flora. This has been shown to modulate local electrolyte flux, thereby mediating diarrhea. Alpha ketoglutarate clears ammonia, and butyrate clears ammonia, spores, and nitrogen. Butyrate and another short-chain fatty acid, caprylic acid, are frequently used as anticandida agents. Ecological Formulas (800) 654-4432 supplies a fluid butyrate. 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, 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 alpha, sequestering ammonia, and clearing biotoxins. An increased amount of niacinamide will be helpful too 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.

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, along with a big glass of carbonated water. 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 time, 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.

“Lactic acid may be elevated in a wide range of conditions including the pyruvate dehydrogenase, pyruvate carboxylase, 6 diphosphatase, and phosphoenol-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 B₁ 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.

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. 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 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."

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. 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.

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 kidney. 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) each day. This can be as salad dressing or drank with the morning glass of water.

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! 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 the 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.

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.

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 autistic 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 of secretin from S-cells in the small intestine walls into the blood. **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.

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, but not well, for HCl/pepsin has not broken

down the protein in the stomach, and vitamin B₁₂ 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).

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 must often be supplemented.** Lewis Laboratories' Brewer's yeast, or desiccated liver, or pure amino acid supplements must be supplied. Seacure™, 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). Further, remember that magnesium raises the threshold for seizures, greatly reducing the chance of seizures and for 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, and other neurodegenerative diseases.

If the fat is not digested because of insufficient bile or a lack of the pancreatic enzyme lipase, or there is a deficiency of lipotropic 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. 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.

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-aurine 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™ by Houston, Inc.

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, Pseudomonaceae, 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 Crohn's disease 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. 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 B₁₂, folic acid, and zinc were better absorbed and utilized.

As with secretin, CCK does many things throughout the body. 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 B₁₂. When B₁₂ 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.

Vitamin B₁₂ is essential for myelinogenesis in the developing central nervous system, a process that is not complete until around the age of 10 years. B₁₂ deficiency may, therefore, be a contributory factor in the developmental regression. The primary sources of vitamin B₁₂, 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 B₁₂ 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 B₁₂ may appear normal, yet the brain will be lacking. This can cause severe mental deterioration. Many find vitamin B₁₂ shots more effective than oral, and are benefiting these with autism.

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, and the product is 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 given exactly one hour after the first bite of food is taken with each meal. 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 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.

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 were 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). 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. (Medication does not correct the nutrient lack, the excess fluoride, 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.

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).

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 rapidly 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 opiate antagonists, such as naltrexone, 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 symptomatology 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 and a normalization of the CD4/CD8 ratio.

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 and 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. Naltrexone should be used only as a diagnostic tool to indicate an opioid problem.

"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, and may be helpful in this respect as well as in its antibacterial properties. It 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.

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 the eight essential 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 to be properly formed. The specific GAGs of physiological significance are hyaluronic acid, dermatan sulfate, chondroitin sulfate, heparin, heparan sulfate, and keratan sulfate.

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.

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 proinflammatory 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, inhibits 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 to accomplish the reduction of Prostaglandin E2. Balancing fatty acid production will do this. 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. Soy milk has a high content of glutamate, and additional glutamate is often added in form of hydrolyzed vegetable protein.

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, 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. Strachan of Britain found that 1/3 of cases of Otis 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. To enable the body to throw off the infection quickly, use Echinacea extract in juice three times a day. It is totally nontoxic, but it works best if it is taken in courses of 10 days to two weeks. Never exceed eight weeks without a break. It becomes ineffective if used longer. Do not use if allergic to daisies. Put a drop of garlic and mullein oil in the ear also. 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.

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.gfcfdiet.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.

Only about half of all Americans get the RDA of vitamin D, E, folic acid, and calcium, yet anticonvulsants lower levels of vitamins B₆, 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 B₆ to P5P. Additionally, a high amount of vitamin A interferes with vitamin D absorption, creating a calcium problem. Don't reduce vitamin A; rather, increase vitamin D which is woefully inadequate in the American diet.

Folic acid deficiency can be caused by use of Depakote™, Tegreto™, 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, 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%) 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%. Nevertheless, supplementation of the general public with large amounts of folic acid will potentially harm those who are undermethylated (more than 50% of ASD children) according to Dr. Wm. Walsh.

Epilepsy often ceases when the child is placed on a gluten-casein free diet. Supplements of copper, vitamin B₁, B₆, niacin, vitamin E, selenium, Evening Primrose Oil, and melatonin have been shown to be helpful in ameliorating epilepsy. One should note that a frequent cause of seizures is parasites, usually worms. **One must always supplement vitamin B₆ when supplementing high amounts niacin to avoid raising homocysteine levels.** A supplement of DMG has benefited many.

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.) 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. This is why it is important to buy the mixed-tocopherols. For additional helps 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 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. 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. 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.

Repligen has found that 25% to 30% had abnormal values of chymotrypsin. Kids with low levels did not respond to secretin infusion.

“Autism” is of unknown cause, and has 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® 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.

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. 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 9 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. The herb feverfew contains a chemical (parthenolide) that inhibits the release of serotonin from platelets facilitating a more regular blood flow, and 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. The cytochrome p450 (Phase I) enzyme pathway (there is said to be 40 variants. Each has different capacities to metabolize drugs and chemicals) is the only way a baby has to deal with endotoxin 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, hypotensions, 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 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 B₆ 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, according to a recent study.

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 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 B₆. 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 B₆ may not be responsive if folic acid is depleted, so it should probably always be accompanied by folic acid, and vitamin B₁₂.

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 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 B₆ and niacin or the tryptophan may be used to create niacin instead, and vitamin B₆ is need in all tryptophan metabolism. For some, eating high tryptophan foods, like turkey, for breakfast may accomplish the same results.

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 grapes, avocado, tomato, orange, plums, pineapple, bananas, 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. 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, bananas, complex carbohydrates, and nuts. Selling tryptophan for human consumption is illegal in the United States; however, it is available for use with animals. You can buy pure pharmaceutical grade

tryptophan from BIOS Biochemicals 8987-309 E. Tanque Verde, No 340, Tucson, AZ 85749-9399 (Phone 520-326-7610). 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 (MAO). Mix them only if so directed by your doctor.

Tryptophan is a precursor of niacin and serotonin and can prevent and cure pellagra (being a source for formation of niacin). A well known antidepressant, it is related to sleep disorders, bloating, and constipation. It increases peristalsis, decreases bleeding, and is related to skin inflammation, depression, insomnia, and alcoholism. It cannot be utilized without adequate vitamin B₆ 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 affect, 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) to avoid systemic damage. The excess cortisol this 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!

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, epinephrine, and norepinephrine. 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 break down serotonin (PST kids) would have the levels increase.** An increase in serotonin in turn increases noradrenaline. They "were in effect being poisoned by the serotonin produced by their own bodies. The irritation victims suffered from migraines, hot flashes, irritability, sleeplessness, pains around the heart, difficulty in breathing, a worsening of bronchial complaints, 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. 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%.

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 DMG, or TMG, 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 phosphatidylcholine, a brain nutrient that makes cell membranes through 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. In other words, the use of TMG reduces the amounts of folic acid, B₁₂, P5P, serine needed to normalize homocysteine. Nevertheless, to effect the conversion in those who are cystathionine Beta-synthase deficient, one must supplement vitamins B₆ and B₁₂ even when supplementing TMG/DMG. Use of folic acid is contraindicated in the undermethylated. 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, or lesser amounts for those undermethylated, can cause abdominal distension, flatulence (gas/wind), irritability, loss of appetite, nausea, over-activity, sleep disturbance and vivid dreams (nightmares).

Is your child experiencing nightmares?

The effect of TMG and of vitamins B₆ and B₁₂ is to reduce homocysteine (which sometimes builds excessively due to a cystathionine beta-synthase, serine, magnesium, zinc, and/or vitamin B₆ deficiency that prevents transulfuration to cysteine and taurine), while controlling cysteine production, where overproduction can be toxic. Additionally, TMG in parallel works with folic acid, vitamins B₆ and B₁₂ 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 very expensive. 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.

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. 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, and many other conditions.

In order for homocysteine to be recycled to methionine and to SAME for reuse, there must be adequate amounts of folic acid and vitamins B₆ and B₁₂. Detoxification is costly to the body's resources, requiring large amounts of vitamins B₆, B₁₂, C, folic acid, methionine, betaine (TMG), taurine, glycine, cysteine, and lecithin. 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. Mercury decreases zinc and methionine availability, depresses rates of methylation, and increases free radicals. Inhibitors of methylation block pancreatic exocrine secretion. 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, and decreased methyl groups available for DNA methylation and for the normal formation of NADH. TMG and DMG are methyl donors aiding in methylation. 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 temporary positive effects in autistic children taking large doses of DMG.

A potentially harmful side effect of any detoxification is the production of massive amounts of free radicals. Normally, this is not a problem for the healthy body's antioxidant defenses (especially glutathione, the principle antioxidant in the liver) are adequate to neutralize the free radicals and protect not only your liver and kidneys, but all the cells threatened. **When mercury and other poisons are being chelated, and the glutathione stores are depleted as in autism, then great damage can be done.**

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.

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 B₆, 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 B₆, folic acid, 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 cod-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 of a 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 B₆ and magnesium in SNT. Dr. Bernard Rimland says that every child is different, but he has found the average amount of vitamin B₆ 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 B₆ 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 B₆ 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 B₂ deficiency otherwise. Vitamins B₆ and B₁ sit on opposite ends of a teeter-totter, with B₁ adding CO₂ to molecules, and B₆ removing CO₂. One of the switch points into the Krebs cycle is made up of two enzymes that run in opposite directions. One is dependent on B₁, the other on B₆. All B-vitamins are closely linked, and so must be supplemented together. In general, the B-vitamins move little bits of things around, with B₅ moving fatty acids, B₃ moving electrons and protons, B₁₂ moving methyl radicals. One study found that people who took higher amounts of B₆ live an average of eight years longer than those in the control group.

Additionally, tests show a marked difference in how autistic children metabolize these nutrients. After giving 500 mg of vitamin B₆ 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 B₆ 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 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 B₆ (up to 1,000 mg daily) coupled with magnesium (up to 500 mg daily) provided relief from many of the symptoms of autism. Neither B₆ 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 play 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 B₆ to its necessary metabolite pyridoxal 5'-phosphate (P5P) (This conversion of vitamin B₆ to its active form requires zinc, magnesium, riboflavin [Vitamin B₂], and Alpha-ketoglutarate, so taking some of the coenzyme form of the vitamin may increase effectiveness—WSL.) We measured B₆ levels in children with autism, and found them to be well above normal (55 vs. 33). We also found that several enzymes related to B₆, including pyridoxal kinase, are dramatically less active than normal. Thus, the inability to convert B₆ to P5P leads to elevated levels of B₆, but a functional need for high amounts of it—Jim Adams, affiliation: professor, chemical and materials engineering, Arizona State University.

One Mom wrote, "Previously, I could not tolerate anything but a low dose of plain B₆. I think this was because I was very low on alpha-ketoglutaric acid needed to convert B₆ to P5P. (Alpha-ketoglutaric acid is destroyed by candida yeast.) When I first started on alpha-ketoglutaric acid combined with a very low dose B₆, 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 B₂ and alpha-ketoglutarate. Too much B₆ without B₂ can deplete the body of B₂ possibly leading to Cheilosis—swollen, cracked, bright red lips, a common symptom of B₂ deficiency. Vitamin B₂ 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 B₂ is needed in glutathione production, in mitochondrial function for energy, and in the pathway that converts homocysteine to methionine and SAME. A shortage would hamper production of cysteine, glutathione, glutathione peroxidase, taurine, and the sulfate needed to detoxify Phase II toxins (PST). Vitamin B₂ is probably the most commonly deficient vitamin in America. Deficiency symptoms are: sensitive, easily-fatigued eyes; blurred vision; itching, bloodshot eyes; dizziness; inflammation of mouth; sore tongue; red lips; dermatitis; itching nose; and cracks in the corners of the mouth. Vitamin B₂ is an antioxidant that aids in utilizing oxygen. It lowers body pH. It aids in carbohydrate and fat metabolism. Radiation destroys 8% of B₂ in foods. Remember, these nutrients (Zinc, magnesium, a-ketoglutarate, and vitamins B₂ and B₆) are necessary to normalize the metabolism of, and to conserve the neurotransmitters serotonin, melatonin, and dopamine. 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 B₁₂ 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. To increase melatonin, take a hot bath.

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 B₁, so this should be added when supplementing magnesium. Other supplements known to help with the hyperness are calcium, zinc, folic acid, and chromium. Additionally, in a placebo-controlled study on prisoners with a history of impulsive/aggressive behavior, the group taking lithium supplements had a significant reduction in aggressive behavior and infractions involving violence.

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 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. Lithium also is important in vitamin B₁₂ transport and distribution, and studies have found low lithium levels common in learning disabled children, 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.

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 B₆ offer the best approach to solving these troubling behaviors. Multiple nutrient deficiencies 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 Rogness 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. 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 signs of toxicity.

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, 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 from 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 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 RBC usually contain less EPA and DHA and, sometimes, more AA than control subjects. (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. Bromelain is a powerful anti-inflammatory—WSL.)

These notes from Dr. Klinghardt: The Phospholipase 2 (PLA2) destroys essential fatty acids. Therefore PLA2 stimulants should be voided. Insulin is a PLA2-stimulator. So the patients should have a diet with low carbohydrates. Avoid all grain, 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. Additionally, high-carbohydrate meals provoke an insulin response that suppresses beta-oxidation of VLCFAs! Do the Iodine Test, and support the thyroid as outlined herein.)

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 mercury has also been found to be a cause of. One mechanism by which mercury has been found to be a factor in aggressiveness and violence is its documented inhibition of the brain neurotransmitter acetylcholinesterase. 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, violent behavior, and functionality, with complete cure in the majority of cases. Copper stimulates production of the neurotransmitters epinephrine, norepinephrine, and dopamine the neurotransmitters that control aggression and irritability. It is also required for monoamine oxidase, an enzyme related to catecholamine utilization in the synapse.

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). 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. 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.

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 increase's 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 sugars or an excess of any sugars. 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.

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 and 5-HTP in small, increasing amounts while carefully observing behavior. If present symptoms worsen, reduce or discontinue the 5-HTP. 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, Seacure™ (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%). Interestingly, no other oil comes close to Vitamin E—222 mg per 100 grams of oil. Whatever you do, get it 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). This has solved the sleep problem for many.

For the behavioral problems take 25 mg several times through the day. It 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, and as tests show, 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. There was an increase in the thromboxane B₂ 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. 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 platelet adhesiveness and coaguability of the blood

Glutathione has been mentioned several 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. 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 coenzyme Q10. When CoQ10 is depleted 25%, clinical symptoms occur, when levels drop 75%, death occurs. Additionally, **Glutathione requires vitamins B₂, B₆, zinc, and selenium to be formed. Vitamin C (500 mg in 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.

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.

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 then 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 antiexcitotoxic 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.

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. If this be the case, 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. 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. It is this loss of B-vitamins needed to process lipids (fats), coupled with a high glycemic, processed-food diet that creates the fatty acid deficiencies and imbalances. Vitamin B₁₂ therapy is based in part upon the role of vitamin B₁₂ in synthesizing essential fatty acids. Best results seem to be had with injections, but be advised that vitamin B₁₂ 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 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. Supplement arginine while struggling with this invader.

So, perhaps start correcting deficiencies of folic acid, B₁₂, zinc, molybdenum, arginine, aspartate, 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. As an added bonus, alpha-ketoglutarate is needed to convert B₆ into its useable coenzyme form, P5P. Get expert guidance on using the aminos, and be very observant when you use them.

2.

Bromelain (200 mg/day), a digestive aid and anti-inflammatory usually available in item 3.

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 Kirkman's EnZym-Complete™ or SpectraZyme™ by Metagenics™ available from www.randallnutritioncenter.com/rcnc2000/spectrazyme.html, or Fern's Nutrition, 1-800-229-3376. SpectraZyme™ is \$16.95 US for 60 capsules (Fern's: free shipping in USA on orders over \$25). It doesn't 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 give the stomach full protection against 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). So, 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).

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.**

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)], 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 do not take 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 anemia).

In 1977 South African Medical Journal study of vitamin A as therapy for excessive bleeding (bleeding is the leading cause of hysterectomies) resulted in a 92.5% cure rate. The article cited the use of vitamin A at Johannesburg General Hospital, and documented a 92% cure rate over a ten-year period. An extreme vegetarian diet, recommended and promoted by many, depletes the body's stores of vitamin A leading to malnutrition. 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. People with underactive thyroids are always vitamin A deficient. They cannot convert beta-carotene to vitamin A, nor can they convert vitamin A to the form usable by the eyes. Without vitamin A they cannot convert the thyroid hormone T4 to T3. Once in a while, 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). 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 Bifido Bifidus bacteria in the gut (they make most of our available vitamin K). Vitamin K is more than a blood-clotting vitamin, however. It is a powerful antioxidant, and necessary to vital pancreas function. It prevents Arteriosclerosis by preventing hardening (calcification) 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. Glutamate also leads to release of insulin that results 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.

Dr. Woody McGinnis, MD, Tucson, Arizona, 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. 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%.

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 Manapol™, or Ambrotose® by Mannatech™ that contains Manapol™ and many other saccharides for even better results, 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 fructooligosaccharide to provide an environment for the "good guys" to overcome yeast and other "bad guys", or other non-gluten fiber.

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 B₆, produce the amino acid GABA. Perhaps because of this relationship, both glutamine and vitamin B₆ have been shown helpful to those suffering epilepsy. A pyridoxine deficiency decreased GABA in the hippocampal area by 32% in female rats. GABA is an inhibitory transmitter that exerts a calming action.

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. 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. 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. 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. Its 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 it 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. A supplement of vitamins C, E, K, and B₆, the amino acids theanine, taurine, glycine, and N-acetylcarnitine, the minerals magnesium, 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™), 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 B₁₂ may be important for many conditions including anxiety, depression, mood swings, and memory loss, so it should be supplemented also (serum B₁₂ is not necessarily an accurate way of measuring B₁₂ status).

The above statement is in error as far as GABA-pentin (Neurontin™) is concerned. Here from the PDR (US medical handbook) 2002 is the statement regarding GABA-pentin: GABA-pentin 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 GABA-pentin have revealed a GABA-pentin 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 (HPPHA). Several autistic children with high HPPHA 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 CLOSTRIDIUM family (genus) are present in high numbers, phenylpropionic acid or 3-hydroxytyrosine may be formed in the intestinal tract. Either of these compounds may then be converted to 3-hydroxyphenyl-propionic acid that is, in turn, converted to HPPHA by the enzymes in the human mitochondria that break down fatty acids"—William Shaw, Great Plains Laboratory.

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 allergic 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 HPHA is elevated. This appears to indicate that a by-product involved in the formation of HPHA 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 tics, OCD, and Exposure Anxiety that keeps the autistic child in constant fight-or-flight mode.**

Now, the \$64.00 question is, what raises HPHA 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. Disruptions in tyrosine production in hepatic cells, arising from a genetic condition called Phenylketonuria (PKU), 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 HPHA 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 prove 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, and can upset the ecological balance in the gastrointestinal tract and lead to a yeast overgrowth. Dr. Shaw warns that the die-off effect can be even more severe than that of Candida. Some combination of AlkaSeltzer 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 neuropsychiatric 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. 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.

When there is not enough GABA a person can have a seizure because receiving neurons can be flooded with signals that say, “pass on this message.” A different type of neurotransmitter that promotes message transfer triggers the “go” messages. The charged signals they set off are positive. This time, more positively charged sodium particles (Na+) enter the neuron, which tells the receiving neurons to pass on the message. Valproic Acid (Depakote™), on the other hand, blocks GABA transaminase activity, thereby elevating GABA levels, thus alleviating seizures. Why depend on a drug that robs the body of L-carnitine and folic acid, vitamin E, and alpha-ketoglutaric acid when GABA can be increased nutritionally with glutamine, zinc, and P5P (or GABA)? Further, Depakote™ (Epilum) is a bad choice of anticonvulsants due to the risk of fatal hepatotoxicity, and it acts on the metabolic pathways, which could further lower the platelet levels. The hepatotoxicity is probably due to valproate-induced carnitine deficiency.

Drug induced tremors and tics are common, and Depakote™ can cause them. To prevent, use at least 333 mg each of vitamins C and niacinamide, and 66 mg each of vitamins B₆ and E with a good broad-based, vitamin-mineral supplement. In one ten-year study, not a single case occurred! If already suffering the devastating effects of this doctor-induced condition, use 5 to 10 times as much, and pray. I believe Ambrotose® and Phyt•Aloe®, and PLUS by Mannatech, Inc. would be mandatory. Of course, when using Depakote™, supplement Carnitine and folic acid also.

Symptoms of carnitine deficiency are poor muscle tone and problems walking. By encouraging the oxidation of fats, carnitine will suppress glucose oxidation. This could contribute to seizures because oxidation of glucose produces more carbon dioxide than does the oxidation of fats. This is important because carbon dioxide helps get oxygen delivered to the tissue and helps protect one from seizures. So, it may be wise to test for carnitine levels before supplementing.

This study is enlightening: Ten control subjects and 14 patients with refractory complex partial seizures were examined. Brain glutamine concentrations were above normal in three of five patients taking valproate and two of nine taking carbamazepine or phenytoin (One-third are being harmed!—WSL). Mean glutamine levels of patients taking valproate were higher than control subjects and patients taking carbamazepine or phenytoin. Brain glutamate concentrations were above normal in four of nine patients taking phenytoin or carbamazepine and two of five taking valproate. Brain GABA levels were below normal in four of nine patients taking carbamazepine or phenytoin and one of five taking valproate. Above normal glutamate or below normal GABA was present in nine of 14 patients and may contribute to their refractory epilepsy. Increased brain glutamine associated with valproate therapy may reflect mild hyperammonemia—Petroff OA, Rothman DL, Behar KL, Hyder F, Mattson RH Department of Neurology, Yale University.

Carnitine supplementation is effective in reducing valproic-acid associated hyperammonemia. Recommended dosages for carnitine replacement are 50 mg/kg/day in children, and 1 to 3 gm per day for adults in 2 or 3 divided doses. Seizures may result from glutathione peroxidase deficiency, which could be from lack of bioavailable selenium. Selenium (selenomethionine) supplementation in children resulted in a reduction in almost continual seizures and improvement in EEG recordings after 2 weeks. Melatonin also causes a significant increase in glutathione peroxidase. Based on the following, Epsom salts baths should be helpful to those prone to seizures. Symptoms of excess glutamate in the brain include headache, numbness, tingling, and flushing.

This abstract is revealing of the place of vitamin B₆ and zinc in the “excess glutamate” paradox:

From “Controlling Seizures: a Nutritional Approach”, by Dr. Ward Dean, MD.

<<<Gamma-aminobutyric acid (GABA), the brain's major inhibitory neurotransmitter, tends to be in lower than normal levels in seizure-prone rats and humans with epilepsy. Seizure-prone pre-eclamptic patients (hypertensive condition during late pregnancy) also have decreased brain GABA concentrations. **Brain GABA levels depend on both zinc and vitamin B₆.** Zinc is involved in the maintenance of pyridoxal phosphate concentrations by the activation of pyridoxal kinase. Pyridoxal kinase is important in decarboxylation, and lack of this enzyme results in lowered brain levels of GABA. Consequently, zinc deficiency may increase the risk of pre-eclamptic seizures by reducing brain GABA concentrations and lowering the seizure threshold. Unfortunately, plasma pyridoxal phosphate measurements alone do not appear to accurately reflect vitamin B₆ status or true tissue pyridoxal phosphate levels.

Glutamate concentrations in the brain are higher in some seizure patients, and these concentrations can increase to potentially neurotoxic concentrations during seizures. These concentrations may reach levels capable of causing cell death. The importance of relative concentrations of glutamate, gamma aminobutyric acid, and pyridoxal-5-phosphate with respect to seizures is illustrated by a 33-month old male seizure patient whose cerebrospinal fluid (CSF) glutamate levels were 200 times normal! When he was given vitamin B₆ at a dose of 5mg/kg body weight per day (350 mg), his EEG normalized and his seizures stopped, but the CSF glutamate concentration was still 10 times normal. With a higher dose of B₆ (10mg/kg bw/d-700 mg), the CSF glutamic acid normalized. These results indicate that the optimal dose of B₆ for epileptics should be the dose that normalizes CSF glutamate levels, not just the control of seizures.

Magnesium sulfate is standard therapy for pregnancy-induced hypertension (eclampsia and pre-eclampsia) to prevent seizures. Ten grams of magnesium are administered intramuscularly initially, followed by 5 gm intramuscularly every 4 hours. If administered intravenously, a 6 gm bolus over 15 minutes is given, followed by 1 to 3 gm per hour. **In a comparative study, Dilantin™ was compared to magnesium in preventing seizures and reducing blood pressure. The investigators found no differences in the patient's tolerance, adverse reactions, or outcomes between the two groups. >>>**

Nevertheless, magnesium will not suppress the immune function: 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 Hattermer, says, "I tried GABA. It made me regress intellectually. I could hardly recall any nouns. GABA-pentin™ was helpful." The usual effect of too much GABA is lethargy (fatigue). It should be noted; GABA-pentin™ 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 B₆ (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 enter cells. Because of the similar structure, theanine can also fit in this doorway, blocking access to glutamate. Although it can fit in the doorway, theanine does not have the same effect on the cell as glutamate does. Rather than causing damage, theanine acts like a shield against damage. Theanine is a precursor known to increase GABA, an important inhibitory neurotransmitter. You might like to use this instead of GABA. 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. It's the T-cells that prompt 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.

Dr. Burgstiner speaks of Thymus 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. Ambrotose, by Mannatech, Inc. has been successful in restoring liver function and energy output. Be mindful of my concerns about Milk Thistle, and high amounts of Lipoic mentioned elsewhere in this paper.

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 37°C, but as molds at 25°C. Dimorphism is regulated by factors such as temperature, CO₂ 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, particularly those with a high glycemic rating, does this most effectively. Sugar and starch 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 B₆, will interfere with the production of serotonin, melatonin, and other important neurotransmitters that controls 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 these 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 Candida overgrowth, but set up an effective anticandida 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 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 and inulin stimulates growth of the genera Bifidobacteria and Lactobacillus. These forms of carbohydrate are found in onion, garlic, chicory, Jerusalem artichoke, and wheat. Insoluble fiber lowers yeast, Clostridia, Staphylococcus, and Proteus in stool cultures and lowers output of ammonia and phenols.

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 be speeded through 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 only 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 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 Flora.

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 cane sugar. Antifungal drugs will not be successful without removing sugars from the diet. This includes all sweetened drinks & 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*.

Complex carbohydrates/polysaccharides (starches) and even disaccharides (sucrose - table sugar, lactose (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 lack the enzyme (lactase) to break down lactose into glucose and galactose. Intact, this sugar is broken down in the intestines by bacteria, and the results are gas, bloating, and intestinal distress. *Candida* supposedly resides and proliferates far down the gastrointestinal tract, but lacking HCl, 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*.**

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 a 50% increased capacity on part of macrophages to kill *Candida*—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.

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 it to normal level. 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, but said to contain traces of casein], or Pro-Culture Gold™ (Kirkman Labs), guaranteed casein free], 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 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 convert only lactose from milk, and without milk they cannot do their thing.

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. 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, but again consult with your practitioner. I am informed that it includes corn.

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 also 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 stimulates 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.

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. 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.

Symptoms of die-off (including lethargy, fever, craving sweets, increased stimming, diarrhea, rash, irritability, gas, bloating, headache, nausea, vomiting, and stuffiness) usually last up to 7 days. After that time, the change in the child can be rather dramatic. If the die-off does not end in 10-14 days, it is generally a reason to change choice of anti-fungal. If the treatment is successful, usually eye contact improves. The children seem more tuned in and less "foggy". Parents report that after the yeast is under control, the frequency of inappropriate noises, teeth grinding, biting, hitting, hyperness, stimming, and aggressive behavior decrease. The children no longer act almost drunk by being silly and laughing inappropriately.

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, over stimulation 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. Remember, the citrate form of magnesium is a laxative.

Additionally, aspartate will breakdown 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. Being one of two main excitatory amino acids, an excess is found in Epilepsy and ALS (Lou Gehrig's disease). It enhances immunoglobulin production and antibody formation. 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.

Autistic children are typically lacking in lysine. This would tend to cause them to be deficient in carnitine. Lysine is an essential amino acid. That is, the body cannot manufacture it. 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 produce chronic tiredness, fatigue, nausea, dizziness, and anemia. Antibody formation will usually be reduced. Insufficient intake leads to poor appetite, decreased 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.

Some do not convert lysine to carnitine. Dr. Leon Chaitow says that is due to malnutrition, most likely a lack of vitamins B₆, 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, B₆, 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 phenylbutyrate 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 freundii* (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”.

This paragraph may be set in a sidebar.

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. Unfortunately, Amphotericin is documented to cause aplastic anemia. 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. Injections, however, come with a long list of possible side effects that would indicate it is preferable to use it orally. Be aware, however, that it depletes __, a vital mineral 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 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, it would cause a buildup to possibly poisonous levels of several classes of drugs and body toxins, and of substances like fatty acids, body alcohols, prostaglandins, retinoic acid, and glycine. It also destroys the gut lining creating a condition favorable to "leaky gut" syndrome. Similarly, some drugs 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.

Almost all remedies lose effectiveness in time and must be alternated, however, goat yogurt and hydrogen peroxide therapy (H₂O₂) seem to continue effectively. 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. 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 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).

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"—Pat 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 Lactic Acid Yeast wafers from Standard Process Labs available from your medical practitioner or on-line. Acidophilus will live only in a lactic acid environment. It may contain corn.

Yersinia is the name of a genus of bacteria, of which 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, 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 to 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. 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.

These medicines prescribed should all be anti-fungal, i.e., non-nicotine and nicotine (very limited usage), along with the nutrients vitamins B₁ through B₆ (especially nicotinic acid, that is strongly antifungal), potassium and 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 55% greater than in controls (Fisher Institute for Medical Research "Proceedings", November 1997).** Those with candida have been shown to have significant deficiencies of vitamins B₁, B₆, and magnesium. Some of the vitamins, especially vitamin B₁₂, are best supplemented by sublingual tablets, or 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•Pac*™ 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]. 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. This 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 yeast 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. The amino acid glutamine (250 to 500 mg up to three times daily) and the mineral chromium (200 mcg) supplemented regularly will also reduce cravings for sweets and starches caused by hypoglycemia by stabilizing delivery of sugar to the brain. 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 daily over time will help reduce these cravings.

One will likely never be free of candida until five things 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 than 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 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 used by physicians who treat autism is to supply a mild antidote that neutralizes the excess acids. The most convenient product is a nonprescription drug called AlkaSeltzer Gold™. Do not use any other kind of AlkaSeltzer™. AlkaSeltzer 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.

“These children also had grave disturbances in electrolyte chemistry, and tended to be acidotic (low CO₂). The data that unfolded was fascinating and clearly earmarked the acidosis and hypoxic state (low serum bicarbonate = low O₂ levels). Potassium bicarbonate, sodium bicarbonate, magnesium carbonate and the like were used. Now we began to understand why so many children responded to Buffered C (potassium bicarbonate, calcium carbonate, magnesium carbonate), and others needed a more specific buffer (in some children for example niacin was grossly depleted and they required niacin bicarbonate)—Patricia Kane. Remember, the carbonates acidify the system. In any case, it should take no longer than six months to rid the body of all 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 inhibit 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 per cent. Giardia infection was found in about half of a group of two hundred patients with chronic diarrhea, constipation, abdominal pain, and bloating—Leo Galland. It 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 started 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. 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. 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% is normally unbound, but in children with autism, this often runs as high as 40% unbound! 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 rises. 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 which 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 pancreatic dysfunction. Pro-oxidant copper ions affect glutathione distribution in several ways. **Jaundice and high bilirubin levels are signs of copper toxicity, as is earaches and ear infections.**

Additionally, copper imbalance 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. A magnesium deficiency will create a vitamin B₁ deficiency! Supplement both together.

Citrus fruit increases intestinal absorption of copper, and monosodium glutamate (MSG) binds and transports it, however, large amounts of vitamin C, with vitamin B₆ and zinc, will remove the excess copper from the brain. These should be combined with manganese in a 3:1 zinc/copper 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 dietary 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 such hair when 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 B₆), 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 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.

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. When unbound with ceruloplasmin, copper begins to accumulate in tissues and organs. It is the 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, sodium, manganese, pantothenic acid (PABA), inositol, Folic acid, rutin, and vitamins A, B₁, B₆, C, and E. The adrenals are strengthened, and copper absorption and utilization are increased by supplementing adrenal glandular, molybdenum, iron, sulfur, folic acid,

niacin, inositol, choline, and the above listed nutrients, including extra biotin and PABA. Additionally, lead and mercury interfere with the synthesis of ceruloplasmin or ferritin, contributing to copper 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 48%! Magnesium, 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 moly excess. Significantly elevated moly is unusual, and some toxic effects are due to displacement of copper or inactivation of copper enzymes. 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 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 B₆ and C, and zinc deficiency results in impaired absorption of folic acid. The best way to overcome copper toxicity is to rebuild the adrenals, as listed above, and to supplement significantly vitamins B₆ and C, 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. In as much as 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.

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. 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, 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. This can sometimes be improved by taking milk thistle extract, taurine, and glycine.

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 is HIGH up on the atomic scale, requires 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 as well as to 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**. 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, Strawberries, are often referred to as containing Goiterogens, 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 deplete the iodine stores. So, rather than avoiding these valuable foods, just do what is needed in the first place, supplement iodine. Do the iodine test periodically to ensure the iodine stores are adequate. Additionally, cooking eliminates the goiterogens—<http://oregonstate.edu/dept/hort/233/toxic.htm>.

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-glutaric (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 bicarbonates between meals to increase CO₂ 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. 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, and 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.

The ultimate treatment for this situation is Immunocal™ or IMUPlus™, the undenatured whey protein supplements that helps 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 (CO₂) and oxygen (O₂) at the same time is essential. The CO₂ breaks the cycle. It corrects the alkalosis and frees the O₂ 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, \$21.95 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 B₆ and dimethylglycine (DMG) all have strong anti-seizure properties, and can be effective even when other anti-seizure medications fail. The deficiency of vitamin B₁, 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, too, is only phosphorylated into its coenzyme (P5P) in the presence of magnesium. Some 70% of the enzymes are dependent on magnesium.

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).

Clinical symptomology of magnesium deficiency is dominated by neuromuscular hyperexcitability (Rayssiguier, 1990; Durlach, 1997) exhibiting latent tetany (Durlach, 1997) and spasmodophilia (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 (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 (Galland, 1991), heart arrhythmia (Burtis, 1994), and mitral valve prolapse (MVP) (associated with HLA B35) (Rybar, 1989).

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 where mercury toxicity is present due to oxidative damage. 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.

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 lipotropic 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. 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 B₆.

Garlic, vitamins E and C, bromelain, Ginkgo Biloba, and the flavonoids (with rutin) all "thin" the blood. Use these in preference to aspirin. 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. 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 months 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 vessels 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 Williss dated 7/22/02.
3. Calcium deficiency as a result of vitamin C deficiency. Actually, this is a symptom of Scurvy.
4. Vitamin B₁₂ deficiency. This is likely with those on a vegan/vegetarian diet. A lack of vitamin B₁₂ 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 indicated, bovine colostrum is very effective is helping the immune system destroy bacterial, viral, and fungal infections (including candida) in that it 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 factor or factors in colostrum that boost the immune system’s ability to recognize antigens (foreign substances or bugs) it has never been exposed to and destroy them, is 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 may learn more about it, and 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 is infected with HHV-6 should enable the body to overcome a chronic infection by that virus.). There is a version of “Transfer Factor” from Chisolm Biological Laboratory that first used the chicken, and now the egg, 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 infantile 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 over and over again without replenishing the lipids (fatty acids) and catalysts (vitamins and minerals), then 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. Manganese, selenium, carnitine, and vitamin B₂ stimulate beta-oxidation of fatty acids, but high carbohydrate meals stimulate insulin response and inhibit beta-oxidation. Characteristically, plasmalogen synthesis and beta-oxidation of very-long-chain fatty acids (VLCFAs) are affected. It's been found that patients with generalized peroxisomal disorders have a profound brain deficiency of docosahexaenoic acid (DHA; 22:6n-3) and low DHA concentrations in all tissues and the blood. Supplementation with 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 pro-oxidant nutrients and oxidative therapies. Excess VLCFAs indicate a deficiency of cytochrome p450 (Phase I) liver enzymes, and pregnenolone increases Phase I activity by conserving existing Phase I enzymes. Stimulating beta-oxidation, however, concurrently stimulates the burning off of essential fatty acids (EFAs) as we said. Children with ASD most often present with acidosis, low CO₂/Bicarbonate, and low oxygen. (Dr. Patricia Kane, Ph.D.). 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 acidosis 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, B₁₂, zinc, and molybdenum. Excess ammonia in the blood is associated with excess lysine.

"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, 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. Normally, the C20s are then shuttled by carnitine to 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.

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 acryl 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 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). This could be a contributing factor in PST.

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 a 73% of Multiple Sclerosis sufferers is impulse 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/arrhythmia's.

Some have found Sphingolin™ most helpful (Ecological Formulas 800-888-4585). Vitamin B₁₂ 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) 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 binds mercury and prevents its absorption. I suggest selenium be consumed with all fish to prevent mercury absorption. These two 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- others 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, 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, one-week, two weeks, three weeks, 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 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 "phytochelatin" 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 phytochelatin help pass these toxins out of the body. Heavy-metal overloads can effectively be treated using oral supplements of zinc, manganese, selenium, N-acetylcysteine (NAC), serine, transdermal glutathione, and vitamins B₆, C, and E. 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.

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.

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, or along with pepsin or 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 B₆) 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. 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.

HCl production is controlled by the zinc-dependent enzyme carbonic anhydrase. 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 6.6 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 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. 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.

Biochemical Observations

Common features in those with autism include:

1. raised blood or serum lactate
2. regional disturbances in glucose uptake in the brain, particularly in the cortex
3. 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:

1. Infant colic
2. Sleep disturbances
3. Eczema
4. Allergies
5. 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:

*****1. Impairment of mitochondrial fatty acid oxidation due to carnitine deficiency. Carnitine pumps fatty acids into the mitochondria. With the help of vitamins B₆, 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 cell 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. 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%). 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 autistic with accumulated VLCFA). It helps to normalize these fatty acids. Canola oil is a very long-chain, fatty acid oil (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 liver toxic. Elevation of DHA is not particularly disturbing unless Omega-6 fatty acids 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 herb Ginkgo Biloba selectively increases the release of nitric oxide synthase, the enzyme that reacts with arginine to produce nitric oxide (NO). It should be avoided in this instance. 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 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 autistic is maniacal laughter.

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.

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. Mercury binds strongly to selenium, a trace element that is needed for cellular health, depleting its stores. Latest research shows a conclusive connection between reduced levels of Selenium and increased risk of cancers.

A lack of selenium also affects the conversion of T4 thyroid hormone to T3 apparently increasing the conversion adversely. Stress reduces the conversion of T4 to the more active T3. Both cadmium and mercury inhibits the conversion of thyroxine (T4) to active T3. Additionally, when the liver can no longer listen to insulin, you can't convert T4 to T3 very well. 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 all go out in their urine.

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. 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. 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. 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.

4. Excess glutamate exposure, a common and increasing source being MSG. 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). Excessive glutamate is implicated in epileptiform activities (Scheyer, 1998; Chapman et al, 1996). Cells that are without oxygen may release excessive glutamate. Low oxygen is common in autistics. 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 its 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 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 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. 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. 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. Iron 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, though poorly absorbed (max 20%), one can supplement sulfates orally as glucosamine and chondroitin sulfate, and by Epsom salts baths. Remember that glucosamine is manufactured from shellfish, so if sensitive to shellfish it could be a problem. Kirkman 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 also depletes molybdenum, and it should be supplemented when using MSM. **“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, 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 commonalities 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.

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. Serotonin is metabolized by Phenol-sulfotransferase (PST) liver enzymes (Phase II). These require sulfate to perform their function.

Nutrients that may improve the mitochondrial function include magnesium, Coenzyme Q10, N-acetylcarnitine, N-acetylcysteine, vitamins B₁, B₂, 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 not well assimilated, though of benefit to the gut. If you use it, take it with some vitamin C that will improve its assimilation by up to 20%. Kirkman has a lotion for transdermal application that will overcome the absorption problem. Where possible, help the body produce its own supply.

Solutions to the Problems

Olfactory and gustatory symptoms of psychiatric patients was 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 B₃, B₆, and C are necessary for the

conversion of essential fatty acids to PgE1 (prostaglandin E1) 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 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. Another study showed that both the mean duration of diarrhea and the total duration of diarrhea after treatment (with 0.3g/kg/day of glutamine) were significantly shorter in glutamine group than in placebo group ($p < 0.05$).

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, 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 raw, carob powder, one teaspoon, 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. 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 B₆ 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.

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, 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 and mercury, and adequate levels are required to balance the adverse effects of these toxic metals 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 are particularly painful for many because free zinc binds to already damaged mucosal cells directly. The zinc drops then are preferable. Consult with your medical professional about this possibility. In the case of pallor, check for anemia and low thyroid activity also. Iron deficiency anemia is often the first sign of hypothyroidism. 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 anemia. Zinc and selenium are essential to formation of T3 thyroid hormone. Vitamin B₆ 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. These 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 (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 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.

While the branched-chain aminos are usually deficient, Maple Sugar Urine Disease (MSUD), that derives its name from the sweet, burnt sugar, or maple syrup smell of the urine, is caused by an excess of these aminos. 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 liquid, ionic forms seem more certain of assimilation.

Several studies have found that most children with ADHD have deficiencies of certain minerals that are commonly depleted by exposure to toxic metals, such as magnesium and zinc, 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 disorder.

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 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 were 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 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 period 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"—Borrmann.

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 enzyme Cellulase that breaks the bonds and releases magnesium and these other minerals for your body to use. Further, there are antinutrients in cereal grains that directly impair vitamin D metabolism [Batchelor 1983; Clement 1987]; and rickets are routinely induced in animal models via consumption of high levels of cereal grains [Sly 1984].

Less well-appreciated are the ability of whole grains to impair biotin metabolism. Bruce Watkins [Watkins 1990], as well as others [Blair 1989; Kopinski 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 18:2n6 (linoleate) to 20:4n6 (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].

When yeast levels are high there are high levels of arabinose. According to Dr. Shaw, this can cause a functional deficiency of B₆, 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 ingestion of raw egg whites, or the use of certain anticonvulsant drugs, primarily Dilantin. (See this article by Dr. Sloan, <http://author.emedicine.com/PED/topic238.htm>.)

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. 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.

SAM is the most important methyl-group donor in cellular metabolism. It is known to be utilized in synthesis of carnitine, CoQ10, creatine, methycobalamin, 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 is a cofactor in a number of critical biochemical reactions and is 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 B₆, folic acid, and B₁₂ 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 65% of autistic children), the homocysteine is recycled to methionine and to SAM in what has been called the 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 B₆ and C, zinc, selenium, and molybdenum, one will lack the glutathione and sulfates needed to detoxify the body (PST). It would appear that a supplement of vitamins B₂, B₆ (P5P), B₁₂, 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 would also be valuable in speeding the SAME Cycle. Ensuring adequate protein, and even supplementing a small amount of 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 (avoid folic acid if histadelic), and need TMG, but not folic acid; whereas 15% were overmethylated with low histamine, and do not do well on TMG. These need folate. If TMG/DMG makes the child hyperactive, he needs folate to balance the overmethylation that is occurring, or he needs to reduce or discontinue the TMG/DMG because it is overmethylating. Supplement glycine instead. Expressed differently, undermethylated autistics thrive on calcium, magnesium, methionine, Vitamin D, DMG, TMG, tyrosine, tryptophan, phenylalanine, and inositol, but tend to get worse on folic acid, DMAE, and choline.

The DMG, by a secondary pathway, with the help of vitamin B₂, 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 B₂ and B₆, magnesium and DMG and its co-nutrient, vitamin B₁₂, before buying SAME. To provide the necessary methionine, get some protein into the kid!

Dr. Shattock of England (a pharmacist) and others suggest that TMG is a higher-priced Betaine hydrochloride long used to improve digestion and utilization of foods. The manufacturer denies this, but in any case, 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 reduces to DMG that 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 of Overmethylated 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. **This is because, for this subset, TMG/DMG is contraindicated.** Use of TMG by the undermethylated subset does significantly reduce homocysteine by methyl donation in becoming DMG, but additional vitamin B₆ (200 to 500 mg) and B₁₂ (500 to 1000 mcg, preferably as sublingual tablets) are probably needed to metabolize homocysteine.

“Some people take large doses of Vitamin B₁₂ 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 B₁₂ for a total of 3 milligrams a day. Vitamin B₁₂ 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™, Tegreto™, aspirin, Pepcid®, Methotrexate, Dilantin™, Zantac®, oral contraceptives, and 21 other commonly used drugs. Genetically, some simply need more folate than others. Use of DMG/TMG causes a loss of folic acid that may cause hyperactivity, particularly in the overmethylated subgroup of ASD. 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, cervical dysplasia, elevated homocysteine leading to heart problems, increased osteoporosis, headache, fatigue, hair 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. 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.

"A small percentage of autistic spectrum patients have methylation defects due to **deficient methyl groups**. The Autism Research Institute, San Diego, has in the past advocated DMG for all autistic spectrum patients. **The methylation defect, when present, can cause a defect in sulfation.** However, this is measurable, and if present, trimethylglycine (TMG—betaine) will provide more methyl groups (than DMG—WSL), and in addition, decrease the abdominal complaints present in patients with such deficiency."—Dr. Hugh Fudenberg. Note that sulfation is a problem with the PST group of children and with food sensitivities, lupus (SLE), Alzheimer's, and arthritis.

Pfeiffer Treatment Center found 15% were overmethylated which is associated with low histamine and excessive levels of dopamine, norepinephrine, and serotonin. Typical symptoms include anxiety, depression, chemical and food sensitivities, under achievement, upper body pain, and an adverse reaction to serotonin-enhancing substances such as Prozac, Paxil, Zoloft, St. John's Wort, and SAME. They have a genetic tendency to be very depressed in folates, niacin, and vitamin B₁₂, and biochemical treatment focuses on supplementation of these nutrients. These persons are also overloaded in copper and methionine, and supplements of these nutrients must be strictly avoided. **If the child is hyper on TMG/DMG, it is likely because he is not getting enough folic acid. Or, looking at it another way, he is being overmethylated by the TMG. In that case, discontinue the TMG/DMG and add glycine. If you continue with TMG/DMG, you must add folic acid and vitamin B₁₂.** "These people usually do best if supplements of methyl agents are strictly avoided and DMAE, choline, GABA, folic acid, and vitamins B₃, and B₁₂ are provided"—Dr. Wm. Walsh.

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. Too much calcium entering the mast cells because of a lack of magnesium and manganese (calcium channel blockers) triggers release of histamine. An increased intake of methionine methylates, and thus detoxifies, histamine. These patients tend to obsessive-compulsive tendencies, oppositional-defiant disorder, or seasonal depression that are associated with low serotonin levels. Seventy-five percent of the undermethylated have seasonal allergies. They generally exhibit perfectionism, competitiveness, and other distinctive symptoms and traits, and often are suicidally depressed. They have a genetic tendency to be very depressed in calcium, magnesium, methionine, and vitamin B₆, with excessive levels of folic acid. These undermethylated persons may benefit nicely from Paxil, Zoloft, and other serotonin-reuptake inhibiting medications, although nasty side effects are common. A more natural approach is to directly correct the underlying problem using methionine, calcium, magnesium, and vitamin B₆, SAME, and inositol (this from Dr. Wm. Walsh). These would benefit from TMG/DMG with vitamins B₆ and B₁₂ and serine.

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 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+++ would be expected to aggravate this condition. Such patients thrive on folate/B₁₂ therapy.

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 B₁₂ 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 (B₁₂). 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 B₁₂ in the form methylcobalamin. Regular vitamin B₁₂ will convert to Methylcobalamin in presence of adequate SAM. It should be noted that vitamin B₁₂ is essential in synthesizing essential fatty acids needed in myelin. "Vitamin B₁₂ deficiency is widespread—nearly 40% of the US population may lack. 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.

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. He 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 that '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. These essential 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. **Individuals 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. This loss of glycine would interfere with glutathione production (opioids have been shown to decrease hepatic glutathione), 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 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 B₆, 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 (histadelic, who is over stimulated), and low levels define another type (histapenia, 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 detoxifies histamine, epinephrine, and nicotinic acid which would be helpful (along with calcium lactate, zinc, and manganese) 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.

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 B₁₂. 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, 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. Epinephrine curbs the release of histamine from mast cells. Ascorbic acid has also been found to have the same kind of an antihistaminic effect. 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. Lots of pure water is the best-known antihistamine! Drink more water.

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. When ox bile is used, increase the amount until the fat is being digested. The health food store will have several choices for you. 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 acid taurine, 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.

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.

One will likely never be free of candida until five things 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 than 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 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. 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 and E deficiency, and stress, causes a spill of taurine into the urine. These kids are highly stressed, and are typically lacking these nutrients.

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). 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 B₆ 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.

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 that receptor 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, stinging, 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 receptor 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 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. Hypomagnesemia 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 from 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 B₆ 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 α- and β-amino acids, including β-alanine and taurine, also activate glycine receptors, but with lower potency. 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 two paragraphs later.

The enzyme kynureninase, which breaks down kynurenine, requires magnesium and pyridoxal phosphate (P5P), and its activity is decreased in a vitamin B₆ 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 other 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 clonazepam (Goetz, 1992; Hewlett, 1993). GABA modulates dopamine concentrations in the nucleus accumbens and corpus striatum (Dewey, 1997).

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 B₆ or zinc is deficient in Rheumatoid Arthritis and liver disease. In fact, taurine in serum rises with low zinc serum, 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 B₆ levels are probably low, and should be tested. P5P, the active form of vitamin B₆, is necessary for many amino acid reactions to take place.

Taurine's function and effectiveness are controlled by vitamin B₆ and zinc. Zinc and vitamin B₆ 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 B₆ 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. 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. 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. Elevated PgE2 suppresses immunity. These eicosanoids serve as a communication "wiring" for the body, communicating information from cellular DNA.

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 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 AlkaSeltzer Gold™ or with 1/2 teaspoon of bicarbonate of soda in a glass of water. Use of excessive bicarbonate of soda can disrupt potassium balance so the use of AlkaSeltzer 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, Pseudomonaceae, 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 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 B₁₂, 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. 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.

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 may not be recognized. Rebuild your immune function by correcting your dietary, and by supplementing with Ambrotose® and Phyt•Aloe® 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. Scary. Considering that mercury depletes selenium, poor diets lack selenium, our kids universally lack selenium, and that most of these kids harbor chronic viral infections, shouldn't you supplement selenium? Use 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 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, B₁, D, K, pantothenic acid, niacin, folic acid, zinc, magnesium, potassium, MSM, fatty acids, and of protein. Supplementing these nutrients, especially vitamin A and zinc 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. 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 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, epilepsy, or hyperventilating. Calcium carbonate may help.
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.

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, 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, and such irritations, four things will surely save the day. Take bromelain, and aloe vera—preferably as found in Ambrotose® by Mannatech, Inc. (Ambrotose® is a superior form, containing a patented,

standardized extract of aloe, Manapol™, and the other essential 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, and of course water soluble fiber, preferably fructooligosaccharide. Drs. Cooter and Schmitt suggest 300 micrograms of molybdenum in three divided doses per day, 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 B₅ (Pantothenic Acid) to Coenzyme A.

Some Additional Aids to Overcome 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 one-third banana (mashed) per pound of body weight. 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.

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 *Self-help Method #1* for more on HCl. A drink with a very strong mixture of lemon or lime juice 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. It too prevents an imbalance of harmful bacteria 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. For mild cases, take two capsules of aged, deodorized garlic concentrate three times daily. For severe problems, take two capsules five times daily.

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. (Round worms cause many attacks of asthma.) In large quantities, it 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® by Mannatech™.

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.

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.

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 B₁, 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 creates and 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!"

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. In normal circumstances, G-proteins are modulated by thyroid hormones. In the absence of thyrotropin (TSH), the G-protein is totally inactive. The binding of thyrotropin 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.

Here is a part of Dr. Mary Megson statement to US Congress on April 6, 2000 about vitamin A deficiency in Autism:

“In the vast majority of these cases, one parent reports night blindness or other rarer 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 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 or 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, Southampton 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. Suddenly, 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 NMDA/glutamate receptors 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 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.

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!

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.

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 one eat according to his 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 alkalizing, and the neurophysiologic research documents that in an alkaline environment Sympathetic activity is reduced and Parasympathetic activity increased. So, if Sympathetic, stressed-out kids will increase vegetable intake (or take Phyt•Aloe™, a vegetable concentrate by Mannatech™) and supplement with magnesium, potassium, vitamins A and D (cod-liver oil), B₆ and Phosphatidylcholine, 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. 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.

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.

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, 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, Tucson, Arizona.

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. 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, acetylcarnitine, 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 Acetylcarnitine, 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 stop digestion of meats and proteins, and interfere with utilization of many vital nutrients? Additionally, the herb ginger is reported to tighten the sphincter muscles, and thus prevent reflux. 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.

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 may lead to a higher level of the reactive (harmful) intermediate compounds that can cause damage to DNA, RNA, and proteins, so this is considered an undesirable effect. 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 it 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 (present in insect poison).

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 that it depletes intracellular glutathione. The detriment can be reversed by high intensity light or by replenishment of intracellular reduced glutathione.

Oleuropein (Olive Leaf Extract)	Hawthorne
Garlic (allicin).....	Niacin
Arginine (amino acid), and high arginine.....	Ginkgo Biloba , increases blood flow
foods. Increases growth hormone and NO.	to brain, increasing oxygen and increasing nutrients to the brain. Increases nitric oxide synthase & increases NO.
Choline	InositolCholine Inositol
Ginger	Yohimbine increases NO
Nitroglycerine , increases NO.	Fluvastatin (cholesterol lowering drug),
Nitrates	increases NO.
Viagra™ increases NO (should not be used with these other nitric oxide donors.)	Chocolate
Sumatripan (antimigraine drug)	Forskolin
	Ginseng , increases NO by blocking Cyclic GMP (Chen 1995). Hypoglycemic persons should not use it.

Aspirin/salicylate/Cox Inhibitors enhances NO synthase (NOS-1), 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 excitotoxic damage 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, and such NMDA stimulation is known to increase nitric oxide synthesis. Infection and other stress 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 (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 (pain registering substance), 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 B₆ 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 include VIP, PACAP, glucagon, parathyroid hormone, and calcitonin.) 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, N-acetylcarnitine (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 B₅). 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 B₆, and B₁₂ metabolize back into usable aminos. TMG helps make SAM. I think that in building acetylcholine, one should supplement the TMG, folic acid, vitamin B₆ and B₁₂, 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, unless the child is strongly PST, I suggest the supplementing of vitamin B₆ and magnesium to conserve serotonin, and 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.

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. 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, 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? 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 morning and afternoon 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, rickets in children, and brittle bones in older folk (osteoporosis). 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.**

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, trans fatty acids from margarine, peanut butter, and processed baked goods, and Omega 6 unsaturated oils. Omega-3 fats are almost nonexistent in the diet. The overabundance of Omega-6 EFAs, the introduction of an entirely new fat type (trans fatty 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 such as heart disease, stroke, hypertension, cancer, and chronic degenerative diseases, and 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). 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.

"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."

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 seem to justify 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 present 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 always 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 far north, the ratio of Omega-6 to Omega-3 is about 2.5:1 in the food chain, in temperate zones 4:1, in the tropics 10:1.

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, excess saturated fats, 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, acetylaldehydes (from candida and alcohol), and stress all interfere with Delta 6 Desaturase, as does a deficiency of vitamin B₆, 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. Avoid these like the plague.

A zinc deficiency, that may be exacerbated by a vitamin B₆ 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), acetylaldehyde (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 in form of Evening Primrose oil.

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.) 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.

The well-documented phytates of cereal grains, including the nutrient supplement IP-6, sequester many divalent ions including calcium, zinc, iron, and magnesium leading to deficiencies that can impair bone growth and metabolism. 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]. Deficiencies of vitamin D, calcium, magnesium, selenium, and zinc are common in autism because of a high carbohydrate diet and malabsorption. Less well appreciated is the ability of whole grains to impair biotin metabolism. Bruce Watkins [Watkins 1990], as well as others [Blair 1989; Kopinski 1989], have shown that biotin deficiencies can be induced in animal models by feeding them high levels of wheat, sorghum, and other cereal grains.

When yeast levels are high, there are high levels of arabinose. According to Dr. Shaw, this can cause a functional deficiency of B₆, 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 ingestion of raw egg whites, or the use of certain anticonvulsant drugs, primarily Dilantin. (See this article by Dr. Sloan, <http://author.emedicine.com/PED/topic238.htm>.)

The amount people are using to overcome this problem is 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.

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.

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, allowing 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 lipoxygenase 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 counter this undesirable flood of calcium into cells.

Biochemically, we know that high-glycemic, carbohydrate diets that stimulate the excess release of 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-lipoxygenase 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.**

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, 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).**

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. Additionally, support fat digestion by a good digestive enzyme with lipase and ensure adequate bile production by supplementing taurine and glycine if necessary. Continue supplementing the antioxidants, and add one 500 mg capsule of EPO. Increase to 2500 mg as it is seen to be tolerated. This can be in two 1300 mg capsules. Evening Primrose oil (GLA) 1 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 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 implications, read *Enter The Zone*, by Barry Sears, Ph.D.

Dr. Sears casts much light on arachidonic and other fatty acids. First, animal protein sources like steak and eggs, organ meats, and fatty red meats are high in arachidonic acid. Getting too much or too little 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. High insulin hormone levels 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]. 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 J Clin Nutr*, 2002 February, 56(2):114-20. Phenols are not in the 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, sardines, and mackerel) 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 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. 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. 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.

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, go to www.mannapages.com/Willis and select "Dietary Needs Assessment Survey". Answer the 50 questions, and then choose from the menu "Dietary Needs Assessment Survey Results and Recommendations". When speaking of ratios of carbohydrate to protein, I am not speaking of total percentages, but of the stuff on the plate. Fruit, vegetables, and grains are carbohydrate. Nuts and cheese are fat. The proper control of this ratio 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. As a result, one can obtain all the GLA needed (a couple of milligrams per day for a healthy adult) from five bowls of old-fashioned oatmeal per week (Barry Sears)! Obviously, not much supplemental GLA is needed when Delta-6 desaturase is working.

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), and balance it by supplementing 50 times more EPA than GLA (Sears). The typical 1,300 mg capsule of Evening Primrose oil provides 117 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. Many of the kids are pyrroluric. That causes a deficiency of zinc and vitamin B₆, and a low level of Arachidonic Acid (AA). 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 Acid (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. Be sure to choose fish oil that has undergone molecular distillation to remove the environmental contaminants. 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—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.

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. On that basis, subject to the qualifications given above, and on the fact that palmitate is often used to standardize other brands, I recommend Nordic Naturals™ CLO from Kirkman Labs.

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—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. Its gelatin content may make it undesirable to those on Gf/Cf diets.). This 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 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 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. Therefore, eliminating yeast, and avoiding the phenols, salicylates, and phytoestrogens in food may help balance the fatty acids. Once essential fatty acids are restored, Kane says that 25 mgs pregnenolone may be administered to an autistic child. Results have been remarkable in some instances, with children starting to talk. Pregnenolone increases the overall p450 enzyme detoxifying power by promoting conservation of the existing enzymes, promoting Phase I body-detoxification processes.

These herbs also enhance this 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. Nevertheless, 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, increases 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 B₆), 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 B₆ 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 problems 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. 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.

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. 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.

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. 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 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.

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 with bile acid and pancreatic lipase deficiencies 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 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. Essential fatty acids and fat-soluble vitamins must be added to MCT oil if it is a significant source of fat in the diet.

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. Darrell 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-virus 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 gonorrhoea. A number of fungi (several species of ringworm), yeast (candida albicans) and protozoa (giardia lamblia) are inactivated or killed by monolaurin. 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 (α)) and Interleukin-6 (IL-6) while stimulating production of anti-inflammatory cytokines such as Interleukin-10 (IL-10).

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.

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).

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)], but recent research has found that 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)! Niacin, or inositol hexanicotinate, is beneficial in lowering LP(a) as well. High doses of vitamin C, and the amino acids lysine and proline also aid in the control of LP(a). One can lower blood viscosity with enzymes such as Bromelain and Wobenzym. Nimotop™ or Trental™ are not required! (Nimotop™ is a calcium channel blocker. Magnesium and manganese are Nature’s calcium channel blockers! Use them.) Lp(a) and ascorbate are involved in cancer, inflammatory disease, and other diseases, including the process of aging. Dr. Robert Rowan, MD, says that Fibromyalgia is caused by a minor clotting disorder that impedes circulation. 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 B₆ (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 B₆ and magnesium. You must supplement vitamin B₆, 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 B₆ 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 (Super Nu Thera by Kirkman Laboratories) 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 B₆ 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 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 and do the 50 Questions on the Dietary Needs Assessment Survey (midway on right hand menu). 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.

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 form used will not be assimilated and utilized in any meaningful amount, so it cannot be effectively used as a source of calcium supplementation.

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 the matter of 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™. 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!

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 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.

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 (B₁₂), 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. 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 a 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.

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 B₁₂ deficiency, causing growth problems, because the same cells of the stomach that produce hydrochloric acid produce the “intrinsic factor” necessary to absorption of vitamin B₁₂. Prilosec™ specifically drains the body of vitamin B₁₂, and Pepcid™

depletes calcium, folic acid, and vitamins D and K. Tagamet™ and Zantac™ deplete calcium, folic acid, iron, zinc, and the vitamins B₁₂ 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 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. 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 known 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 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 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. 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 Turns™. It stops the

symptoms of stomach distress, but so would additional hydrochloric acid! 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 alkalizer. (O, the power of advertising!) Of course Pepcid™ is not an alkalizer. However, it hinders the stomach from producing acid. If one is, in fact, producing too much HCl, that may be a good thing, but, as I've indicated, most have too little HCl. The symptoms of too much or too little 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 who do make too much acid and have an ulcer or gastritis. 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.

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.

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, and creates lots of free radicals. 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 parent molecule and 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. The result of this reaction is the generation of a reactive molecule, which is often more toxic than the parent compound. Unless this intermediate metabolite is further metabolized by a well-functioning Phase II system, it may react with and cause damage to proteins, RNA, and DNA within the cell. Furthermore, Phase I reactions also generate damaging free radicals. This is bioactivation. 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, 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 of endogenous compounds including fatty acids, steroids, estrogen, body alcohols, Retinoic acids (vitamin A), glycine, prostaglandins, leukotrienes, several 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, and 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. This is the condition of these with "PST syndrome". As a result, some herbs, listed later, that enhance these enzymes may be very beneficial for a time.

The balance between Phase I and Phase II is critical, 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.

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.

"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 some 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.

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:

- Ø Inhibits the uptake of glycine and alanine.
- Ø Depresses Phagocytosis of bacteria by neutrophils.
- Ø Chelates calcium.
- Ø Causes air hunger (dyspnea).
- Ø Methyl malonate is toxic to kidneys
- Ø 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.
- Ø 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 B₂ as FAD. Malonic acid may come from extra-mitochondrial malonyl CoA involved in fatty acid biosynthesis and from foods.
- Ø Induces ketonemia.
- Ø Reacts with aldehydes.
- Ø Competes with zinc and magnesium, depleting them.
- Ø Can reduce concentrations of magnesium and calcium by 25% to 50%.
- Ø Severely reduces calcium and iron transport in rats.
- Ø Cause a fall in malate concentrations leading to depletion of NADP.
- Ø Causes oxidation of NADH and cytochromes.
- Ø Raises cholesterol.
- Ø Reduces survival times of animals.
- Ø Can pick up an amino group from glutamine, thereby destroying it.
- Ø Depresses the reduction of GSSG to glutathione.
- Ø Inhibits insulin stimulation of muscle respiration.
- Ø Inhibits acetylcholine synthesis.
- Ø Inhibits entry of phosphate and potassium into cells.

- Ø Causes systemic acidosis.
- Ø Inhibits pyruvate oxidation.
- Ø Increases lactic acid formation by inhibiting cellular respiration.
- Ø Stimulates glycolysis.
- Ø Much less glucose goes to form amino acids and proteins.
- Ø Diverts fatty acid metabolism to acetoacetate, acetone, and alcohol in dogs.
- Ø Inhibits oxidation of fatty acids.
- Ø Inhibits cell cleavage (the formation of a wall between dividing cells). The resulting multinucleate cell is a hallmark of cancer.

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 B₆ 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, 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 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. The liver must be checked for elevated liver enzymes when using these antifungals, however, it should be noted that high amounts of vitamin B₆ 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. 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 already are impaired, 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, 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, and valerian are ones that I know of. Valerian is also reported in long-term use to decrease adrenal function. 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.

Using these herbs 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-acetylaldehydes, not with flower scents), and **candida yeast toxins (acetylaldehydes)**. 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.

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 hyperkinesia.

Progressive neutralization of these 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 B₁₂, 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.

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® and Phyt•Aloe® by Mannatech™, and Green Tea Extract (however, the high content of both aluminum and fluoride in tea is cause for great concern 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. Unfortunately, Turmeric is toxic to the liver and Peripheral Blood Mononuclear Cells (immune cells) and should only be used short term, or under medical supervision.

Pregnenolone enhances Phase one 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, 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. The glutathione it supplies is best supplied by other herbs and foods. 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 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 In Vitro 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 stimulants such as Schizandra.

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 B₁, B₁₂, D, and K, and the mineral calcium, and Tegretol™ depletes biotin, folic acid, and vitamin D. 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-sulphotransferase (PST)

This speaks of a condition that affects 80% to 90% 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 (phenol-sulfotransferase) is a Phase II enzyme that detoxifies leftover hormones and a wide variety of toxic molecules, such as phenols and amines 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 reactions include the breakdown 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 CO₂, low glucose, and high bilirubin are also indications of low thyroid function. In children, a low thyroid condition is often 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). These deficiencies cause sulfate levels in PST children to be about 15% of NT kids! These 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 foods that inhibit PST enzymes (citrus fruits), can worsen behavior problems.

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%**; p < 0.005). 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 B₆. **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 HPPHA—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. One can improve the glucuronic pathway by supplementing Calcium D-Glucarate (now being proven a powerful cancer preventive and treatment aid). 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.

Unfortunately, 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.

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 be used to make 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. 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 metabolize 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 B₂, B₆, B₁₂, 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. This 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. 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. 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, and it is necessary for optimal Natural Killer Cell function, 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.

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 deficient. Do you or your child have bumps on shoulders, thighs, elbows, and calves? Supplement with pure amino acids, Seacure™, 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. Seacure™ is available at www.voicenet.com/~seacure/seacure, or from HomeCure™ at 800-559-2873 or www.homecure.com.

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 should 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.

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.

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. 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 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. NAG is one of the eight essential sugars found in Ambrotose®.

Essential saccharides have also been shown in clinical trials to reduce allergies and to allay symptoms 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 Mondo, 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 chronic 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 DANI 2002 not to use Ribovarin.

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. Drugs such as Ritalin™ and ADDerol™ affect 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.

“... 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.

There are a number of consequences attributable to PST/sulfate deficiency including effects upon the impaired breakdown and metabolism of classical neurotransmitters such as serotonin and dopamine; impaired breakdown and metabolism of the bile pigments bilirubin and biliverdin; impaired action of the hormone CCK on CCKA receptors which 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. 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 detox 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. 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 B₆, in the form P5P. Aldehyde oxidase requires molybdenum. A deficiency of P5P, NAD, vitamin B₂, 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 acetaldehyde 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.

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. There are 4 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 magnesium toxicity. 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 creatinine 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. 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. Some 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. 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 \$69, plus two filters \$129. 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 B₆, 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 it 15% 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 of 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 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. 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, Resveratrol, green tea, and other things have phenols, salicylates, and other stuff that are normally detoxified by PST. Some recent studies indicate that salicylate has an effect on PST, an enzyme needed by the brain and the gut to metabolize high-phenolic compounds like the artificial colors and flavors. Salicylate suppresses PST enzymes up to 50%. Phase II has been shown to be low for people with ADHD or autism. Excess boron interferes with the metabolism (breakdown and excretion) of phenols. Ritalin, used in the treatment of ADHD, inhibits the metabolism of coumarins (phenols). Supplementing boron reduces calcium losses by 30%, but excess boron increases copper in the body. High copper levels reduce the vitamin B₁, and this reduces oxygen supply to the brain. Excess boron reduces the vitamin B₆ 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 and muscular twitching (ants 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 well as 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.usa.glycoscience.com. 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.

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 stimulated MT and EGF+ 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 identical 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 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.

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 the detoxification process. Schizandra extract enhances liver glutathione status, and increases Phase II liver enzyme activity. 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.

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. These foods have been shown to improve liver detoxification, 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 phenols 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.

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 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.

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® 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 caused a vitamin B₁₂ 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. Her son no longer suffers daily seizures. He actually went for over a year without seizures. She had been using Immunocal™ for both 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 Should We 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 this was accompanied with 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 system 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. A lot of vitamin C (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 7500 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 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. It has strong antihistamine properties, inhibiting release and enhancing degradation of histamine. Large amounts, coupled with vitamin B₆, 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, preferably Ester C™ or buffered C (calcium, not sodium).

There are four things one should look for: 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) Amounts of vitamin C 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 and 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 being digested and assimilated. This is apparently what happened to me. 4) If taking sodium ascorbate, which many do to minimize the acidity problem, one may become overloaded with sodium and deplete potassium. This can lead to many health problems, including palpitations, which I have suffered ever since that incident, controlling them only with high doses of potassium. So, if you continue to use vitamin C in high amount, use only Ester C™. There are several reasons: it is neutral in pH, it has a three-times-longer half-life, so you get better results with less frequent dosing, and it is four times as effective, so you don't need the extreme doses. I would urge no more than 2000 mg day. 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.

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.

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 B₆ and B₁₂. “A far more direct and effective way would be to supplement with methionine and/or SAMe. TMG increases methyl status only 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. The more pronounced the noise, and the greater the magnesium deficit, the higher the catecholamine excretion, with epinephrine and NE excretion reaching 5 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 B₆ on hyperactive children. One group was given Ritalin; a second group was given vitamin B₆, and a third group was given a placebo. Both the vitamin B₆ and Ritalin™ groups improved significantly as compared to the placebo group, and there was no difference between the Vitamin B₆ 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.

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. Additionally, supplement Ambrotose® and Phyt•Aloe® from Mannatech™, and TMG. Clinical studies on 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 based on the fact that 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), and **never 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 B₁, B₂, B₆, B₁₂, C (ascorbyl palmitate), and E, para-aminobenzoic acid (PABA), folic acid, beta-carotene, calcium, magnesium, zinc, chromium picolinate, selenium, reduced glutathione (an antioxidant), and St. John's Wort (hypericum). 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 who specialize in autism at that conference. 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 B₆. 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. Stronger associations include kidney failure, some nerve disorders, vitamin deficiencies, pregnancy, iron deficiency, and some medications (such as antidepressants). About 50% of those who have restless leg syndrome have relatives with the same condition.

Mercury Poisoned.

Due to the high dosage of mercury 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 fabric softeners. Environmentally safe household products and paints can be had from AFM at www.nontoxic.com/nontoxicpai, (800) 968-9355. Melalucca™, Shaklee™, and Neways™ also carry the 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, muscle spasms, nausea, vomiting, abdominal pain, garlic odor to the breath, diarrhea, anuria, 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, plastic bedding and playpens pads, and wool carpets and underlays.

One of the greatest effects of cadmium, arsenic, and mercury is that they deplete selenium in the body because selenium is essential for their removal. Selenium atoms combine with cadmium, arsenic, and mercury atoms and escort them out of the body via the bile system. When selenium is depleted by cadmium or mercury, 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 enhance the conversion of T4 to 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 B₁₂ 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 will usually have some of the classic signs and symptoms of B₁₂ 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 β -Amyloid (A β) 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 μ g/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 as yet 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 (Todoroki et al., 1998REF30). It is not excluded that both these mechanisms could be operating simultaneously.

"The release of both A β 1-40 and A β 1-42 into the culture medium was increased by exposure of SHSY5Y cells to mercury. Melatonin preincubation resulted in a significant decrease in A β 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 A β production and oxidative stress; thus, the chelation of mercury by melatonin could shift the APP metabolism back toward the secretase pathway, reducing A β production and the concomitant oxidative stress-inducing effects of mercury and A β . A β -Fibrillogenesis is also inhibited by melatonin, thereby potentially reducing the toxic buildup of A β 1-40 and A β 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 A β production. Both A β 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), B₆, folic acid, B₁₂, magnesium, and serine. A supplement of 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 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 B₆, B₁₂, 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 B₆ and B₁₂, with effects on the cytochrome-C energy processes as well. Epsom salts (magnesium sulfate) baths, supplementation with the P5P form of vitamin B₆, and with vitamin B₁₂ 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 when compared with adults with the 'acquired' or common variable form of the disease. T-cell deficiency results in intractable diarrhea and monilial infection of the gastrointestinal tract. End of abstract. **Pernicious anemia occurs 20 times more frequently in patients with hypothyroidism than generally.** In another study, a significant reduction in the number of B-lymphocytes was observed in mercury-exposed individuals.

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 (B₁₂, 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, manganese, magnesium, and vitamin B₆ 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. I now understand it may come from wool carpets and underlays that are treated with arsenic! Yes, and from your playpen mattress! 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. You must have a heavy metals check, and detoxify your child at the earliest time. My book "Self-help to Good Health" (\$21.95) 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 B₆, C, and E. 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. DMPS takes considerable glutathione (GSH) to metabolize it, in addition to folic acid, vitamins B₆, and B₁₂, and molybdenum. 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.

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. There is 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 detoxified out 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—WSL.] There is also evidence that alpha-lipoic acid reduces copper excretion. 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. Additionally, it will feed a vigorous overgrowth of candida —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.

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 know as thiamine (vitamin B₁) 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 B₁. 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.

Kidney side effects and lowering of neutrophils are both known 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, rash, 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 reaction to DMSA, 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. 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. 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.

Toxic epidermal 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 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.

According to Dr. Dietrich Klinghardt, regarding challenge tests with chelating agents (administration of appropriate agent followed by mercury urinalysis), “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 also assists in reducing the amount of zinc and copper excreted through the urine in the presence of mercury. Selenomethionine 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 has 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! 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. Liquid zinc is better, and liquid, ionic zinc (www.wateroz.com) is undoubtedly best [(800) 547-2294]. Out of US, call (208) 926-7971. Taking it 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,

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, 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]

In one study, after 7 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, and phosphatidylserine. The results demonstrate that the contents of phospholipid and ubiquinone 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 intake), 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 high amounts of these minerals, you must remove all fluoride from your child's drinking and bath water, toothpaste, and prepared breakfast cereals (that have up to three times as much as is legal for drinking water). Supplementing the above-mentioned phospholipids may be wise.

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 with 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. A low calcium/phosphorus ratio causes more lead to be incorporated into the skeleton, and adequate calcium, magnesium, 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.

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" (\$21.95 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 can also further damage the sulfur oxidation system (especially DMPS) by draining the system 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 is not a good choice for chelating mercury, nor for removing lead, for it removes 8 to 12 essential minerals, 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 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 of Pb²⁺ added to an LD-1 of Hg²⁺ gave a solution with an LD-100. If it were additive, it would have been an 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), but 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 and 15 mg manganese.) Vitamin B₁, 50–100 mg (in form of a B-complex supplement), detoxifies lead also.

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, 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. 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 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 can 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 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 B₁₂ deficiency** [M Siepmann, W Kirch]. It decreases lipoic acid serum levels of vitamin B₁₂ [Aktuelle Neurologie, 2000, Vol 27, Iss 1, pp 33-35. www.drmirkin.com/diabetes/8310.html]. It would thus be wise to supplement vitamin B₁₂ 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 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. Both L-cysteine and whole glutathione do this. N-Acetyl-L-Cysteine (NAC) produces glutathione, and 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 pharmacokinetics study). NAC does not contribute directly to cysteine toxicity unless you take massive amounts of it. Around 500 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®, or AmbroStart™, and Phyt•Aloe® by Mannatech™. Plus, by Mannatech™ supplies plant sterols that detoxify mercury. PLUS and Ambrotose™ detoxify 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.

Dr. Yoshiaki Omura discovered that the leaves of the coriander plant 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. (Acupunct 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).

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 it 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.

Acetylaldehyde and NAD

Chronic exposure to acetylaldehyde from alcohol, cigarette smoke, auto exhausts, and candida creates a deficiency of vitamin B₁, pantothenic acid, and niacin (resulting in a lack of NAD/NADH). A moderately severe B₁ 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

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. It has been shown to improve mental and physical health by increasing production of a neurotransmitter called dopamine. Dopamine is needed for our short-term memories to work properly, and is required for good muscle tone. Without enough dopamine in our bodies, our muscles will get stiff. NADH 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 B₆. 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 B₆, 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 B₆ (up to 1.2g/day) that were used by Hoffer (niacin) and Pfeiffer (vitamin B₆). It would seem reasonable that adding a significant amount of tryptophan as a supplement to the B₆ 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, and the superior brand is Dr. Sinatra’s Q-GEL-PLUS, 800-304-1708. It contains water soluble CoQ10 combined with carnitine fumarate and vitamins E, B₁₂, and folic acid. 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 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 most 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 B₅) 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.

In case you wondered, Dr. Cooter and Dr. Schmitt 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.

Pyrrroluria

Candida converts sugars into ethanol. Unused alcohol converts into acetaldehyde. If you have adequate amounts of glutamine, selenium, niacin, folic acid, B₆, B₁₂, 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!

Kryptopyrrole is an avid aldehyde-reacting agent that has been shown to combine irreversibly with pyridoxal-5-phosphate. 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 pyrrroluria (or malvaria) and affects about 20% 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 B₆ and zinc dependent and respond readily to zinc and vitamin B₆ therapy, however, experience shows it will take 6-months of supplementation at high levels.

Thus, acetaldehyde induces a deficiency of Pyridoxal 5` Phosphate (P5P) the major coenzyme necessary to form virtually all major brain neurotransmitters. It 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 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 to niacin and niacin/niacinamide into the active coenzyme form, NAD. Unfortunately, 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. If fighting candida, you must supplement P5P.

Depression, which can affect hyperactive and hypoactive children, and perceptual disturbances are often the first indications of pellagra. Like people with schizophrenia, affected children may hear voices. 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. 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 kryptopyrroluria (KP), a substance commonly found in the urine of schizophrenic patients. This substance causes a deficiency of B₆ (pyridoxine) 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 B₃. 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). If the child's perceptual and behavioral problems are caused by a deficiency, Hoffer says that improvement will be noticed within months (or sooner).

Pyrrroluria is a common feature of many behavior and emotional disorders. It is an inborn error of pyrrole chemistry that results in a dramatic deficiency of zinc, vitamin B₆, and arachidonic acid. Common symptoms include explosive temper, emotional mood swings, poor short-term memory, and frequent infections. These patients are easily identified by their inability to tan, poor dream recall, abnormal fat distribution, and sensitivity to light and sound. The decisive laboratory test is analysis for kryptopyrroles in urine. Treatment centers on zinc, magnesium, and vitamins B₂, B₃ and B₆ supplements together with omega-6 essential fatty acids.

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 B₆ (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 B₆ may cause the formation of picolinate to be suboptimal. Manganese 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 pyrrroluria. I have all Pyrrrolurics (low AA) on Evening Primrose Oil.—Dr. Woody McGinnis (compressed). Walsh finds biotin very useful in “slender malabsorber group”.

Pyrrroluria or Hemopyrrolactam Uria (HPU): Pyrrole is a toxin that interferes with liver detoxification (blocks cytochrome p450) and with heme production. There may be a need for niacin because B₆ is required to convert tryptophan into niacin. Many of the children with HPU have low levels of histamine (undermethylated), which may make them more sensitive to allergies. One source of the elevated hemopyrrolactam (pyrroles) is intestinal bacteria (Irvine and Wilson 1976). Sometimes, a form of the antibiotics tetracycline and kanamycin turn off the production of pyrrole.

Heme production is promoted by the enzyme delta-aminolevulinic acid synthase (ALA synthase) that is formed in the mitochondria. An essential cofactor is pyridoxal 5'phosphate (vitamin B₆). The reaction is sensitive to nutritional deficiency of this vitamin. Drugs that are antagonistic to P5P will inhibit it, reducing formation of Heme. It is stimulated by barbiturates and by steroids with a 4,5 double bond, such as testosterone and certain oral contraceptives (as a result, these drugs exacerbate certain porphyrias). 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. Since the 5-beta reductase appears at puberty, some porphyrias are not manifested until this age.

Symptoms of HPU are: paleness of the skin, especially of the face (pallor, a China Doll appearance), recurrent ear infections, colds, allergy's, 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, in summer the skin is yellowish or golden brown, a bad set of teeth, hypermobility of the joints, growing pains, especially of the knee (left), changes in handwriting, white marks on their nails (zinc deficiency), sensitivity to sunlight (probably B₆ deficiency), loss of appetite, stretch marks on the skin, sweetish breath odor, constipation, but more often an excessive stool mucus with bloating and a light colored stool, and learning and behavioral problems. 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 B₆ and Evening Primrose Oil along with magnesium and zinc.

HPU belongs to the non-acute porphyrias. Multiple chemical sensitivity (MCS) has been linked to porphyrin metabolism problems. In porphyrias, there is elevated porphyrins in the urine. 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. You can get a urinary screen for elevated pyrroles for \$32 from BioCenter Laboratory in Wichita, 1 800-494-7785. Collect the urine with the child off all zinc and B₆ supplementation for two days prior.

Acetaldehyde unfavorably influences 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, a key regulatory biochemical for both nerve cells and the immune system. Conditions that promote production of Prostaglandin E1 prevents excessive production of the inflammatory prostaglandin E2 from the dietary fatty acid, arachidonic acid, that is plentiful in meat, poultry and dairy products.

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 number 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. See cautions about using NAC elsewhere in this paper.

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 the following: 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 and breast swelling/tenderness in women.

I recite these biochemical effects of acetylaldehyde 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 acetylaldehyde 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 AlkaSeltzer Gold™ and N-acetylcysteine or lipoic acid (as outlined elsewhere in this article).**

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.

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, brou@istar.ca. He has a newsletter—"Parents of Fluoride-Poisoned Children." Thyroid hormones are closely related to all brain function and to pancreas function. This common knowledge serves as the basis for the worldwide iodine supplementation program. Healthy humans require iodine, an essential component of the thyroid hormones, thyroxine (T4) and triiodothyronine (T3). 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.

Dr. Raphael Kellman, MD, The Center for Progressive Medicine in New York, finds high rates of thyroid dysfunction in his patients. **He states that 90% of medical problems of both mother and child result from a lack of proper attention 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."

Both cadmium and mercury inhibits the conversion of thyroxine (T4) to active T3. 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. 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. To convert T4 to the active T3, you need a specific ratio of zinc to copper of about 8:1. Zinc supplementation can increase plasma levels of TSH and normalize T3 and fT4, and selenium and vitamin E are essential to convert T4 to T3. Additionally, vitamin E greatly reduces sensitivity of cells to the excitotoxins glutamate and aspartate. These nutrients are universally lacking in these children.

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 in fact be normal, but rather, evidence of developing hypothyroidism, or a level that is potentially able to cause hypothyroidism symptoms in patients.

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.

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 (in vitro). Phenol-sulfotransferase is used 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) 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, 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 heal these infections, as will bovine colostrum, Ambrotose®, 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 B₆ deficiency, cadmium toxicity, Aspartame poisoning (drinking Diet Coke™?), lysine deficiency, zinc deficiency (white spots on nails?), folic acid deficiency, hyperammonemia (too much ammonia), and fatty acid deficiency. Take your pick :-). 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 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. **Each degree of low body temperature represents a 13% decline in energy levels.**

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.** Copper slows the thyroid while zinc increases thyroid action. 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 B₁₂), or B-vitamins, which are essential for iron utilization. Copper and iron work together to form hemoglobin and need to be supplemented together. 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 & Higuere, 1977; Morley et al., 1978; Higuere & 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 fish 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 cal/mag 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, calcium will enter the cell excessively 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 B₅ (pantothenic acid) deficiency may have an effect on heart rate. A vitamin B₅ deficiency has similar effects to a calcium deficiency, and a potassium deficiency can create an irregular heartbeat. 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. Carnitine will conserve calcium, magnesium, and potassium, and may reduce heart arrhythmias and fatigue. Many studies show that magnesium suppresses the sympathetic function, while potassium stimulates parasympathetic activity.

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 calcium/magnesium 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 rate 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 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. 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. 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.

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 transfats, and mercury that uses up selenium for detoxification.** Studies show that a deficiency of selenium causes the body to increase the conversion of T4 to T3, which can lead to higher levels of 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. 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 hyper and should supplement minerals, especially copper. Acta Societatis Medicorum Upsaliensis Vol 72, 1-2, 1967 reports a relationship between pyridoxine (B₆) and the thyroid gland. Individual's who are suffering from a condition of hyperthyroidism appear to need more pyridoxine than normal people. The result is that there is a derangement in the way the body uses pyridoxine when the thyroid gland is disordered.

Opioids have been shown to decrease hepatic glutathione. Low levels of glutathione have been demonstrated in autism.

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 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)

The hypothyroid problem is relatively easy to treat once the doctor is convinced it is malfunctioning, and the results are dramatic. It can be quite effectively regulated, however, by supplying the necessary nutrients, including iodine-bearing kelp, 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, 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 *Ioso*[™]. 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.

The amino acid tyrosine and the mineral iodine are necessary to form thyroid hormones, and the liver requires zinc, selenium, vitamin A, 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 its excretion, Phase II liver detoxication, and 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 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, 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%), 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%). 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-HT_{1A}, 5-HT_{2A} receptors, 5-HT transporter, and tryptophan hydroxylase (TPH) in the mature brain. The study reports that the decrease in cortical 5-HT_{2A} 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. For some this may be good, for others it can be 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.

Failure to have adequate iodine leads to insufficient production of thyroid hormones (hypothyroidism), which affects many different parts of the body, particularly muscle, heart, liver, kidney, and the brain. Chlorine, fluoride, and iodine are chemically related. Chlorine and fluoride block iodine receptors in the thyroid gland, resulting in reduced iodine-containing hormone production and finally in 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 simple test to determine if adequate iodine is available for proper thyroid function, and to resupply stores if needed is this: obtain a bottle of standard Tincture of Iodine (sodium iodide, 2.4%) from the drug store. Paint a 50 cent-sized spot 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. Interpretation of the 24-hour stain: Color almost as strong as when it was applied (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). One should supplement selenium, and also kelp (unless there is excess iodine), but do not use the drugstore iodine internally. 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 96.0⁰ F), measure the underarm temperature for ten minutes. Average the results for the five days. If that average reading is below 97.6⁰ F (normal underarm temperature), you likely have a problem. Below 97.2⁰ F, you definitely have a problem. Remember, if you take the temperature orally, normal is 98.6⁰ F, and rectally it is 99.6⁰ 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.

A major cause of hypothyroidism, especially in autistic who cannot break down such chemicals easily, is fluoride taken in from water, toothpaste, mouthwash, soft drinks, prepared breakfast cereals, and coating of the teeth. 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.

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. Some of the things to consider are: medications (for colds, heart disease, asthma, tumors, epilepsy), vitamin deficiencies of B₁ (Beri Beri), niacin (Pellagra), B₁₂ (Pernicious Anemia), zinc deficiency, lead poisoning, copper toxicity, constipation, ammonia buildup from inadequate digestion of protein, vaccine reaction 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, xz choline, phosphatidylcholine, and 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 (S-AdoMet), now touted as the 'cure all' nutrient. 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 Ayurvedic 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.

"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).

"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, dideozoforskolin, 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 he 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”. 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, vitamin C, urate, glutathione, vitamin E, etc.), as well as protein defense molecules (e.g., superoxide dismutases, catalases, peroxidases, metallothioneins, etc.). A wide variety of insults (e.g., trauma, hemorrhage, hypoglycemia, 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 damage. 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 radical, cause secondary initiation of lipid peroxidation, and/or react with some proteins to promote oxidative damage. 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 Wetzell, in preparation).

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 polio virus produces a breakdown of the myelin sheath, called poliomyelitis, that results in paralysis. Encephalitis, whether caused through disease or as a result 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 have 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.). Yet, doctors and hospitals typically do not use vitamin A.

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 Compulsive 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 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. **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 B₁₂ neurological deficiency symptoms. An excess of serine and threonine is seen in vitamin B₆ deficiency.** One variation of serine, namely Phosphatidylserine, serves several important functions within the central nervous system, including development of the myelin sheath. Serine is required for growth and maintenance of muscle, and 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.

Phosphoserine, a modification of serine, is a good predictor of Vitamin B₆ deficiency, in particular the form of Vitamin B₆ called Pyridoxal-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.

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 (OCD?), and perhaps Torero's (Tourette's?) Syndrome. At least two seem particularly promising. One is IVIG—intravenous, immunoglobulin therapy. 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 was there 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-suppressor, 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™. 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. Dr. Hugh Fudenberg had this to say, "With IVIG, ONLY ABOUT 15% WERE HELPED. These turned out to be the same types in whom we found AUTOANTIBODIES TO MYELIN BASIC PROTEIN and other Central Nervous System tissue constituents." Shouldn't we use Sphingolin first?

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 months supply), or from L & H VITAMINS at (800) 221-1152. The Web page for stories of people with MS that have used Sphingolin™ is <http://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. 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.)

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. There are a number of safer ways to restore the immune function mentioned in this paper. These should be used before resorting to the very expensive, potentially dangerous IVIG.

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 B₁₂. A serine deficiency is seen in candidiasis and hypoglycemia. Serine is required for the growth and maintenance of muscle. An excess of serine and threonine is seen in vitamin B₆ deficiency. One variation of serine, namely Phosphatidylserine, serves several important functions within the central nervous system including development of the myelin sheath. The amino acid glycine is a precursor to serine, and the two are interconvertible. 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. Ninety percent 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. Its phytoestrogens require sulfate to solubilize them to remove them from the body; thus, **a PST child should severely limit 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. 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). Soy is lacking in the essential, sulfur-bearing, amino acid, methionine. Methionine is a critical nutrient for infants and children for growth and tissue development. It 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.] Patients with increased serum aluminum, due to a marked deficiency of zinc and/or manganese, have been found to experience a variety of memory disturbances. Some children displaying hyperactive behaviors and/or learning disabilities were found to have increased serum aluminum and a deficiency of zinc and/or manganese.

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 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.

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 blood sugar 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 recommended by Dr. Williams is *Drenamin*TM by Standard Process Products (800-848-5061).

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 B₆, and B₁₂ 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.

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.

In tests, aloe vera extract stimulated fibroblasts that grow and repair tissue (from Sugars that Heal). Coupled with support for the thymus (a multivitamin/mineral plus a thymus glandular extract), one should see many vital improvements at a fraction of the cost.

A 24-year study of 11,384 people by James E. Enstrom 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 (Annals 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, or supplement Betaine hydrochloride. Supplement with digestive enzymes (SpectraZyme™, EnZym-Complete™, Peptizyme™/Hn-Zyme Prime. 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® and the Phytonutrient Phyt•Aloe®. These five would be the basic five. Additionally, a high intake of vitamin B₆, magnesium, and zinc with balancing amounts of vitamins B₁ and B₂ would be strongly recommended. The antiviral/bacterial Lauricidin would be a welcome addition. 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, and tyrosine to high-normal levels. Reduction of fluoride, excess copper, and mercury 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 for that period of time. 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 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 if selenium, zinc, magnesium, manganese, and/or molybdenum are low. A casein/gluten free diet has been of great help to many.

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", 34 Chapters, 535 Pages, \$24.95 US. A list of Chapter Titles may be seen at www.yahogroups.com/group/Williss/files .

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www.glycoscience.com (Thousands of peer-reviewed papers on glyconutrients)

www.mannapages.com/Willis (Information on Mannatech™ products and business venture, and buy glyconutrients at retail prices)

www.glyco.com/Willis (Stories of health gains and business building information)

www.wellthmaker.com/Willis (Build another income stream)

www.yahogroups.com/group/Williss (Autism List)

www.callpne.com (Pharmacists trained in glyconutritionals and drug usage/interactions, diabetes counseling, etc.)

www.glycoinformation.com (Latest science, and stories of recovered health)

www.mannarelieff.org (Bringing Health and Hope to the Children of the World)

WillissL@aol.com or (760) 439-7884 (for free counseling)

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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.**

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These additional sources are recommended:

From a compilation by Dr. Woody McGinnis of Tucson, Arizona.

Ø **Gastrointestinal Abnormality:**

- Ø Malabsorption (J. Autism/Childhood Schizo, 1971 1(1):48-62)
- Ø freq. reports acholic stools, undigested fibers, positive Sudans.
- Ø 85% of autistic meet criteria for malabsorption (B.Walsh, 500 pts)
- Ø Maldigestion--elevated urinary peptides:
- Ø P Shattuck (Brain Dysfunct 1990; 3: 338-45 and 1991; 4: 323-4)
- Ø KL Reicheldt (Develop Brain Dys 1994; 7: 71-85, and others)
- Ø Z Sun and R Cade (Autism 1999; 3: 85-96 and 1999; 3: 67-83)
- Ø 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.
- Ø Abnormal Intestinal Permeability: P D'Eufemia (Acta Pediatr 1995; 85: 1076-9) G.I. Symptoms reported by parents: diarrhea, constipation, gas, belching, probing, visibly undigested food and need for rubs.

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Ø **Compromised immunity:**

- Ø Recurrent Infections:
- Ø Euro Child/Adolesc Psych, 1993;2(2):79-90
- Ø J Autism Dev Disord 1987; 17(4): 585-94

○ **Abnormal Indices:**

- Ø T-cell Deficiency (J Autism Child Schizo 7:49-55 1977)
- Ø Reduced NK Cell Activity (J Ann Acad Chil Psyc 26: 333-35 '87)
- Ø Low or absent IgA (Autism Develop Dis 16: 189-197 1986)
- Ø Low C4B levels (Clin Exp Immunol 83: 438-440 1991)
- Ø Skewed ("elevated") Viral Titers increasing grass-roots reports V Singh University of Michigan

Ø **3.. Detoxification Weakness:**

- Ø Phase II Liver Enzymes, Depression (S. Edelson, DAN Conference Sept, 1997, and Toxicology and Industrial Health 14 (4): 553-563 1998)
- Ø Sulphation low in 15 of 17 (mean 5 vs. nl 10-18)
- Ø Glutathione Conjugation low in 14 of 17 (mean 0.55 vs 1.4-2.9)
- Ø Glucuronidation low in 17 of 17 (mean 9.6 vs. 26.0-46.0)
- Ø Glycine Conjugation low in 12 of 17 (15.4 vs. 30.0-53.0)
- Ø Sulphation Deficit (Biol Psych 1; 46(3): 420-4, 1999)
- Ø Peroxisomal Malfunction (P Kane, J of Orthomolec Med 1997; 12-4: 207-218 and 1999; 14-2: 103-109)
- Ø Higher blood lead levels in Autism and documented response to EDTA Chelation (Am J Dis Chld 130: 47-48, 1976)
- Ø Apparent temporal association autism onset and lead exposure (Clinical Pediatrics 27: 1; 41-44 1988)

Ø **Abnormal Nutritional Profile in Children with Autism:**

- Ø Lower serum Magnesium than controls (Mary Coleman, The Autistic Syndromes 197-205, 1976)
- Ø Lower RBC Magnesium than controls (J. Hayek, Brain Dysfunction, 1991)
- Ø Low activated B₆ (P5P) in 42%. Autistic group also higher in serum copper. (Nutr. and Beh 2:9-17, 1984)
- Ø Low EGOT (functional B₆) in 82% and all 12 subjects low in 4 amino acids (tyrosine, carnosine, lysine, lysine hydroxylysine).
- Ø Dietary analysis revealed below-RDA intakes in Zinc (12 of 12 subjects), Calcium (8 of 12),
- Ø Vitamin D (9 of 12), Vitamin E (6 of 12) and Vitamin A (6 of 12) (G. Kotsanis, DAN Conf., Sept, 1996) B₆ and Magnesium therapeutic efficacy--multiple positive studies (start with Am J Psych 1978; 135: 472-5)
- Ø 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)

- Ø Low Methionine levels not uncommon (Observation by J. Pangborn)
- Ø 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)
- Ø Reduced sulphate conjugation and lower plasma sulphate in autistic. (Dev. Brain Dysfunct 1997; 10:40-43)
- Ø B₁₂ deficiency suggested by elevated urinary methylmalonic acid (Lancet 1998; 351: 637-41)
- Ø Hypocalcinurics Improve with Calcium Supplementation, Lower Hair Calcium in Autistics Reported (Dev Brain Dysfunct 1994; 7: 63-70).