

Mercury, Neurological Problems and Glutathione

Mercury is the most toxic substance according to The Agency for Toxic substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services. It creates **free radicals and free radical damage** when there is too much of it. When exposure is great enough and long enough the body may not be able to recover quick enough in producing enough free radical scavenging aid to help assist the body in dealing with this attack. It is important to supplement one's diet with a high quality glutathione accelerating supplement that can raise the body's own natural ability to produce more glutathione quickly.

ANTIOXIDANTS AND FREE RADICALS

Taking antioxidants combats excessive free radical damage. Molecules become free radicals when the oxygen atom loses an electron and starts to "attack" surrounding molecules, seeking a replacement electron. When exposed to mercury a chain reaction of cell damage results until an antioxidant halts the process by providing a spare electron.

Free radicals play an important role in both health and disease and have been implicated in countless human disease processes. Free radicals are vital to human health. These molecules (Reactive Oxidant Species) are extremely important to human metabolic processes.

Any molecule can become a free radical by either losing or gaining an electron and molecules containing these uncoupled electrons are very reactive (unstable). Once free radicals are initiated, they can propagate by becoming involved in chain reactions with other less reactive (stable) types. The resulting chain reaction compounds generally survive longer in the body and therefore increase the potential for cellular damage.

A free radical has three stages: the initiation stage, propagation and finally, termination. They are terminated or neutralized, by nutrient antioxidants enzymatic mechanisms or by recombining with each other. The aim is to balance free radical activity and antioxidant activity to achieve a state of balance (homeostasis).

THE DANGERS OF MERCURY

The Agency for Toxic substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services lists **mercury** as the **most toxic substance** in the United States and the third-most frequently found metal (lead and arsenic are first and second).

More than **25 percent of children in utero in the United States are exposed to levels of mercury** above the EPA safe reference dose (0.1 microg methylmercury/kg body weight/day) for at least 30 days during gestation and leading to an increased risk for neurological damage. (Environmental Working Group. What women should know about mercury contamination of fish. Washington, D.C. Environmental Working Group; 2001:1-4)

Eighty percent of inhaled elementary mercury vapor is absorbed (like from amalgam tooth fillings when chewing) and can cross the blood-brain barrier or reach the placenta. (Ozuah PO. Mercury poisoning. Curr Probl Pediatr 2000;30:91099)

The **dangers of mercury go widely unnoticed** and unconnected to their source, mercury. Most people do not know that mercury is far more poisonous than arsenic and lead; even one atom of mercury in the body is toxic. With

mercury having such high level of toxicity and free radical formation the need for glutathione becomes much greater.

SOURCES OF MERCURY

There are so many uses for mercury today that it is mind boggling to really think of all the sources that we are exposed to. The primary sources of mercury are from freshwater fish and some salt water fish which come from industrial pollution. **Coal-fire power plants** put 40 tons of mercury a year into the atmosphere through burning coal. In the U.S. alone, **hospitals that burn their wastes** put 20 tons a year into the atmosphere. **All plastics manufacturing** put a ton of mercury in the atmosphere. **Farmers** are using mercury on their seeds. For example, wheat seed is sprayed with a purple/pink color that is a fungicide containing mercury. Many farmers have sprayed their crops with mercury fungicides as well..

Cosmetics, eye makeup, flu shots, vaccinations, latex paint, disinfectants, tattoo pigments, plastics, fluorescent light bulbs all have mercury in them, to name just a few.

Another major source of mercury toxicity is from **silver “amalgam” tooth fillings**. It has been conclusively proven that mercury vapor is released from amalgams and stored in the body, and nearly 200 million people in the USA alone have these fillings. While the placement and safe removal of these toxic fillings is a dental issue, the effect caused by mercury vapor is a medical one.” (Chronic Mercury Poisoning and Mercury Detoxification by *Tom McGuire*, DDS, Townsend Letter, June, 2007)

HOW MERCURY AFFECTS THE BODY

Elemental mercury and its metabolites have the toxic effect of denaturing biological proteins, inhibiting enzymes, and interrupting membrane transport and the uptake and release of neurotransmitters. (Charkson TW. The three modern faces of mercury. Environ Health Perspect 2002:111:11-23.)

Chronic exposure presents itself as excitability and irritability, tremors, and gingivitis. (Ozuah PO. Mercury poisoning. Curr Probl Pediatr 2000:30:91099)

Chronic exposure can cause central and peripheral nervous system damage. (Tunnessen WW Jr. McMahon KJ, Baser M. Acrodynia: exposure to mercury from fluorescent light bulbs. Pediatrics 1987:79:786-789)

The majority of toxicity from mercury is due to methyl mercury exposure involving the central nervous system. It can cause abnormal central nervous system cell division, demyelization, autonomic dysfunction, sensory nerve conduction delay, abnormal neuronal migration. Chronic toxicity induces paresthesia, peripheral neuropathy, cerebular ataxia, akathisia, spasticity, memory loss, dementia, constricted vision, dysarthria, impaired hearing, smell and taste impairment, tremors, and depression. (Ozuah PO. Mercury poisoning. Curr Probl Pediatr 2000:30:91099, Charkson TW. The three modern faces of mercury. Environ Health Perspect 2002:111:11-23.)

Researchers have found evidence that glutathione depletion and exposure to toxic metals like mercury can lead to neurological damage like that found in Parkinson’s and strokes. (Packer, L, Kraemer K, Rimbach G Molecular aspects of lipoic acid in the presentation of diabetes complication. Nutrition 2001:17:888-895)

Mercury spreads throughout the body and settles in every cell and tissue. This is why is so difficult to know that you may be suffering from mercury poisoning until it has become so great that the symptoms have become severe.

GLUTATHIONE BINDS HEAVY METALS

The most common low-molecular weight sulfhydryl-containing compound in mammalian cells is glutathione. It reduces the levels of mercury by binding to the glutathione and eliminates it. **Mercury can deplete the glutathione reserves** because it makes highly toxic hydroxyl radicals from the breakdown of hydrogen peroxide (Lee YW, Ha MS, Kim YK. Role of reactive oxygen species and glutathione in inorganic mercury induced injury in human glioma cells. *Neurochem Res* 2001;26:1187-1193.)

Glutathione also increases mercury elimination from renal (kidney) tissue. Studies in animal renal cells show that glutathione is 50 percents as effective as the chelating agent DMSA in preventing the inorganic mercury accumulation in renal cells.(Endo T, Sakata M, Effects of sulfhydryl compounds on the accumulation, removal and cytotoxicity of inorganic mercury by primary cultures of rat renal cortical epithelial cells.*Pharmacol Toxicol* 1995;76:190-195.)

Purdue University did a study on plants, glutathione and toxic metals. It was found that plants with high levels of glutathione were able to tolerate toxic metals without damage or death and plants that were engineered to have low glutathione were unable to tolerate toxic metals. With high glutathione the plants ability to hyperaccumulate toxic metals correlated with increased resistance to oxidative stress from toxic metals. September 1, 2004 Purdue study finds antioxidant protects metal-eating plants.

Glutathione increases the antioxidant capacity of the cell. It gives it a defense against hydrogen peroxide, singlet oxygen, hydroxyl radicals, and lipid peroxides produced by mercury.(Kromidas L, Trombetta LD, Jamall IS. The protective effects of glutathione against methylmercury cytotoxicity. *Toxicol Lett* 1990;51:67-80.)

Glutathione is an antioxidant that normally binds to heavy metals targeting them for elimination. When concentrations of glutathione are low the body is unable to detoxify poisons. The presence of heavy metals such as mercury, lead, cadmium and nickel actually knocks glutathione out of commission. There is also a strong correlation between low levels of glutathione in children with autism whereas normal children have normal glutathione levels. (wordpress.com, 2006, 9,11 heavy Metals stay in Fatty Tissues)

Heavy metals like mercury are known to inhibit anti-oxidative enzymes, **disrupt the metabolism and biological activities of** many proteins and **deplete intracellular glutathione**. High concentrations of mercury can deplete glutathione in glutathione deficient neural cell lines in culture. (<http://fattyacids.wordpress.com/2006/09/11/heavy-metals-1stay-in-fatty-tissues>)

MERCURY IN VACCINES

Thimerosal, is 49.6 percent ethyl mercury (organic mercury) and is a preservative in vaccinations since the 1930's. Based on the Centers for Disease Control (CDC) recommendations for vaccinations, a typical six-month-old child, if receiving all thimerosal-containing vaccines, could receive the equivalent of more than 1.0 micro g per day. This amount exceeds the EPA limits for mercury exposure that is safe. (Halsey NA. Limiting infant exposure to thimerosal in vaccines and other sources of mercury. *JAMA* 1999; 282:1763-1766)

Almost all brains in America under the age of thirty have been exposed to excessive mercury from the large number of vaccinations and this "vaccine generation" grew up in an environment with relatively higher levels of mercury from power plants. It is a unique population group with exceptionally higher incidence of brain developmental disorders associated with mercury induced free radical damage and extrapolating this phenomenon into the future means that the largest group of people above 60 years with Alzheimer's, dementia, Parkinsonism and autoimmune suppression

related diseases will be in the US. **The injected organic form of mercury (as in vaccinations) are readily taken up by the brain and heart muscle cells.**

GLUTATHIONE: HELP FOR MERCURY?

Mercury has a high affinity for reduced sulfhydryl groups, including those of cysteine and glutathione (GSH). Once Mercury has entered the cell, some of it binds to Glutathione if it is present, and becomes a medium to cellularly export it out of the body using glutathione. (Transport of toxic metals by molecular mimicry. [Ballatori N](#). Environmental Health Perspectives, 2002 Oct;110 Suppl 5:689-94. Department of Environmental Medicine, University of Rochester School of Medicine, Rochester, NY 14642, USA. Ned_Ballatori@urmc.rochester.edu)

Glutathione transport is the main method of the removal of mercury. A molecule of glutathione attaches to mercury to facilitate its removal. It requires at least two and in some situations three molecules of glutathione to remove a single molecule of mercury. This is because mercury must first be reduced from the +3 oxidized state to the +2 state, then to the +1 state to be combined with glutathione and removed from the lipid soluble state by glutathione. That means that the body needs to produce a lot of glutathione to get rid of just one molecule of this deadly toxin. (Tim Guilford, M.D. *Glutathione in Health and Disease*, Cubberly Community Center, 4000 Middlefield Road, Room H1, Palo Alto, California, December 15, 2005)

Dr. Tim Guilford says that mercury displaces normal minerals, interrupts enzyme systems and depletes glutathione. In studies on lab animals the first measurable sign of mercury toxicity is depletion of glutathione. In the detoxification pathway, glutathione is a major component.

GLUTATHIONE DEFENSE IN AUTISM AND NEUROLOGICAL ISSUES

The body needs adequate amounts of free radical scavengers to deal with the high amounts of mercury that we are being exposed to knowingly and unknowingly. The best scavenger of all is glutathione.

Boyd Haley, an expert on Mercury poisoning and its neurological effects says that "In the end it is mercury in the brain that causes such problems, and that mercury can come from several sources," Boyd Haley concludes that all mercury exposures are additive, even if some exposures are greater than others. (Washingtontimes.com/upi-breaking/20050518-06521-1970r.htm. United Press International, May 20, 2005)

In situations where glutathione is being used up rapidly to remove toxins, the ability to form new glutathione becomes critical. It is impossible to get enough glutathione from diet alone and supplements of glutathione are not digested well so the synthetic glutathione sources are useless.

Exposure to mercury is just the type of situation in which the production of glutathione is needed, yet cannot be formed, that has been found to be present in autism. The observation of deficient glutathione as a biomarker of disease was published about a year ago by Jill James, PhD. (See report by James SJ, Cutler P, Melnyk S, Jernigan S, Janak L, Gaylor D, and Neubrandner J; entitled: "Metabolic biomarkers of increased oxidative stress and impaired methylation capacity in children with autism *American Journal of Clinical Nutrition* 2004;80:1611-7. PMID: 15585776". Tim Guilford, MD)

Dr. Jill James of the University of Arkansas for Medical sciences, published research which has uncovered a unique and consistent metabolic imbalance in autistic children when compared to normal healthy children (James 2004a, 2004b). Autistic children, when compared to normal, healthy children showed a significant impairment in every one of the body's five measurements to maintain a healthy glutathione defense.

Dr. Jill James' research suggests that the impairment, found in autistic vs. control groups, manifests as a severe deficit in the body's most important antioxidant and metals detoxifier, glutathione. Her research gives strong evidence that if these children were exposed to a potentially toxic dose of mercury or other compounds their defense would be much less effective. (<http://www.ewg.org/reports/autism/execsumm.php>)

Dr. Sallie Bernard and her colleagues, in a study titled, "Autism: a Unique Type of Mercury Poisoning," illuminates the speech difficulties, unusual behavior (such as unprovoked crying spells, head banging), various degrees of cognitive impairment, gastrointestinal difficulties, and immune difficulties that autistic children can have. Dr. Bernard feels that mercury is possibly connected as a causative factor in other developmental disorders as well, such as delayed speech and attention deficit-hyperactivity.

One of the many functions of glutathione is conjugation and detoxification of metals and other toxins. It is speculated that children with autism are unable to excrete metals because of a glutathione deficiency. Children with autism had significantly lower levels of glutathione. This could possibly render them unable to detoxify thimerosal (mercury) from vaccines.

Certain individuals produce less glutathione as a result of various gene mutations/polymorphism, the resulting glutathione deficiency doesn't provide enough glutathione to bind (James) and excrete mercury the way it would in others. Exposure to thimerosal in vaccines adds to their toxic burden causing certain brain cells to die from a known neurotoxin, mercury.

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