Heavy Metal Toxicity and Chelation

There has been much debate regarding heavy metal toxicity in children with Autism Spectrum Disorder, especially **mercury.** Exposure to mercury can cause immune, sensory, neurological, motor and behavioural dysfunction. These are similar traits defining or associated with autism. The ethylmercury containing preservative, thiomersol, has been implicated as a source of heavy metal contamination in Autism Spectrum Disorder children. Although the manufacturers and Governments do not believe that vaccinations are harmful, the majority of vaccines for children are now free of thiomersol.

Apart from mercury, tests for heavy metal toxicity, Hair Mineral Analysis, Urinary heavy metal testing following oral DMSA (meso-2,3-dimercaptosuccinic acid) challenge, Porphyrin testing and blood testing also consistently show children to be high in aluminium, lead, cadmium, arsenic, antimony and other heavy metals.

- **zinc** is important for increased expression of metallothioneins, which are proteins capable of binding heavy metals and excreting them from the body. Metallothioneins are cysteine-rich metal-binding proteins and antioxidant compounds. They have the capacity to bind heavy metals such as cadmium, arsenic and mercury, as well as physiological metals such as zinc and copper.
- **selenium** has been shown to affect the distribution and reduce the toxicity of mercury in animal studies.
- **meso-2,3-dimercaptosuccinic acid (DMSA)** is an effective chelator of heavy metals and is used orally at higher doses as a challenge, after which the levels of urinary heavy metals excreted are measured, or at lower more frequent doses often in combination with lipoic acid (**Cutler Lipoic Acid Protocol**). Due to its low molecular weight it is readily filtered by the kidneys and excreted via the urine. Does not chelate mercury in the brain.
- **sodium 2,3-dimercaptopropanesulfate (DMPS)** is similar to DMSA, however because of the tendency to have more severe side-effects is not commonly used.
- **lipoic acid** in the form **R-alpha lipoic acid** is the more active form that should be used. Alpha lipoic acid is a powerful antioxidant, an effective chelator of heavy metals and an enhancer of glutathione. Lipoic acid has a short half life in the body indicating that it is best taken several times throughout the day, which is the basis of the Cutler Lipoic Acid Protocol used to chelate heavy metals in children and adults.
- **glutathione** is a molecule made up of glycine, glutamate (glutamic acid), and cysteine. Glutathione has an important role in the removal of heavy metals in the body by supporting biochemical pathways essential for heavy metal removal like metallothionine.

All Natural Advantage

John Pietryka
Biomedical Naturopath
55 Marianne Way
MT WAVERLEY 3149
www.allnaturaladvantage.com.au
Phone: (03) 8802 7687
E-mail:pietryka@optusnet.com.au

Helping children achieve their full potential

- **spirulina** in combination with zinc assists the removal of heavy metals from the body. A study of 41 patients with chronic arsenic poisoning found spirulina and zinc to be effective in removing arsenic. Spirulina has also been found to reduce the toxic load of lead.
- **curcumin** is well known for its antioxidant properties and has been found to protect against lead and cadmium toxicity , reducing damage to neurons.
- **pectin** is able to reduce absorption and bioaccumulation of toxic metals by binding the metals in the digestive tract and preventing their absorption. This is also helpful to ensure the elimination of heavy metals that have been excreted into the bile by preventing their reabsorption.
- **coriander** has traditionally been used to enhance the excretion of toxins and metals. Results of animal studies on lead suggest that coriander achieves this by chelating lead in the gut and reducing absorption as well as chelating lead systematically, with enhanced lead excretion in the kidneys.
- **bioflavonoids** quercetin and rutin can assist in the removal of heavy metals.
- **vitamins B5 and C, n-acetyl-cysteine, methionine and selenium** are antagonists to mercury.
- **zeolites** form where volcanic ash layers react with alkaline groundwater forming zeolite crystals. The slow leaching of chemicals over time through mineral water create this family of microporous solids that act as molecular sieves which are natural chelators, having the ability to be used as tools for cation exchange.
- **EDTA** has been used to chelate heavy metals from the body.

Specific Chelation Protocols

Metallothionein Promotion

Metallothioneins are proteins whose purpose are to metabolise and regulate metals. There are at least ten known closely related metallothionein proteins expressed in the human body. In humans, large quantities are synthesized primarily in the liver and kidneys, however they have been found at a number of other sites as well. Its production is dependent on availability of the dietary minerals zinc and selenium, and the amino acids histidine and cysteine.

In a 2001 presentation to the American Psychiatric Association, Dr. William J. Walsh of the Pfeiffer Treatment Center (now the Walsh Research Institute) suggested a potential link between metallotionein disorders and autism. Walsh concluded:

"The absence of copper and zinc (Zn) homeostasis and severe Zn deficiency are suggestive of a metallothionein (MT) disorder. MT functions include neuronal development, detoxification of heavy metals, and immune response. Many classic symptoms of autism may be explained by a MT defect in infancy including G.I. tract problems, heightened sensitivity to toxic metals, and abnormal behaviors. These data suggest that an inborn error of MT functioning may be a fundamental cause of autism."

Mammals possess genes for four subfamilies of metallothionein, the ubiquitous MT-1 and MT-2, the brain specific MT-3 and the squamous epithelium specific MT-4.

A genetic metallothionein weakness is consistent with:

- Casein/gluten intolerance
- Presence of dense, undeveloped brain cells evident in autopsy studies
- Hypersensitivity to mercury & other toxic metals
- High autism incidence after thalidomide
- Hypersensitivity to vaccines
- Poor immune function
- Low stomach acid
- Higher incidence in males
- Taste/texture sensitivities
- Tendency for yeast overgrowth
- Leaky gut
- Behaviour problems

Measurements of MT-levels, as well as zinc, have been used to indicate zinc deficiency. MT increases rapidly after zinc supplementation and decreases if the diet is deficient in zinc. The zinc from plasma proteins begins to be used up when the body stores are depleted. When plasma zinc levels are below 33 mcg/dL, skin-rash, abdominal pain, diarrhoea, loss of appetite and a reduced sense of taste and smell can occur.

The Walsh Research Institute has developed a nutrient therapy to promote metallothionein in the gastrointestinal tract, brain and elsewhere. Aggressive zinc loading must precede any attempt to promote MT for best results. Each molecule of MT requires 7 atoms of zinc to function properly. Premature synthesis of MT at the intestinal mucosa can temporarily prevent zinc transport into the blood, which can result in severe irritability.

The Pfeiffer MT Promotion protocol is a 2 stage process:

- Preloading zinc and co-factors (Primer)
- Metallothionein promoting nutrients (Promoter)

Alpha-Lipoic Acid and DMSA Protocol

Dr. Andy Cutler is a chemist receiving his Bachelor of Science in Physics from the University of California and his Ph.D. in Chemistry from Princeton University. Dr Cutler determined, several years ago, that he had health problems due to mercury toxicity. He read a extensively and tried a lot of protocols, and eventually got better. In the process he came up with very definite ideas about what is helpful and what isn't. He is fairly well known as being one (of many) people with strong opinions on the topic of mercury detoxification. His protocol is widely known as the **Cutler Lipoic Acid Protocol**.

This detoxification protocol uses **alpha lipoic acid (ALA)**, and may optionally also use **meso-2,3-dimercaptosuccinic acid (DMSA)**. Both are administered orally with adequate frequency to maintain reasonably steady blood levels. ALA detoxification is reportedly effective for the removal of mercury and arsenic from the brain. DMSA is effective for the removal of lead, and assists in the removal of mercury.

The theory why his chelation treatment works is that it doesn't just mobilise mercury, stir it around, and dump it again in the most sensitive tissues, but effectively removes it out of the body. This is because every chelating agent, which can mobilize mercury and/or other elements, has a specific half life, meaning it will only stay in the body for a certain amount of time. Once the levels drop, the mobilised mercury resettles, where ever it is. What Cutler's protocol does, is it keeps a constant level of chelating agents present in the body for a longer time, making it possible for these chelators to actually escort mercury out of the body and not just stir it around like other treatments do. His protocol achieves this by very frequent dosing of chelators.

Precautionary Notes

- all methods of chelation and all chelation agents have some risk
- pay attention to your child or yourself as to new symptoms or signs that may appear
- if experiencing bad results then **stop**
- **do not** try to chelate mercury if your child or yourself has/have any amalgam dental fillings present
- ensure **iron** levels are adequate. Absorption of iron is dependent on a metal transporter (DMT 1). This transporter is upregulated in iron deficiency. Toxic elements such as cadmium and lead share the same transporter and may be the reason that iron deficiency predisposes to cadmium and lead toxicity
- ALA depletes **biotin**, therefore biotin may need to be supplemented with ALA

Dose Frequency

- DMSA: every 4 hours, **including at night**
- ALA: every 3 hours, **including at night**. (You can stretch it to every 4 hours at night if it helps you get a little more sleep, but go back to every 3 hours during the day.)
- DMSA + ALA (together): same as ALA, every 3 hours, **including at night**. (You can stretch it to every 4 hours at night if it helps you get a little more sleep, but go back to every 3 hours during the day.)
- it is generally okay to take a dose sooner, if this is more convenient. For instance, it is fine to take the next dose of ALA after 2.5 hours rather than 3. If you do this, be sure to adjust the time of the next following dose so that it is taken within 3 hours. (Don't accidentally leave it till 3.5 hours later because of the "early" dose). All dose guidelines are about the LONGEST you can go between doses. Shorter is okay.

Dosage

- dosages vary and should be guided by your healthcare professional
- generally parents use 12.5mg ALA and 12.5mg DMSA
- a 1**:**1 ratio of ALA:DMSA seems to work fine.

Length of Cycles (Often referred to as one round)

- at least a few days on. Three days on or more is recommended. 2.6 days on is acceptable. (3 entire daytimes and the 2 nights in between = 2.6 days.) (Also, Friday after school until Monday morning = 2.6 days.) Less may not be as effective.
- at least as many days off as you had on.
- there is not an obvious one-size-fits-all answer. The following are all reasonable options: 3 days on, 4 days off. OR 3 days on 11 days off . Many other options are also reasonable.
- two weeks on at most.