Neurological and Immune Reactive Conditions Affecting Kids:

The mercury connection to neurological pervasive developmental disorders

(**autism, schizophrenia, dyslexia, ADD, childhood depression, learning disabilities, OCD, etc.**)

and developmental immune conditions (**eczema, asthma, and allergies**)

Bernard Windham (Ed.)

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1.1 Introduction

The incidence of neurotoxic, allergic, and immune reactive conditions such as autism, schizophrenia, ADD, dyslexia, allergies, asthma, eczema, psoriasis, childhood diabetes, etc. have been increasing rapidly in recent years (1, 2, 3, 5, 23, 50, 52, 59, 75, 82, 86, 92). A report by the National Research Council in 2000 found that 50% of all pregnancies in the U.S. were resulting in prenatal or postnatal mortality, significant birth defects, developmental disabilities or otherwise chronically unhealthy babies (3a) and recent studies published in JAMA found similar trends continuing with huge increases in children's chronic conditions (3de). Incidence of chronic developmental conditions in infants more than doubled between 1988 and 2006, especially asthma, learning and behavioral problems, and obesity (3e). There has been a similar sharp increase in developmental disabilities in Canadian children over the last 2 decades (71), including learning disabilities and behavioral problems, asthma and allergies, and childhood cancer. Studies have documented that the primary cause of the increased developmental conditions are increased toxic exposures, including increased use of vaccines with toxic and inflammatory ingredients (50, etc.).

The U.S. Dept. Of Education indicates that over 5 million children attending school have neurological related disabilities reported by state agencies, other than ADD (2a). A random sample of Oregon high school students found that over 16% had been diagnosed with depression (75b). According to the American Academy of Pediatrics between 6 to 12% of all school age children are affected by ADHD (4) and a similar number have some degree of dyslexia (1). "The Centers for Disease Control is out with a new survey that shows 5.4 million schoolchildren have been diagnosed with attention-deficit/hyperactivity disorder (AD/HD). That's 10%." In fact "from the years 2003 to 2007, the number of kids between four and ...17 with AD/HD jumped by one million. That's a 22% increase." (560) However large surveys of elementary level student records finds much higher levels-with over 20% of elementary school boys in some areas being treated for ADD (75a, 560). Studies have found that long term use of stimulant drugs commonly causes significant adverse neurological and health effects (76), and options are available to deal with such conditions without such adverse effects including dealing with the underlying causes. Estimates of the percentage of children with mood or anxiety orders are as much as 20%.

Most of the increase in children's neurological or developmental conditions have been found to be related to major increases in brain and immune system inflammation related to increased exposure to toxic chemicals or dietary excitoxins of the 4 million U.S. children born each year (598, 3, 1, 2, 22, 33). At least 1 in 6 had one of the neurological conditions previously listed (1-3). One of the main causes of increased exposures to toxic metals such as mercury and aluminum and other toxics is the greatly increased vaccination schedule for infants in recent years compared to 1983 and prior (4e). U.S. EPA has estimated that over 3 million of these are related to lead or mercury toxicity, with at least 25% of U.S. children getting mercury exposure at dangerous levels (1, 81, 499-502).

Studies indicate that over 60,000 children are born each year with neurodevelopmental impairments due to prenatal exposure to methyl mercury (45, 46). But two other sources of mercury exposure appear to have been more common and at higher levels than this, ethyl mercury from vaccines (23, 33) and mercury vapor from amalgam dental fillings (81, 501), with Mom's mercury fillings being a the largest source of mercury in the fetus and a significant source of mercury in infants (502, 580). Vaccines have unacceptable levels of many toxics such as mercury thimerosal, aluminum, formaldehyde, endotoxins, and altered strains of viruses that cause brain inflammation and *immune effects*[1] on infants (580, 582, 598, 52, 570, 571, 575), with some more *susceptible*[2] to such effects than others based on genetics and other *synergistic toxic exposures*[3].

1.2 A survey of thousands of parents of autistic children

A *survey*[4] of thousands of parents of autistic children or children with Asperger's by the Autism Association found that chelation/detoxification was by far the most effective treatment for autism and also much safer than most drug treatments for autism spectrum conditions (110, 133). This is consistent with the findings of most autism treatment clinic tests that most autistic children tested are highly mercury and metal toxic (603). Another significant factor in some autism cases has been found to be lyme disease (98b).

A study at the U.S. CDC found "statistically significant associations" between neurologic developmental disorders such as autism, attention deficit disorder (ADD) and speech disorders with exposure to mercury from thimerosal-containing vaccines before the age of 6 months (62, 80). An analysis of the U.S. CDC VAERS database for adverse reactions from vaccines regarding effects of the diptheria-tetanus-pertusis vaccine found that those receiving DTaP and DTucP vaccines with

[1] **Internet:** "http://www.generationrescue.org/vaccines/side-effects".

[2] **Informativo:** "Susceptibility Factors in Mercury Toxicity: Immune Reactivity, Detoxification System Function, Enzymatic Blockages, Synergistic Exposures".

[3] **Internet:** "http://www.flcv.com/synergis.html".

[4] **Internet:** "http://www.autism.com/pdf/providers/ParentRatings2009.pdf".

thimerosal had significantly higher rates of autism, speech disorders, and heart arrest than those receiving DtaP vaccine without thimerosal, and that the rate of these increase exponentially with dose (81). The Head of the CDC has admitted that mercury can cause autism in *susceptible children*[5] (130). An analysis of the U.S. Dept. of Education report on the prevalence of various childhood conditions among school children found that the rate of autism and speech disorders increased with increasing levels of thimerosal exposure from vaccines (81). Mercury has been well documented to cause birth defects, spontaneous abortions, and neurological problems (502, 570), so these autism related effects are not surprising.

A follow-up study using DMSA as a chelator found that overall, urinary mercury concentrations were significantly higher in children with autistic spectrum disorders than in a matched control population, and that vaccinated cases showed significantly higher urinary mercury concentrations than vaccinated controls (81b). This is consistent with other studies that found that those who are poor excreters of mercury are more likely to accumulate mercury and have adverse health effects. Changes in birth procedures in hospitals such as immediate cord clamping has also been found to be a factor in the increase in neurological developmental problems (83). Children with autism had significantly (2.1-fold) higher levels of mercury in baby teeth (90) and blood (102), but similar levels of lead and similar levels of zinc. Baby teeth are a good measure of cumulative exposure to toxic metals during fetal development and early infancy (90). A study of environmental mercury levels in Texas school districts found a 61 percent increase in autism and a 43 percent increase in special education cases for every 1,000 pounds of mercury released into the environment (94a). Autism prevalence diminished by 2 percent for every 10 miles of distance from a mercury source. Another similar study found similar results and estimated economic costs due to disability or lower IQ (94b). Fossil fuel-burning power plants were the largest source of the widespread mercury pollution (94) but dental amalgam was the largest source in sewers and a significant source of environmental mercury in water bodies, fish, and air emissions (95).

Children with autism also had significantly higher usage of oral antibiotics during their first 12 mo of life. Children exposed to high levels or mercury and/or toxic metals have been found to have weakened immune system and increased susceptibility to pathogens (500, 572). Tylenol, antibiotics, and *milk*[6] are documented to increase the effects of mercury (570, 571, etc.).

A new survey released recently indicates a strong correlation between rates of neurological disorders, such as ADHD and autism, and childhood vaccinations. The survey found vaccinated boys were two and a half times (155%) more likely to have neurological disorders compared to their unvaccinated peers. Vaccinated boys were 224% more likely to have Attention Deficit Hyperactivity Disorder (ADHD), and 61% more likely to have autism (93). For older vaccinated boys in the 11-17 age bracket, the results were even more pronounced. Vaccinated boys were 158% more likely to have a neurological disorder, 317% more likely to have ADHD, and 112% more likely to have autism. Other studies have found similar results regarding a connection to vaccines and toxic metals (92, 50, 131, 562). Studies have also found a significant link between food additives (food colorings and food preservatives) and ADHD (561).

Also according to the U.S. FDA, at least 26 million have allergies, at least 17 million have asthma (1b), 15 million have systemic eczema (82), and childhood diabetes is increasing rapidly (52, etc.). Although Russian and U.S. studies from the 1980s found that thimerosal was highly toxic and recommended that its use as a medical preservative should be discontinued (70, 79), its use was not discontinued. One study (60a) found 5 times higher rate of allergy among a group vaccinated with pertussis vaccine (DPT) as opposed to an unvaccinated group, and 3 other studies (60bcd) found increased asthma, allergies, and eczema among the vaccinated group. Vaccines given in the first 6

[5]**Informativo:** "Susceptibility Factors in Mercury Toxicity: Immune Reactivity, Detoxification System Function, Enzymatic Blockages, Synergistic Exposures".

[6]**Internet:** "http://www.flcv.com/autismgc.html".

months of infants commonly cause asthma (99).

Over the last 20 years the percent of diabetes cases below 20 years old has increased from 2% to over 30%, and there was a 70% in cases under 40 years of age between 1990 and 1998 (52, 50). Studies in the U.S. and Sweden have confirmed vaccinations to be a major factor in the increased diabetes cases (52). Currently over 16 million have diabetes (52).

DPT vaccinations have also been linked to sudden infant death syndrome (SIDS) (61, 92a,m). DPT vaccines are mostly given at 2, 4, and 6 months of age and 85% of SIDS cases occur during this age span. One study found babies die at a rate 8 times the normal rate within 3 days of DPT shots (60a), while another found that among SIDS victims 61% had DPT within the 2 previous weeks and 13% within 24 hours of DPT vaccination (60c). According to Dr. Harris Coulter, "Crib death was so infrequent in the pre-vaccination era that it was not even mentioned in the statistics, but it started to climb in the 1950s with the spread of mass vaccination against diseases of childhood." A monitoring study of infant breathing patterns after DPT vaccinations showed large increases in breathing difficulties including episodes of ceased breathing, which continued for months after DPT in some cases (61b). Some cases of seizures after DPT were also observed. Another study found significantly higher rates of heart arrest in those getting DpaT vaccines with mercury thimerosal compared to those without (81). Prenatal exposure to mercury has also been found to predispose animals and infants to seizures and epilepsy (85).

Many thousands of adverse reactions and adverse health effects to the Gardasil HPV vaccine and many deaths (559).

The computer records from the National Vaccine Injury Compensation Program, obtained by Gannett News Service using the Freedom of Information Act as part of a four-month study of federal immunization policy, reveal:

Of 253 infant death cases awarded more than $61 million by the U.S. Court of Federal Claims in the 1990s under the compensation program, 224, or 86 percent, were attributed to vaccination with DTP, the diphtheria, tetanus and pertussis (whooping cough) shot. In these cases, mortality was originally attributed to SIDS in 90, or 40 percent, of them. (61g) The Vaccine Court has awarded at least nine judgments in favor of children who have become autistic or have had serious damage from MMR vaccine. The effect of metals in vaccines on peptides from *milk and gluten*[7] have been suggested as another mechanism causing apnea in infants and some SIDS cases (24, 26).

Of 771 total claims filed by parents from 1990 through mid-1998, 660, or 86 percent, contained assertions that DTP was the cause of death. And 43 percent were classified by medical authorities at time of death as SIDS cases.

A second federal database tends to draw a similar connection. This one, for the 1990s from the Food and Drug Administration, contains 460 reports of children who died within three days of receiving shots containing DTP. Of those 460 reports, 266 – or 58 percent – listed SIDS as a "reaction".

That database is called VAERS, for Vaccine Adverse Event Reporting System. It was ordered by Congress to track dangerous reactions to the shots all babies must receive as admission to our society. In typical federalese, the FDA refers to death as an "adverse event" or a "reaction". By law, reports of reactions to DTP and other vaccines are supposed to be made religiously by doctors, pharmaceutical companies and public health clinics. But former FDA commissioner David A. Kessler has estimated the reports "represent only a fraction of the serious adverse events" – perhaps as few as 10 percent. Dr. Marcel Salive, chief of the FDA's epidemiology staff, says, "Any number you get, take with a grain of salt". (61g) Some spokespersons at various government and medical institutions have continued to deny the strong evidence that vaccines are a major factor in autism and other conditions, however they can identify no credible evidence to support their opinion that I've aware

[7] **Internet:** "http://www.flcv.com/autismgc.html".

of. Most such have been found to have significant connections to special interests and no credible paper or clinical evidence has been provided to support their position that has not been credibly debunked in Congressional Hearings and other documentation (570, 571, etc.)

Vaccines contain immune adjuvants such as aluminum and mercury thimerosal that cause stimulation and activation of the immune system (598, 580, 582, 570, 571). This has been found to cause high levels of brain inflammation with increased free radicals and inflammatory cytokines over prolonged periods of time, as long as a year from one vaccination. Brain inflammation has been found to be a major factor in irritability, anxiety, depression, insomnia, and neurological conditions including ADHD, schizophrenia, and autism (598, 22a). Aluminum has also been found to significantly increase the effects of other toxics such as mercury through *synergistic effects*[8] (582, 571). Autistic children have been found to have on average 3 times as much aluminum in erythrocytes as non-autism children (571). There is new evidence supporting a link between the aluminum hydroxide used in vaccines, and symptoms associated with Parkinson's, amyotrophic lateral sclerosis (Lou Gehrig's disease), and Alzheimer's (582, 571).

With large numbers of vaccines being given in recent years in rapid succession, the brain of infants becomes increasingly overexcited and inflamed, resulting in brain damage and disruption of brain development. Vaccine adjuvants, mercury from mother's amalgam fillings (502), and dietary excitotoxins such as MSG and soy products have all been found to be major factors in the brain inflammation causing large numbers of developmental neurological conditions in children (598, 580, 582, etc.).

Mercury has been found to cause an increase in inflammatory Th2 cytokines (58, 500, 22). In the pancreas, the cells responsible for insulin production can be damaged or destroyed by the chronic high levels of cytokines, with the potential of inducing type II diabetes - even in otherwise healthy individuals with no other risk factors for diabetes (52). Mercury inhibits production of insulin and is a factor in diabetes and hypoglycemia, with significant reductions in insulin need after replacement of amalgam filings and normalizing of blood sugar (52, 500). In addition to this mechanism, other links between vaccines and diabetes have also been found and there is evidence vaccines are the number one cause of Type I diabetes in young children (52).

The largest increase in neurological and immune conditions has been in infants (1, 2, 5-7, 23, 4, 50, 81, 92), with an increase in autism cases to over 500,000 (1, 2, 23, 86), an over 900% increase to a level of approx. 1 per 500 infants in the last decade (2ab), making it the 3rd most common chronic childhood condition. For 1999 through 2002, the number of professionally diagnosed in California with full syndrome autism has doubled (2e, 86). There have been similar increases in ADD and dyslexia to over 10 million, similar large numbers (over 10%) with childhood depression or anxiety (75b), and over 10% of infants-approximately 15 million in the U.S. with systemic eczema (1, 2, 82). Studies researching the reason for these rapid increases in infant reactive conditions seem to implicate earlier and higher usage of vaccines containing mercury (thimerosal) as a likely connection (2cd, 23, 30, 40, 80-82). A recent study comparing pre-and post-vaccination mercury levels, found a significant increase in both preterm and term infants after vaccination (42a), with post-vaccination mercury levels approximately 3 times higher in the preterm infants as compared with term infants. The study found mercury blood levels up to 23.6 μg/L and received an average dose of 16.7 μg/kg. Just this one vaccination gave an exposure to mercury that is many times the U.S. ATSDR adult minimum risk level (MRL) for mercury of .3/μg/kg body weight per day (41, 81). Recent research provides evidence that the use of hepatitis B vaccines with thimerosal in newborns appears to be very harmful (42b). The first phase of this monkey study, published in 2009 in the journal **Neurotoxicology**, focused on the first two weeks of life. Baby monkeys received a single vaccine for Hepatitis B, mimicking the U.S. vaccine schedule, and were compared with matched, unvaccinated monkeys. The vaccinated monkeys, unlike their unvaccinated peers, **suffered the loss**

[8] **Internet:** "http://www.flcv.com/synergis.html".

of many reflexes that are critical for survival.

It has been estimated that if all of the vaccines recommended by the American Assoc. of Pediatrics are given and contain thimerosal, then by age 6 months an infant would have received 187 micrograms of ethyl mercury which is more than the EPA/ATSDR health standard for organic mercury (33, 41, 81) and by age 3 the typical child has received over 235 micrograms of mercury thimerosal from vaccinations which is considerably more than Federal mercury safety guidelines (41, 81, 501), in addition to significant levels from other sources for many (23). Infants during this period have undeveloped blood brain barriers and much of the mercury goes to the brain, resulting in significant adverse neurological effects in those that are most *susceptible*[9] (43, 3). Neonatal administration of the vaccine preservative, thimerosal, has been found to produce lasting impairment of nociception [pain sense] and apparent activation of opioid system [controls pain, reward and addictive behaviors] in rats, which is similar to brain problems in some children with autism. The mercury load was calculated and injected into the rats that corresponded to what infants receive with vaccines in many countries including the U.S. (575). The bioaccumulation in the brain and toxic effects of ethyl mercury are comparable to that of methyl, with mercury accumulation in the brain and physical effects actually being more extensive (79, 88, 89).

Researchers on autism have found and are in agreement that autism is primarily caused by various disruptions in the body's homeostasis that result in a cascade of systemic problems characterized by the term "autism". (581, etc.) Vaccines and mercury have been found to be something that is capable of causing such a disruption in the body's homeostasis in *susceptible*[10] individuals.

1.3 Mechanisms by which vaccines/mercury/toxic metals are documented to cause Autism Spectrum conditions

1. Brain inflammation from exposure to excitotoxins

Brain inflammation has been found to be a major factor in autism, and in the sometimes related metabolic syndrome (598, 603, etc.). Causes of oxidative stress and lipid peroxidative related brain inflammation that have been documented include vaccines, mercury, aluminum, excitotoxins such as MSG, aspartame, food additives, and overconsumption of high-fructose corn sweetener. These cause high glutamate levels in the brain and oxidative damage-resulting in inflammation of the brain and immune system, as well as damage to brain microglia cells and the mitochondrial DNA, high triglycerides, metabolic syndrome, etc. These have been found to be factors in most chronic neurological diseases including autism and diabetes.

Mercury and other toxic metals inhibit astrocyte function in the brain and CNS (22, 129), causing increased glutamate and calcium related neurotoxicity (129, 333, 416, 496). Mercury and increased glutamate activate free radical forming processes like xanthine oxidase which produce oxygen radicals and oxidative neurological damage (142, 13).

Nitric oxide related toxicty caused by peroxynitrite formed by the reaction of NO with superoxide anions, which results in nitration of tyrosine residues in neurofilaments and manganese Superoxide Dimustase (SOD) has been found to cause inhibition of the mitochondrial respiratory chain, inhibition of the glutamate transporter, and glutamate-induced neurotoxicity (524, 521). Mitochondrial DNA mutations or dysfunction is fairly common, found in at least 1 in every 200 people (275), and toxicity effects affect this population more than those with less susceptibility to mitochondrial dysfunction.

These inflammatory processes damage cell structures including DNA, mitochondria, and cell mem-

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branes. They also activate microglia cells in the brain, which control brain inflammation and immunity. Once activated, the microglia secrete large amounts of neurotoxic substances such as glutamate, an excitotoxin, which adds to inflammation and stimulates the area of the brain associated with anxiety (598, 22). Inflammation also disrupts brain neurotransmitters resulting in reduced levels of serotonin, dopamine, and norepinephrine. Some of the main causes of such disturbances that have been documented include vaccines, mercury, aluminum, other toxic metals, MSG, aspartame, etc. (598, 22, 500, 582, 570, 571, etc.)

Inflammation induced by vaccine adjuvants like aluminum and mercury or by excitotoxins like MSG has been found to play a significant role in insulin resistance (type-2 diabetes) and in high levels of LDL cholesterol (597, 598, etc.). Type 2 diabetes is an epidemic among young Americans and greatly increases the incidence of heart attack, blindness, stoke, infertility, and early death. There is also evidence that the diet drink sweetener aspartame can cause or increase the effects of diabetes and hypoglycemia (450, 498). Iron overload has also been found to be a cause of insulin resistance/type 2 diabetes (595).

Reduced levels of magnesium and zinc are related to metabolic syndrome, insulin resistance, and brain inflammation and are protective against these conditions (599, 43). Mercury and cadmium inhibiting magnesium and zinc levels as well as inhibiting glucose transfer are other mechanisms by which mercury and toxic metals are factors in metabolic syndrome and insulin resistance/diabetes (43, 198, 338, 597).

2. Impairment of methionine synthase function and impairment of folate-depdendent methylation.

The authors of 2 new studies of thimerosal developmental effects (88) write: "Our studies . . . provide evidence that mercury, aluminum, other heavy metals and the vaccine preservative thimerosal potently interfere with [methionine synthase] activation and impair folate-dependent methylation. In vitro, mercury and thimerosal in levels found several days after vaccination inhibit methionine synthetase (MS) by 50%. Normal function of MS is crucial in biochemical steps necessary for brain development, attention and production of glutathione, an important antioxidative and detoxifying agent. Repetitive doses of thimerosal leads to neurobehavioral deteriorations in autoimmune susceptible mice, increased oxidative stress and decreased intracellular levels of glutathione in vitro. Subsequent to vaccination, autistic children have significantly decreased level of reduced glutathione. Since each of these agents has been linked to developmental disorders, our findings suggest that impaired methylation, particularly impaired DNA methylation in response to growth factors, may be an important molecular mechanism leading to developmental disorders."

Citing Stajich et al 2002 (J Peds) and Pichichero et al 2002 (Lancet), Waly (88a) et al write: "A single thimerosal-containing vaccination produces acute ethylmercury blood levels of 10-30nM . . . , and blood samples in 2-month-old infants, obtained 3-20 days after vaccination, contain 3.8-20.6 nM ethylmercury. Our studies therefore indicate the potential for thimerosal to cause adverse effects on [methionine synthase] activity at concentrations well below the levels produced by individual thimerosal-containing vaccines. A second study notes that it has been found that those with autism generally had higher levels of exposure to mercury from their mother's amalgam fillings or other sources prenatally (88b, 50b). Another study on mice supported the autism/thimerosal connection (88c). Many other studies have documented the vaccine/thimerosal connection to autism (91-104).

Because of the evidence the FDA has completed a study and written a letter to vaccine manufacturers asking that mercury be removed from vaccines. The updated letter stated, "The Center for Biologics Evaluation and Research (CBER) has completed its evaluation of the use of thimerosal in vaccines. Our review concluded that reducing or eliminating thimerosal from vaccines is merited (44). The letter pointed to a joint statement by the American Academy of Pediatrics and the United States Public Health Service in 1999, which called for the removal of thimerosal from vaccines as soon as possible." A Congressional Committee after holding a hearing has also called for elimination of mercury in vaccines as soon as possible. However it has been documented that most children

still receive high levels of mercury in vaccines and that aluminum in vaccines have similar significant adverse neurological effects (570, 571, etc.).

Many thousands of parents have reported that their child got such conditions after vaccination, and tests have confirmed high levels of mercury and aluminum in most of those tested, along with other toxic exposures. An additional source of thimerosal to the fetus of women who are RH negative is the 30 micrograms in the RhoGAM shot they receive, which has been found to be a significant factor in autism incidence (81c, 86). Mother's of children with neurodevelopmental disorders, autism, or ADHD treated by 2 clinics were compared to a set of mother's from a control group of children for Rh-Negativity. Prior to 2002 when thimerosal use in vaccines was reduced, the group of mother's of children with neurodevelopmental disorders or conditions were more than 25% more likely to have Rh-Negativity than mother's of the control group (81d). After 2002, there was no significant difference in Rh-negativity incidence between mother's of children with ND disorders versus controls.

Underweight infants that get the same dose of thimerosal as other infants have also been found to be at special risk. Many of those diagnosed with high mercury levels have also been found to have significant improvement after mercury detoxification (23, 30, 40, 11, 35, 51). Thimerosal had been previously removed from similar preservative uses in eye drops and eye medications after evidence of a connection to chronic degenerative eye conditions.

After over 15,000 law suits were filed in France over adverse effects of the Hepatitis B vaccine, the French Minister of Health ended the mandatory hepatitis B vaccination program for all school children. Adverse effects included neurological disorders and autoimmune disorders such as multiple sclerosis and lupus. (62) Some hospitals in the U.S. also quit recommending certain vaccinations. Dr. Loren Koller, Pathologist and Immunotoxicologist at the College of Veterinary Medicine, Oregon State University, recognized that more is involved in the vaccine effects than just ethylmercury. He mentions aluminum and even the viral agents beings used as other possibilities. This is especially important in the face of Dr. RK Gherardi's identification of macrophagic myofascitis, a condition causing profound weakness and multiple neurological syndromes, one of which closely resembled multiple sclerosis. Both human studies and animal studies have shown a strong causal relationship to the aluminum hydroxide or aluminum phosphate used as a vaccine adjuvants. More than 200 cases have been identified in European countries and the United States and has been described as an "emerging condition". Some of the neurological problems seen with the use of aluminum hydroxide and aluminum phosphate in vaccines: In two children aged 3 and 5, doctors at the All Children's Hospital in St. Petersburg, Florida described chronic intestinal pseudo-obstruction, urinary retention and other findings indicative of a generalized loss of autonomic nervous system function (diffuse dysautonomia). The 3-year old had developmental delay and hypotonia (loss of muscle tone). A biopsy of the children's vaccine injection site disclosed elevated aluminum levels. In a study of some 92 patients suffering from this emerging syndrome, eight developed a full-blown demyelinating CNS disorder (multiple sclerosis). (584) This included sensory and motor symptoms, visual loss, bladder dysfunction, cerebellar signs (loss of balance and coordination) and cognitive (thinking) and behavioral disorders.

Dr. Gherardi, the French physician who first described the condition in 1998, has collected over 200 proven cases, One third of these developed an autoimmune disease, such as multiple sclerosis. Of critical importance is his finding that even in the absence of obvious autoimmune disease there is evidence of chronic immune stimulation caused by the injected aluminum, known to be a very powerful immune adjuvant. The reason this is so important is that there is overwhelming evidence that chronic immune activation in the brain (activation of microglial cells in the brain) is a major cause of damage in numerous degenerative brain disorders, from multiple sclerosis to the classic neurodegenerative diseases (Alzheimer's disease, Parkinson's and ALS). In fact, I have presented evidence that chronic immune activation of CNS microglia is a major cause of autism, attention deficit disorder and Gulf War Syndrome. Dr. Gherardi emphasizes that once the aluminum is injected into the muscle, the immune activation persists for years. In addition, we must consider

the effect of the aluminum that travels to the brain itself. Numerous studies have shown harmful effects when aluminum accumulates in the brain. A growing amount of evidence points to high brain aluminum levels as a major contributor to Alzheimer's disease and possibly Parkinson's disease and ALS (Lou Geherig's disease). This may also explain the 10X increase in Alzheimer's disease in those receiving the flu vaccine 5 years in a row. (Dr. Hugh Fudenberg, Journal of Clinical Investigation).

Mucocutaneous lymph node syndrome (Kawasaki syndrome) is an autoimmune disease that manifests as a multisystemic necrotizing medium vessel vasculitis that is largely seen in children under 5 years of age, which affects many organs, including the skin, mucous membranes, lymph nodes, and blood vessel walls, but the most serious effect is on the heart where it can cause severe aneurysmal dilations in untreated children. Medical literature, epidemiological findings, and some case reports have suggested that mercury may play a pathogenic role (573). Several patients with Kawasaki's Disease have presented with elevated urine mercury levels compared to matched controls. Most symptoms and diagnostic criteria which are seen in children with acrodynia, known to be caused by mercury, are similar to those seen in Kawasaki's Disease. Genetic depletion of glutathione S-transferase, a susceptibility marker for Kawasaki's Disease, is known to be also a risk factor for acrodynia and may also increase susceptibility to mercury. Coinciding with the largest increase (1985-1990) of thimerosal (49.6% ethyl mercury) in vaccines, routinely given to infants in the U.S. by 6 months of age (from 75microg to 187.5microg), the rates of Kawasaki's Disease increased ten times, and, later (1985-1997), by 20 times. Since 1990 88 cases of patients developing Kawasaki's Disease some days after vaccination have been reported to the Centers of Disease Control (CDC) including 19% manifesting symptoms the same day.

Although vaccinations appear to be the largest source of mercury in many infants, mercury has been found to be transmitted from the mother to the fetus through the placenta and accumulate in the fetus to higher levels than in the mother's blood (50b, 123). Infants of mothers who had dental work involving amalgam during pregnancy had significantly higher levels of mercury in hair tests (78, 86). Breast milk of women who have amalgam fillings is the 2nd largest source of mercury in infants and young children (50b, 69), but eating a lot of fish has also been found to be a significant source (45). Milk increases the bioavailability and retention of mercury by as much as double (50b, 68, 69) and mercury is often stored in breast milk and the fetus at much higher levels than that in the mother's tissues (50b, 69). Inorganic mercury has been shown to be excreted to milk from plasma to a higher extent than methylmercury (123c). Mercury is transferred mainly by binding to cassein (68, 24). The level of mercury in breast milk was found to be significantly correlated with the number of amalgam fillings (69), with milk from mothers with 7 or more fillings having levels in milk approx. 10 times that of amalgam-free mothers. The mercury in milk sampled ranged from 0.2 to 6.9 μg/L. Prenatal mercury exposure can also developmentally damage the metals detox system of the liver which can lead to accumulation and toxicity of later metals exposure (50b).

A group of Chinese children with autism were diagnosed as having mercury toxicity from eating fish as a major factor in their conditions (162). Overall, it was estimated that the children examined received an estimated median mercury dose of 0.40 micrograms mercury/kilogram bodyweight/week (0.06 micrograms mercury/kilogram bodyweight/day). This is a remarkably low dose of mercury considering that children receiving Thimerosal-containing childhood vaccines on average received 10 to 20 micrograms mercury/kilogram bodyweight / day and the US Environmental Protection Agency (EPA) methylmercury safety limit is 0.1 micrograms mercury/kilogram bodyweight/day), and yet these children had very serious adverse outcomes.

A recent study found that prenatal mercury exposures and *susceptibility factors*[11] such as ability to excrete mercury appear to be a major factors in those with chronic neurological conditions like autism (86). Infants whose mothers received prenatal Rho D immunoglbulin injections containing mercury

[11] **Informativo:** "Susceptibility Factors in Mercury Toxicity: Immune Reactivity, Detoxification System Function, Enzymatic Blockages, Synergistic Exposures".

thimerosal or whose mother's had high levels of amalgam fillings had a much higher incidence of autism. While the hair test levels of mercury of infants without chronic health conditions like autism were positively correlated with the number of the mother's amalgam fillings, vaccination thimerosal exposure, and mercury from fish, the hair test levels of those with chronic neurological conditions such as autism were much lower than the levels of controls and those with the most severe effects had the lowest hair test levels, even though they had high body mercury levels. This is consistent with past experience of those treating children with autism and other chronic neurological conditions (23). Very low levels of exposure have been found to seriously affect relatively large groups of individuals who are immune sensitive to toxic metals (11, 35), or have an inability to detoxify metals due to such as deficient sulfoxidation or metallothionein function (18, 36, 51) or other inhibited enzymatic processes related to detoxification (15-24, 30) or excretion of metals (87). Those with the genetic allele ApoE4 protein in the blood have been found to detox metals poorly and to be much more *susceptible*[12] to chronic neurological conditions than those with types ApoE2 or E3 (87).

3. Mercury and toxic metals *block enzymes*[13] required to digest milk casein and wheat gluten, resulting in dumping morphine like substances in the blood that are neurotoxic and psychotic, as a major factor in schizophrenia, autism, and ADHD.

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 these allergic/immune reactive conditions (15-23, 36, 47, 51, 98). For example mercury has been found to strongly inhibit the activity of xanthine oxidase and dipeptyl peptidase (DPP IV) which are required in the digestion of the milk protein casein or wheat protein gluten (15, 16, 17, 19, 20, 500, 23-26, 98, 105), and the same protein that is cluster differentiation antigen 26 (CD26) which helps T lymphocyte activation. CD26 or DPPIV is a cell surface glycoprotein that is very susceptible to inactivation by mercury binding to its cysteinyl domain. Mercury and other toxic metals also inhibit binding of opioid receptor agonists to opioid receptors, while magnesium stimulates binding to opioid receptors (15). Studies involving large samples of patients with autism, schizophrenia, or mania found that over 90% of those tested had high levels of the milk protein beta-casomorphine-7 in their blood and urine and defective enzymatic processes for digesting milk protein (24, 25, 27), and similarly for the corresponding enzyme needed to digest wheat gluten (24, 26). Like casein, gluten breaks down into molecules with opioid traits, called gluteomorphine or gliadin. As with caseomorphin, it too can retain biological activity if the enzymes needed to digest it are not functioning properly.

Proteins in bovine milk are a common source of bioactive peptides. The peptides are released by the digestion of caseins and whey proteins (105). In vitro the bioactive peptide beta-casomorphin 7 (BCM-7) is yielded by the successive gastrointestinal proteolytic digestion of bovine beta-casein variants A1 and B, but this was not seen in variant A2 or in goats milk. In hydrolysed milk with variant A1 of beta-casein, BCM-7 level is 4-fold higher than in A2 milk. Variants A1 and A2 of beta-casein are common among many dairy cattle breeds. A1 is the most frequent in Holstein-Friesian (0.310-0.660), Ayrshire (0.432-0.720) and Red (0.710) cattle. In contrast, a high frequency of A2 is observed in Guernsey (0.880-0.970) and Jersey (0.490-0.721) cattle (105). In children with autism, most of whom have been found to have been exposed to high levels of toxic metals through vaccines, mother's dental amalgams, or other sources; higher levels of BCM-7 is found in the blood (24-26).

BCM-7 appears to play a significant role in the aetiology of human diseases (105). Epidemiological evidence from New Zealand claims that consumption of beta-casein A1 is associated with higher national mortality rates from ischaemic heart disease. It appears that the populations that consume milk containing high levels of beta-casein A2 have a lower incidence of cardiovascular disease and type 1 diabetes. Beta-casomorphin-7 has opioid properties including immunosuppression, which account

[12]**Informativo:** "Susceptibility Factors in Mercury Toxicity: Immune Reactivity, Detoxification System Function, Enzymatic Blockages, Synergistic Exposures".

[13]**Internet:** "http://www.flcv.com/autismgc.html".

for the specificity of the relation between the consumption of some but not all beta-casein variants and diabetes incidence. BCM-7 has also been suggested as a possible cause of sudden infant death syndrome (SIDS). In addition, neurological disorders, such as autism and schizophrenia, appear to be associated with milk consumption and a higher level of BCM-7 (105).

The studies found high levels of Ig A antigen specific antibodies for casein, lactalbumin and beta-lactoglobulin and IgG and IgM for casein. Beta-casomorphine-7 is a morphine like compound that results in neural disfunction (24, 25), as well as being a direct histamine releaser in humans and inducing skin reactions (14, 21, 25c). Similarly many also had a corresponding form of gluten protein with similar effects (24, 26). Elimination of milk and wheat products and sulfur foods from the diet has been found to improve the condition (100, 28, etc.). A double blind study using a potent opiate antagonist, naltrexone (NAL), produced significant reduction in autistic symptomology among the 56% most responsive to opioid effects (28). The behavioral improvements was 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. Studies have found mercury causes increased levels of the CD8 T-cytotoxic-suppressors (29). As noted previously, such populations of patients have also been found to have high levels of mercury and to recover after mercury detoxification (23, 11, 500, 30, 40, 100). As mercury levels are reduced the protein binding is reduced and improvement in the enzymatic process occurs (500, 11, 96). The neurotoxic effects of such opioid mechanisms has also been found to be a factor in multiple sclerosis, and low dose naltrexone (LDN) has been found to often be effective in reducing MS symptoms and exerbations (115).

Lactose Intolerance

Lactose (milk sugar), which is a major component of milk, is a disaccharide sugar made up of the simple sugars glucose and galactose (132). Lactase is an enzyme which facilitates digestion of lactose. Over 50% of non-Caucasians are lactose intolerant, to a significant degree and about 20% of Caucasians. Infants are most lactose tolerant but lactase activity declines dramatically over time so that by adulthood to about 5 to 10% of the level of infants. Only a relatively small percentage of people retain enough lactase activity to absorb significant amounts of lactose throughout their adult life (132). Lactose intolerance results in undigested lactose in the intestines which often causes gas, bloating, abdominal discomfort, and proliferation of bacteria in the intestines. In addition to inhibiting the enzymes required to digest *milk casein*[14] and whey, chronic mercury exposure in animals has also been found to inhibit lactase and glucose-6-phosphatase needed to digest lactose and other polysaccharides (19b). Thus chronic exposure to mercury and toxic metals also increases lactose intolerance and digestion problems of carbohydrates in general. Digestive problems have been found to *commonly be improved*[15] by reducing chronic mercury and toxic metal exposures.

Lactose intolerance can also be alleviated to some degree by supplemental enzymes, using fermented milk products such as yogurt or kefir, or using only small amounts of milk products spread throughout the day (132).

Studies have also found heavy metals to deplete glutathione and bind to protein-bound sulfhydryl SH groups, resulting in inhibiting SH-containing enzymes and production of reactive oxygen species such as superoxide ion, hydrogen peroxide, and hydroxyl radical (39, 43, 45-47, 63-65, 89, 97, 500). In addition to forming strong bonds with SH and other groups like OH, NH2, and Cl in amino acids which interfere with basic enzymatic processes, toxic metals exert part of their toxic effects by replacing essential metals such as zinc at their sites in enzymes. An example of this is mercury's disabling of the metallothionein protein, which is necessary for the transport and detoxification of metals. Mercury inhibits sulfur ligands in MT and in the case of intestinal cell membranes inactivates MT that normally bind cuprous ions (66), thus allowing buildup of copper to toxic levels

[14] **Internet:** "http://www.flcv.com/autismgc.html".
[15] **Internet:** "http://www.flcv.com/hgrecovp.html".

in many and malfunction of the Zn/Cu SOD function. Another large study (51) found a high percentage of autistic and PDD children are especially *susceptible*[16] to metals due to the improper functioning of their metallothionein detoxification process, and that with proper treatment most recover or significantly improve. Mercury has also been found to play a part in neuronal problems through blockage of the P-450 enzymatic process (67, 89). Another study found accelerated lipofuscin deposition–consistent with oxidative injury to autistic brain in cortical areas serving language and communication (97). Compared with controls, children with autism had significantly higher urinary levels of lipid peroxidation. Double-blind, placebo-controlled trials of potent antioxidants–vitamin C or carnosine–significantly improved autistic behavior.

4. Mercury induced reactive oxygen species and lipid peroxidation has been found to be a major factor in mercury's neurotoxicity, along with leading to decreased levels of glutathione peroxidation and superoxide dismustase (SOD) (63, 89). This has been found to be a major factor in neurological and immune damage caused by the heavy metals, including damage to mitochondria and DNA (63, 500), as well as chronic autoimmune conditions and diseases (35, 104, 500).

Additional cellular level enzymatic effects of mercury's binding with proteins include blockage of sulfur oxidation processes such as cysteine dioxygenase, gamma-glutamyltranspeptidase (GGT), and sulfite oxydase, along with neurotransmitter amino acids which have been found to be significant factors in many autistics (18, 36, 47, 17, 100c), plus enzymatic processes involving vitamins B6 and B12, with effects on the cytochrome-C energy processes as well. For example, the Vitamin B6 activating enzyme, B6-kenase, is totally inhibited in the intestine at extremely low (nanamolar) concentrations (56). Epson salts (magnesium sulfate) baths, supplementation with the p5p form of Vit B6, N-acetyl cysteine (89), and vit 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 (39, 500, 47, 50, 100c, 581b). Supplementing with these minerals has also been found to be effective in the majority of cases (39, 50, 100c, 581b), and lithium oratate has even been found to cause regeneration of neurons in damaged areas of the brain such as the hippocampus. Another of the results of these toxic exposures and enzymatic blockages is the effect on the liver and disfunction of the liver detoxification processes which autistic children have been found to have (30, 36, 51, 500, 581b). All of the autistic cases tested were found to have high toxic exposures/effects and liver detoxification profiles outside of normal (30a).

5. Another aspect of gastrointestinal dysfunction that is found in the majority of autism cases are intestinal inflammation, enterocolalitis, lymphondular hyperplsia, abnormal intestinal permeability, or malabsorption (17, 53, 580). The intestinal damage also causes improper functioning of the buffering mechanism that maintains blood PH and of enzyme functions. Such damage to the intestines and gastrointestinal processes are known from animal studies to be caused by mercury and other toxic metals (54). Inorganic mercury is the predominant excretionary form in the intestines, whatever the source form. All forms are absorbed by the intestines and inorganic mercury accumulates in intestinal tissues, especially in young animals or infants (55), which are known to have poor biliary excretion of mercury. As noted previously children in the U.S. are exposed to high levels of mercury thimerosal, a highly toxic organic form of mercury. Organic mercury in primate studies is found to cause paneth cells in the intestines to be enlarged and packed with secretionary granules (57). This is also common in autistic children (17c).

Along with these blockages of cellular enzymatic processes, mercury has been found to cause additional neurological and immune system effects in many through immune/autoimmune reactions (11, 12, 35, 104). Mercury (32b, 500) as well as thimerosal (31, 32a), aluminum (32c), and other toxic metals (50) also have direct neurotoxic effects on brain nucleoid binding proteins through their effect

[16]**Informativo:** "Susceptibility Factors in Mercury Toxicity: Immune Reactivity, Detoxification System Function, Enzymatic Blockages, Synergistic Exposures".

on Ca2+ATPase and Na+/K+ATPase activity. But the effects on the neurological and immune systems of exposure to various toxic substances such as toxic metals and environmental pollutants has also been found to have additive or *synergistic effects*[17] and to be a factor in increasing eczema, allergies, asthma, delayed food allergies, and sensitivity to other lesser allergens (14, 500, 582, 35, 50). Most of the children tested for toxic exposures have found high or reactive levels of other toxic metals, and organochlorine compounds (30, 40, 11, 12, 35, 48). Other than the organochlorines or toxic metals which are discussed later, three common pollutants that have been documented to have effects on such conditions are traffic and industrial pollutants nitrogen oxide, power plant residual oil fly ash, and organochlorine pollutants (48).

Mercury has also been found to cause reduced acetylycholine levels (77) and to be a factor in autism. When the author succeeded in removing excessive metal deposits using cilantro and upregulation techniques, he found Acetylcholine suddenly increased towards a normal level, short-term memory, the ability to concentrate and think clearly improved significantly; and often those who had abnormal or anti-social and irritable behavior returned to more acceptable behavior.

Another effect of mercury and toxic metals is a reduction in B- lymphocytes (37, 38, 50, 500). Many studies (37, 580) dealing with autistic patients and further work with such patients has found toxic metal exposure causes a tendency to be more seriously affected by viruses and to develop intestinal disorders including leaky gut, lymphoid modular hyperplasia, and a high incidence of parasites. Gut disease with inflammation has become increasingly evident in autism (37). Enterocolitis and lymphonodular hyperplasia are found in nearly 90% of regressed autistic children (37d). Widespread inflammatory changes with poor intestinal digestive enzyme activity, abnormal intestinal permeability, and malabsorption have been reported in various autistic subgroups (37e, 580). Studies have found that mercury has similar effects on animals (37b, 42).

6. A mechanism by which vaccines such as MMR trigger autism by causing a loss of homeostasis between the amino acids glycine and glutamate has been demonstrated (581). Also, mercury exposure has been shown to disrupt immune system homeostasis making the systems more susceptible to infectious agents such as measles virus and other viruses (22, 598). The stabilizer in MMR and a few other vaccines is hydrolyzed gelatin; a substance that is approximately 21% glycine. It appears that, based on studies, that the use of that form of glycine triggers an imbalance between the amino acid neurotransmitters responsible for the absorption rate of certain classes of cells throughout the body. It is that wide-spread disruption that apparently results in the systemic problems that encompass the mind and the body characterized in today's 'classic' autism. The authors also added, "The use of our model indicates each of the disorders within Autism Spectrum Disorder (ASD) is attributable to different disruptions in homeostasis."

7. Autoimmunity Metals by binding to SH radicals in proteins and other such groups can cause autoimmunity by modifying proteins which via T-cells activate B-cells that target the altered proteins inducing autoimmunity as well as causing aberrant MHC II expression on altered target cells (72). Studies have found that various protein related disorders such as misfolded proteins are found in some autism cases (596b). The mechanisms by which mercury and other toxics or allergens cause protein abnormalities have been discussed throughout this paper.

Studies have also found mercury, aluminum, and lead cause autoantibodies to neuronal proteins, neurofilaments, and myelin basic protein (73, 74, 104, 571). While zinc binding with MBP stabilizes the association with brain myelin, mercury and cadmium have been found to intefere with zinc binding to MBP and thus cause disfunction and autoimmunities (74). Dr. Stejskal (11) recently began testing children with autism. Her preliminary results on 18 autistic children and 11 controls, found that 5 of 18 autistic children had a positive proliferative ("allergic") response on MELISA to Thimerosal, vs. 1/11 controls. Similar results were recently found for methyl mercury (6/10 autistics vs 0/11 controls) and inorganic mercury (6/18 autistics, vs 0/11 controls). Most importantly, 13/16

[17] **Internet:** "http://www.flcv.com/synergis.html".

autistics tested positive for reactivity to the mercury-MBP vs. only 3/10 controls. The mercury-MBP reactivity is presumed to be caused by the mercury reconfiguring the three-dimensional MBP, to which the body generates the allergic (autoimmune) response. In another study a significant percentage of children with autism developed anti-SK, anti-gliadin and anti-casein peptides and anti-ethyl mercury antibodies, concomitant with the appearance of anti-CD26 and anti-CD69 autoantibodies (89). These antibodies are synthesized as a result of SK, gliadin, casein and ethyl mercury binding to CD26 and CD69, indicating that they are specific. The study found that bacterial antigens (SK), dietary peptides (gliadin, casein) and Thimerosal (ethyl mercury) in individuals with pre-disposing HLA molecules, bind to CD26 or CD69 and induce antibodies against these molecules. Immune mechanisms are thus seen to be a major factor in neurotoxicity of metals seen in conditions such as autism and ADD (112, 63, 72-74).

8. Parathyroid Hypertensive Factor (PHF) is produced by the parathyroid gland and is measurable by the University of Alberta. Preliminary PHF determinations on over 100 patients through the Pfieffer Treatment Center have revealed very high levels for autistic patients. Heavy metals are known to block calcium L-channels at the cell membrane, whereas PHF is known to open calcium L-channels [84a] and stimulate phosphodiesterase [84b]. Calcium L-channels perform numerous functions, including initiation of transcriptional events which support learning, memory and endocrine secretion. Mercury inhibits L-channels at micromolar concentration [84c] in an irreversible manner in hippocampal neurons. Hypothetically, elevated PHF may serve to at least partially compensate Hg-inhibition of L-channels. Mercury is also a potent inhibitor of cAMP [84d], cellular levels of which presumably further decrease with PHF-stimulation of phosphodiesterase. Thus, in the context of mercury toxicity, PHF may play both adaptive and maladaptive roles. The very mechanism of mercury-induced auto-immune disease in mercury-sensitive rats is related to L-channel signaling. This process involves induction of interleukin-4 gene expression, which is mediated by protein kinase C-dependent calcium influx through L-channels [84e]. PHF hypothetically may affect the auto-immune response.

9. An IRB approved study assessing urinary levels of porphyrins found an apparent dose-response effect between autism severity and increased urinary coproporphyrins (91). For patients with non-chelated autism (83% had levels ¿ 2 SD above the control mean) and for children with non-chelated AutismSpectrumDisorders (58% had levels ¿ 2 SD above the control mean), but for patients with non-chelated pervasive developmental delay-not otherwise specified (PDD-NOS) or Asperger's disorder (46% had levels ¿ 2 SD above the control mean). Each group of ASDs had significantly increased median coproporphyrin levels versus controls. A significant increase (1.7-fold) in median coproporphyrin levels was observed among non-chelated ASD patients versus chelated ASD patients. Mercury toxicity was found to be associated with elevations in urinary coproporphyrin (cP), pentacarboxyporphyrin (5cxP), and precoproporphyrin (prcP) (also known as keto-isocoproporphyrin) levels. Two cohorts of autistic patients in the United States and France each had urine porphyrin levels associated with mercury toxicity. Another study using chelation therapy on a group of autistic patients found significant improvement during the study period (96).

Following up other studies showing higher than normal androgen levels in most autistic patients, a study found increased androgen levels in virtually all of a group of autistics. Morning blood samples collected following an overnight fast, compared to the pertinent reference means, showed significantly increased relative mean levels for: serum testosterone (158%), serum free testosterone (214%), percent free testosterone (121%), DHEA (192%), and androstenedione (173%). A medical hypothesis has suggested that some autism spectrum disorders (ASDs) may result from interactions between the methionine cycle-transsulfuration and androgen pathways following exposure to mercury. A study following treatment including chelation using DMSA and Lupron brought significant improvement in the majority of patients (96).A significant (p¡0.01) overall improvement from the 70-79th percentile of severity at baseline to the 40-49th percentile of severity at the end of the study was observed for patients treated for a median of approximately 4 months. Significant improvements in sociability,

cognitive awareness, behavior, and clinical symptoms/behaviors of hyperandrogenemia were also observed. Significant decreases in blood androgens and increases in urinary heavy metal concentrations were observed. Minimal drug adverse effects were found.

10. Another disorder caused by metals/vaccine exposure is pyrroluria, which about 50% of autistic and Schizophrenic children have been found to have. (585).

1.4 Hypothyroidism during pregnancy as cause of developmental delays, reduced IQs, and autism-the mercury and toxic metal connection

Studies have documented that mercury causes hypothyroidism (150, 84, 390, 407), damage of thyroid RNA (458), autoimmune thyroiditis (369, 382, 191), and impairment of conversion of thyroid T4 hormone to the active T3 form (369, 382, 390, 407, 150d). These studies and clinical experience indicate that mercury and toxic metal exposures appear to be the most common cause of hypothyroidism and the majority treated by metals detoxification recover or significantly improve (503).

The estimated prevalence of hypothyroidism from a large federal health survey, NHANES III, was 4.6%, but the incidence was twice as high for women as for men and many with sub clinical hypothyroidism are not aware of their condition (113a). Another large study (113b) found that 11.7% tested had abnormal thyroid TSH levels with 9.5% being hypothyroid and 2.1% hyperthyroid. According to survey tests, 8 to 10% of untreated women were found to have thyroid imbalances so the actual level of hypothyroidism is higher than commonly recognized (508). Even larger percentages of women had elevated levels of antithyroglobulin (anti-TG) or antithyroid peroxidase antibody (anti-TP). Tests have found approx. 30% of pregnant women to have low free T4 in the first trimester (509b).

Thyroid hormones are of primary importance for the perinatal development of the central nervous system, and for normal function of the adult brain (109a). Hypothyroidism of the adults causes most frequently dementia and depression. Nearly all the hyperthyroid patients show minor psychiatric signs, and sometimes psychosis, dementia, confusion state, depression, apathetic thyrotoxicosis, thyrotoxic crisis, seizures, pyramidal signs, or chorea occur (109a). These hormones primarily regulate the transcription of specific target genes. They increase the cortical serotonergic neurotransmission, and play an important role in regulating central noradrenergic and GABA function.

Studies indicate that slight thyroid deficiency/ imbalance (sub clinical) during the perinatal period can result in delayed neuropsychological development in neonate and child or permanent neuropsychiatric damage in the developing fetus or autism or mental retardation (109, 509, 511). Low first trimester levels of free T4 and positive levels of anti-TP antibodies in the mother during pregnancy have been found to result in significantly reduced IQs (509a-e) and causes psychomotor deficits (509f). Women with the highest levels of thyroid-stimulating-hormone (TSH) and lowest free levels of thyroxin 17 weeks into their pregnancies were significantly more likely to have children who tested at least one standard deviation below normal on an IQ test taken at age 8 (509a). Based on study findings, maternal hypothyroidism appears to play a role in at least 15% of children whose IQs are more than 1 standard deviation below the mean, millions of children. Overt autoimmune thyroiditis is preceded by a rise in levels of thyroid peroxidase antibodies. "Collectively, reports show that 30-60% of women positive for TPO antibodies in pregnancy develop postpartum thyroiditis," the researchers point out (561, 108), calling it "a strong association". Without treatment, many of the women with thyroiditis go on to develop overt clinical hypothyroidism as they age and, eventually, associated complications such as cardiovascular disease. About 7.5% of pregnant women develop thyroiditis after birth (108). Studies have also established a connection between maternal thyroid disease and babies born with heart defects (509h).

Infants of women with hypothyroxinemia at 12 weeks' gestation had significantly lower scores

on the Neonatal Behavioral Assessment Scale orientation index compared with subjects (109b). Regression analysis showed that first-trimester maternal free thyroid hormone T4 was a significant predictor of orientation scores. This study confirmed that maternal hypothyroxinemia constitutes a serious risk factor for neurodevelopmental difficulties that can be identified in neonates as young as 3 weeks of age.

Mercury (especially mercury vapor from dental amalgam or organic mercury) rapidly crosses the blood brain barrier and is stored preferentially in the pituitary gland, thyroid gland, hypothalamus, and occipital cortex in direct proportion to the number and extent of dental amalgam surfaces (114, 119, 185, 199, 273, 274, 407), and likewise rapidly crosses the placenta and accumulates in the fetus including the fetal brain and hormone glands at levels commonly higher than the level in the mother (120, 122-127). Milk from mothers with 7 or more mercury amalgam dental fillings was found to have levels of mercury approximately 10 times that of amalgam free mothers (1500). The milk sampled ranged from 0.2 to 57 μg/L. In a population of German women, the concentration of mercury in early breast milk ranged from 0.2 to 20.3 μg/L (126). A Japanese study found that the average mercury level in samples tested increased 60% between 1980 and 1990[125]. The study found that prenatal Hg exposure is correlated with lower scores in neurodevelopmental screening, but more so in the linguistic pathway (125). The level of mercury in umbilical cord blood, meconium, and placenta is usually higher than that in mother's blood [123-125].

Alterations of cortical neuronal migration and cerebellar Purkinje cells have been observed in autism. Neuronal migration, via reelin regulation, requires triiodothyronine (T3) produced by deiodination of thyroxine (T4) by fetal brain deiodinases (407). Experimental animal models have shown that transient intrauterine deficits of thyroid hormones (as brief as 3 days) result in permanent alterations of cerebral cortical architecture reminiscent of those observed in brains of patients with autism. Early maternal hypothyroxinemia resulting in low T3 in the fetal brain during the period of neuronal cell migration (weeks 8-12 of pregnancy) may produce morphological brain changes leading to autism. Insufficient dietary iodine intake and a number of environmental antithyroid and goitrogenic agents can affect maternal thyroid function during pregnancy.

Mercury can have significant effects on thyroid function even though the main hormone levels remain in the normal range, so the usual thyroid tests are not adequate in such cases. Prenatal methylmercury exposure severely affects the activity of selenoenzymes, including glutathione peroxidase (GPx) and 5-iodothyronine deiodinases (5-Di and 5'-DI) in the fetal brain, even though thyroxine (T4) levels are normal (390e). Gpx activity is severely inhibited, while 5-DI levels are decreased and 5'-DI increased in the fetal brain, similar to hypothyroidism. Thus normal thyroid tests will not pick up this condition.

Mercury reduces the bloods ability to transport oxygen to fetus and transport of essential nutrients including amino acids, glucose, magnesium, zinc and Vit B12 (143, 196, 198, 263, 264, 338, 339, 427); depresses enzyme isocitric dehydrogenase (ICD) in fetus, causes reduced iodine uptake, autoimmune thyroiditis, & hypothyroidism. (150, 191, 212, 222, 369, 382, 407, 135). Because of the evidence of widespread effects on infants, the American Assoc. of Clinical Endocrinologists advises that all women considering becoming pregnant should get a serum thyrotropin test so that hypothyroidism can be diagnosed and treated early (558, 17b). Since mercury and toxic metals are common causes of hypothyroidism, another test that should be considered is a hair element test for mercury or toxic metal exposures and essential mineral imbalances.

An ecological study in Texas has correlated higher rates of autism in school districts affected by large environmental releases of mercury from industrial sources.

In addition to large numbers of cases affecting infants, allergic contact eczema is the most frequent occupational disease (1, 500, 82); and the most common cause of contact eczema is exposure to toxic metals (1, 6-12, 500). The metals most commonly causing allergic immune reactivity are nickel, mercury, chromium, cobalt, and palladium (1, 6-14, 500). The highest level of sensitization is to

Infants, who are most reactive to thimerosal, a form of mercury that has been used as a preservative in vaccines and eye drops (6, 7). Many with immune reactive conditions like eczema and psoriasis recover after tests and treatment for the cause of the immune reactivity (11, 500).

1.5 Conclusion and Treatments

There has been strong suggestive and clinical evidence for a connection between toxic metals and autism spectrum conditions (2bcd, 15-40, 50, 92, 103, 603) and recent studies using government databases have confirmed the connection (80, 91, 92). There also appear to be subgroups of exposure and symptom patterns among the many different types of persuasive developmental disorders (PDD) including autism, Asperger's syndrome, obsessive compulsive disorder (OCD), dyslexia, ADD/ADHD, learning disabilities, childhood depression, etc.

Some of the apparent subgroups of autism include: the group with blocked enzymatic processes needed to properly *digest casein and gluten*[18], a group related to blockage by toxic metals of methionine synthase function, a group related to *mother's hypothyroid condition*[19] during the first trimester of pregnancy (due to metals effects), a group of general brain-related encephalies and/or immune effects of toxic exposures (23), the Singh subgroup of autoimmune reactions to brain myelin sheath or other autoimmunity (112), the reduced B lymphocyte/MMR subgroup with intestinal leaky gut and/or involvement of measles virus (37, 581), and the Megson/DPT visual abnormality related group (49). Since most children have been found to have high levels of toxic exposure, most of those affected appear to have symptoms related to both the first subgroup plus often one or more of the other exposures/subgroups. The Megson group are often helped significantly by treatment with Vitamin A from cod liver oil (581b) and urocholine. Thousands of autistic children are being treated for metals toxicity using chelation protocols after tests have documented high exposures to mercury and other toxic metals, and the majority have shown significant improvement (23, 40, 51, 81, 96, 100, 133). In a large survey of parents of autistic children by the Autism Research Institute of treatment success in treating autism, chelation/detoxification with nutritional support was found to be by far the most effective and least harmful treatment of all treatments surveyed, with over 73% of those using chelation protocol improving significantly after treatment (100). Autism treatment clinics testing and treating autism usually find high toxic metal body burdens and successful cognitive and behavioral treatment results as toxic metal body burden declines and metabolic imbalances are improved (101, 133, 603). Most of those using chelation/nutrition protocol recovered or significantly improved and are doing well in school.

Most children with autism have been found to have gastrointestinal damage and *leaky gut*[20], as well as damaged enzymatic process and damaged systems that control blood PH. This results in digestive dysfunction, inability to absorb minerals and nutrients, nutritional deficiencies, damage to autonomic nervous system, and neurological and behavioral problems. Supplements to deal with these nutritional deficiencies and imbalances are needed to alleviate these problems. These problems also cause proliferation of unfriendly bacteria, yeast, and parasites (580, 603), for which supplementation with probiotics and Saccharomyces boulardii yeast are helpful. Treatment is complicated and individual, usually requiring detoxification as well as protocols to deal with the dysfunctional gastrointestinal, immune, and hormone systems (580). Lists of doctors with experience at successfully treating these problems can be found at the Autism Research Institute website: *www.autism.com/ari/*[21]. Some deficiencies usually found include sulfates, magnesium, zinc, essential fatty acids, vit A, vit E, selenium, etc. (580). Supplementation for these and other essential minerals and nutrients are needed due to the dysfunctional digestive systems. A large double blind study of autistic patients found a

[18] **Internet:** "http://www.flcv.com/autismgc.html".
[19] **Internet:** "http://www.flcv.com/ASDendo.html".
[20] **Internet:** "http://www.flcv.com/leakyghg.html".
[21] **Internet:** "http://www.autism.com/ari/".

nutritional approach using 400 mg carnosine, 50 IU vit E, and 5 mg of zinc two times per day to be highly beneficial (580). Large numbers of autistic children have shown significant improvement after detoxification and biomedical nutritional treatment (100, 133, 603). A program found to significantly improve most children with with autism spectrum conditions including ADHD is Brain Balance (163). Information on low budget ABA (Applied Behavioral Analysis) can be found at: (600). Properly formulated nutritional treatments have also been found to be effective in treating ADHD and depression (522).

Physical activity has been found to help kids who may be restless or hyperactive, or who have been *diagnosed with ADHD*[22]. Even emotional disturbances can be improved with exercise, as the activity provides an outlet for their energy and reduces the natural inclination of children to "act out". Use of exercise therapy along with Emotional Freedom Technique (EFT) were found to have significant benefits (574). Exercise at school was also found to significantly increase reading and math ability of students, in addition to helping control obesity.

1.6 References

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