

A Comprehensive Review of Heavy Metal Detoxification and Clinical Pearls from 30 Years of Medical Practice

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Introduction

Heavy metals appear in the mammalian system because they have become part of our environment. We are in a constant exchange with our environment which is governed by the laws of osmosis. If mercury is in the fish we eat, over time we have mercury in our system. We cannot keep our system pristine and clean, because we are separated from our toxic environment only by semi-permeable membranes: skin and mucosal surfaces. Maintaining relative cleanliness requires a number of inherent detox systems to work overtime against the osmotic pressure of the incoming toxins. As the toxicity of our environment increases so does the osmotic pressure, pushing the often man-made poisons into our body.

Toxins almost never come alone. They come in synergistically acting package deals. Mercury alone is toxic. Together with zinc it is many times more toxic; add in a little copper and silver, as in dental amalgam fillings and the detrimental effect to the body increases many fold. Together with mercaptan and thioether (dental toxins) the toxic amalgam effects grow exponentially. Add in a little PCB and dioxin, as in fish, and the illness causing effect of the methyl mercury in fish increases many fold again. Toxicology is to a large degree the study of synergistic effects. In synergy, $1 + 1 = 100$. Heavy metals are primarily neurotoxins. There is a synergistic effect between all neurotoxins which is responsible for the illness-producing effect.

Making the neurotoxin elimination a major part of my practice has been an amazing experience. Many illnesses considered intractable respond when the related issues are successfully resolved.

What are Neurotoxins?

Neurotoxins are substances attracted to the mammalian nervous system. They are absorbed by nerve endings and travel inside the neuron to the cell body. On their way they disrupt vital functions of the nerve cell, such as axonal transport of nutrients, mitochondrial respiration and proper DNA transcription. The body is constantly trying to eliminate neurotoxins via the available exit routes: the liver, kidney, skin and exhaled air. Detox mechanisms include acetylation, sulfation, glucuronidation, oxidation and others. The liver is most important in these processes. Here most elimination products are expelled with the bile into the small intestine and should leave the body via the digestive tract. However, because of the lipophilic/neurotropic nature of the neurotoxins, most are reabsorbed by the abundant nerve endings of the enteric nervous system (ENS) in the intestinal wall. The ENS has more neurons than the spinal chord. From the moment of mucosal uptake the toxins can potentially take 4 different paths:

1. Neuronal uptake and via axonal transport to the spinal chord (sympathetic neurons) or brainstem (parasympathetics) – from here back to the brain.
2. Venous uptake and via the portal vein back to the liver
3. Lymphatic uptake and via the thoracic duct to the subclavian vein
4. Uptake by bowel bacteria and tissues of the intestinal tract

Here is an incomplete list of common neurotoxins in order of importance:

(i) Heavy metals:

mercury, lead, cadmium, iron, manganese and aluminum (are the most common).

Common Sources: metallic mercury vapor escapes from dental amalgam fillings (they contain about 50 % mercury, the rest is zinc, silver copper, tin and trace metals). Cadmium: car fumes, cigarette smoke, pigment in oil paint, Lead: outgassing from-paint, residues in earth and food chain from time when lead was used in gasoline, contaminated drinking water
Aluminum: cookware, drinking water

(ii) Biotoxins:

such as tetanus toxin, botulinum toxin (botox), ascaridin (from intestinal parasites), unspecified toxins from streptococci, staphylococci, lyme disease, chlamydia, tuberculosis, fungal toxins and toxins produced by viruses. Biotoxins are minute molecules (200-1000 kilodaltons) containing nitrogen and sulfur. They belong to a group of chemical messengers which microorganisms use to control the host's immune system, host behavior and the host's eating habits.

(iii) Xenobiotics (man-made environmental toxins):

such as dioxin, formaldehyde, insecticides, wood preservatives, PCBs etc.

(iv) Food Preservatives, excitotoxins and cosmetics:

aspartame (diet sweeteners), MSG, many spices, food colorings, fluoride, methyl and propyl-paraben, etc.

Heavy Metal Toxicity

Metals can exist in the body with different kinds of chemical bonds and as different molecules. Mercury appears to be the kingpin in the cascade of events in which metals become pathogenic. Mercury can be present as metallic mercury (Hg^0), as mercury salt (e.g. mercury chloride – Hg^{2+}), or as methyl mercury (CH_3Hg^+). Methyl mercury is 50 times more toxic than metallic mercury. Methyl-Hg is so firmly bound to the body that it has to be first reduced to Hg^{2+} before it can be removed from the cell. This is achieved with reducing agents (antioxidants) e.g. intravenous vitamin C and reduced glutathione. To remove Hg-Salts or metallic Hg from the outside of the cell, other agents are useful. Mercury belongs to a group of metals that oxidize in the presence of sulfur and form compounds with sulfur (sulfhydryl affinitive metals). Methyl mercury is already oxidized to its maximum and bound firmly to sulfur in the different proteins of the body. The following metals belong to the sulfhydryl affinitive group and respond to similar detoxification methods: Copper, arsenic, cadmium, lead, mercury. Aluminum and iron, for example, would not respond to a sulfur compound. Some detox agents have multiple mechanisms by which they bind to metals. The algal organism chlorella has over 20 known such mechanisms.

Other metals oxidize with oxygen. Iron turns to rust when oxidized. Rust is nontoxic to the body, whereas iron is. Iron overdose responds to a chemical called desferoximin (desferal). Aluminum responds to the same detoxification agent. A recent Japanese study showed that Chinese parsley, cilantro, is a powerful elimination agent for aluminum stored in bone and the brain.

Other facts:

- Some metals are extremely toxic, even in the most minute dose, whereas others have very low toxicity, even in high doses. However, dependent on the dose, all metals can become toxic to the body. Iron can cause severe oxidative damage, copper may compromise liver

function and visual acuity, selenium and arsenic have been known to be used to murder people and so on.

- Most metals serve a functional role in the body. For example, selenium is needed in the enzyme that restores oxidized glutathione back to its functional form as reduced glutathione. Another important function of selenium is its role as a powerful antioxidant in preventing cancer.
- Some metals have a narrow physiological range. That means the difference between a therapeutic dose and toxic overdose is very small. Selenium is an example of this. Magnesium on the other hand has a wide physiological range and thus is more difficult to overdose.
- Some metals have no physiological function. Mercury, lead, and aluminum are in this group. Even the smallest amounts have negative physiological-effects.
- Biochemical individuality: some people may react more or less than others to the presence of heavy metals in the tissues. Some people may also develop a severe chronic illness after exposure of a few molecules of mercury, whereas others may be more resistant to it. Genetic deficiencies in the enzymes responsible for the formation of the metallothioneins and glutathione production and reduction are examples.

Possible side-effects during heavy metal detox:

Every patient can be affected by metals in two ways:

1. through their non-specific toxic effects
2. through the system's allergic reactions to the neurotoxins

Often these two distinctive types of symptoms cannot be easily distinguished. During a detox program, the patient may also temporarily become allergic to the various substances that help to carry out the toxins. This is based on a physiological mechanism called "operant conditioning". Every time the detoxifying substance is given, mercury emerges from its hiding places into the more superficial tissues of the body, where mercury can now be detected by the immune system. The immune system however is fooled into thinking that the detoxifying substance itself is the enemy. The immune system now starts to react to the detoxifying substance as if it was the mercury itself. This reaction typically resolves spontaneously after six weeks of not using the detox agent in question. This type of conditioned reflex can also be easily treated with simple techniques e.g. NAET, PK (APN), or by giving the detox substance in a homeopathic dilution for a few days. Often the basal membranes in the kidney will swell as a sign of the allergic reaction, causing low back pain, anuria or inability to concentrate urine. Neural therapy or microcurrent stimulation of the kidneys quickly resolves the issue. Muscle aches indicate the redistribution of toxins into the connective tissue and an insufficient program. Depression, headaches, trigeminal neuralgia, seizures, and increased pain levels indicate redistribution of metals into the CNS and an inappropriate detox program. Eye problems and tinnitus that occur during detox indicates redistribution of metals into these organs and require selective mobilization from these locations before the program is continued. I use a specific type of microcurrent for this purpose

Some recently published findings related to the metal issue:

Iron/manganese: A recent paper on Parkinson's disease (Neurology June 10, 2003;60:1761-1766) revealed that just by eating iron and manganese-containing foods such as spinach or taking supplements containing Fe or Mn increased the risk of developing PD almost 2 fold. This demonstrates that even dietary supplements or organically grown foods are amongst the possible culprits in metal toxicity.

Methyl mercury:

There are two major sources:

1. Mercury escaped from dental **amalgam** fillings is converted by oral and intestinal bacteria to methyl mercury, which then is bound firmly to proteins and other molecules. Methyl mercury crosses the blood brain barrier and the placental barrier leading to massive prenatal exposure. Earlier studies determined that over 90% of the common body burden of Hg is from dental fillings. Recent studies show that eating fish is starting to compete with amalgam fillings for the leading position as a risk factor.

2. **Seafood**

A recent study (JAMA, April 2, 2003;289(13):1667-1674) revealed the following: It is estimated that nearly 60,000 children each year are born at risk for neurological problems due to methyl mercury exposure in the womb.

One in 12 U.S. women of childbearing age has potentially hazardous levels of mercury in their blood as a result of consuming fish, according to government scientists.

The U.S. FDA recommends that pregnant women and those who may become pregnant avoid eating shark, swordfish, king mackerel, and tile fish known to contain elevated levels of methyl mercury, an organic form of mercury. Nearly all fish contain some amount of methyl mercury. Mercury accumulates in the system, so larger, longer-lived fish like shark or swordfish contain the highest amounts of mercury and pose the largest threat if eaten regularly.

The National Center for Policy Research for Women & Families published in May 2003, that the following fish are lowest in methyl mercury:

- Catfish (farmed)
- Blue Crab (mid-Atlantic)
- Croaker
- Fish Sticks
- Flounder (summer)
- Haddock
- Trout (farmed)
- Shrimp

The FDA also recommends these fish as safe to eat:

- Haddock
- Tilapia
- Wild Alaskan Salmon
- Sole

Ethyl mercury:

Recent quote from Boyd Haley, PhD: *“Our latest research clearly points to the ethyl mercury exposure as being causal in autism. The tremendous enhancement of thimerosal toxicity by testosterone and the reduction of toxicity by estrogen explains the fact that 4 boys to 1 girl getting the disease and the fact that the bulk of severe autistics are boys. Most importantly, this autistic situation clearly shows that exposure to levels of mercury that many ‘experts’ considered safe was capable of causing an epidemic of a neurological disease.”*

A. Symptoms

Other authors have tried to specify typical symptoms for each metal. Because of the synergistic effects and simultaneous occurrence of several toxins at the same time. The best source of literature on the effects of specific metals on the system is the old homeopathic textbooks "materia medica" (Kent, Boericke)

I prefer to look at a client in a systemic way, not focusing on single issues. A manganese typical symptom (i.e. violent behavior) may be a lot more worrisome in a given patient than

their particular mercury related symptom (i.e. insomnia). However, the practical focus of detox should be almost always on the mercury first. If mercury is addressed appropriately, the manganese often leaves the body as a side effect of mercury detox. The opposite is not true. Any illness can be caused by, contributed to, or exaggerated by neurotoxins. Here is a short list:

- neurological problems: Fatigue, depression, insomnia, memory loss, blunting of the senses, chronic intractable pain (migraine, sciatica, CTS etc.), burning pain, paresthesia, strange intracranial sensations and sounds, numbness. Autism. Seizure disorder. Hyperactivity syndromes. Premature ejaculation and inorgasmia
- emotional problems: inappropriate fits of anger and rage, timidness, passivity, bipolar disorder, frequent infatuation, addictions, depression, dark mood, obsession, psychotic behavior, deviant behavior, psychic attacks, inability to connect with god, etc.
- mental problems: memory loss, thinking disorder, messy syndrome (cluttering), loss of intelligence, AD, premature aging
- GI problems: candida, food allergy, leaky gut syndrome, parasites, inflammatory bowel disease
- Orthopedic problems: joint arthritis, persisting musculo-skeletal pain, fibromyalgia, TMD, recurrent osteopathic lesions
- Immunological disorders (autoimmune diseases, hypothyroid disorders, MS, ALS, Sjogen's Syndrome, CFIDS, and MCS etc.)
- Cardiovascular disorders (vascular disease, arrhythmias, angina, increased heartbeat)
- Cancer –mercury, arsenic, copper etc. can be a trigger
- ENT disorders: chronic sinusitis, tinnitus, glandular swelling,
- Eye problems: macular degeneration (dry and wet), optic neuritis, iritis, deteriorating eye sight, etc.)
- Internal medicine problems: kidney disease, hypertension, hypercholesterinemia, syndrome X
- OB/gyn: difficulties of pregnancy, impotence, uterine fibroids, infertility, etc.

B. Diagnosis

- History of Exposure: (Did you ever have any amalgam fillings? How much fish do you eat and what kind? A tick bite? etc)
- Symptoms: (How is your short term memory? Do you have areas of numbness, strange sensations, etc).
- Laboratory Testing:
 - direct tests for metals: hair, stool, serum, whole blood, urine analysis, breath analysis
 - xenobiotics: fatty tissue biopsy, urine, breath analysis
 - Indirect tests: cholesterol (increased while body is dealing with Hg), increased insulin sensitivity, creatinine clearance, serum mineral levels (distorted, while Hg is an unresolved issue), Apolipoprotein E 2/4, urine dip stick test: low specific gravity (reflects inability of kidneys to concentrate urine), persistently low urine ph (metals only go into solution in acidic environments - which supports detoxing), urine porphyrins
- Autonomic Response Testing: (Dr. Dietrich Klinghardt M.D., Ph.D.)
- BioEnergetic Testing (EAV, kinesiology etc.)
- Response to Therapeutic Trial
- Functional Acuity Contrast Test (measure of Retinal Blood Flow)
- Non-specific neurological tests: upper motor neuron signs (clonus, Babinski, hyperreflexia), abnormal nerve conduction studies, EMG etc. non-specific MRI/CT findings: brain atrophy as in AD, demyelination

- Several "challenge tests" are used today. They generally involve measuring the urine metal content, then administering an oral or iv mobilizing agent and re-measuring the metal content in the urine after a few hours. Most well known is the DMPS challenge test: However, there is agreement amongst most researchers, that the urine Hg content does not reflect total body burden – only the currently mobilizable portion of Hg in the endothelium and kidneys. If nothing comes out, there can still be detrimental but non-responsive amounts of Hg in the CNS, connective tissue and elsewhere.
- I have developed a simple approach that works well. I use autonomic response testing (muscle biofeedback) to determine what metal is stored where and what detox agents would be most suitable for this individual. I obtain a hair sample and have it analyzed. It may or may not show any toxic metals. Metals reach the root of the hair via the blood stream. Hair only can show those metals that have been in the blood in the last 6 weeks. That means, hair only reflects acute toxicity or recently mobilized metals but not the true body burden. Then we embark on the detox and mobilizing program. In 6 weeks another hair sample is sent to the lab and analyzed. If for example manganese is now high, mercury starting to rise (mostly it is methyl Hg, that is reflected in hair), aluminum is at the same value as before, it means, that this program is starting to mobilize Mn and Hg, but not Al. Through minor adjustments and following the client closely, we observe as the levels in the hair may rise for months or years before returning to low or absent levels. That is the end point. At that time biochemical challenges with Ca EDTA, DMPS or DMSA can be valuable to see if there are still hidden pockets of metals somewhere in the system that have been overlooked with the other methods. In general, the hair-mineral analysis is often over interpreted. Hair minerals are a reflection of the toxic-metal induced distortion in mineral metabolism.

C. Treatment

Why would we want to treat anyone at all? Is it really needed? Can the body not eliminate these toxins naturally on its own?

First we need to consider a multitude of risk factors, which influence later decisions:

Here is a short list of independent **risk factors** which can either cause accumulation of metals in an otherwise healthy body - or slow down, or inhibit the body's own elimination processes.

- Genetics – Several genes are involved in coding for the production of inherent detox mechanisms. Example: ApoE being the major repair protein in neuronal damage and responsible for removing mercury from the intracellular environment. There are 4 different subtypes, one of them making the individual prone to accumulating Hg: (Danik, M. and Poirier, J. *Apolipoprotein E and lipid mobilization in neuronal membrane remodeling and its relevance to Alzheimer's disease. In: Brain Lipids and Disorders in Biological Psychiatry, edited by Skinner, E.R. Amsterdam: Elsevier Science, 2002, p.53-66.*) Also well known and studied are the individual genetic differences in glutathione availability. Several companies in the Integrative Medicine Field are offering genetic testing today. So far my clinical results were not impressive when I based my detox program on genetic testing only.
- prior illnesses (i.e. kidney infections, hepatitis, tonsillitis etc.)
- surgical operations (scars often restrict the detoxifying abilities of whole body sections, such as the tonsillectomy scar with its effect on the superior cervical ganglion - restricting lymph drainage and blood flow from the entire cranium)
- medication or 'recreational' drug use (overwhelming the innate detox mechanisms)
- emotional trauma, especially in early childhood. This issue is huge and almost never appropriately addressed
- social status (poor people may still drink contaminated water)

- high carbohydrate intake combined with protein malnutrition (especially in vegetarians)
- use of homeopathic mercury (may redistribute Hg into deeper tissues)
- food allergies (may block the kidneys, colon etc.)
- the patient's electromagnetic environment (mobile phone use, home close to power lines etc. Omura showed that heavy metals in the brain act as micro antennae concentrating damaging electro smog in the brain)
- constipation
- compromise of head/neck lymphatic drainage (sinusitis, tonsillectomy scars, poor dental occlusion)
- number of dental amalgam fillings over the patients life-time, number of the patients mothers amalgam fillings

Detox Methods

There are many considerations in choosing detox agents. After choosing the appropriate agent for the individual client and particular metal and exact chemical form of it, we have to consider the body compartment where the metal is stored. For example, the algae chlorella is ideal for removing virtually all toxic metals from the gut but has too little effect on mercury stored in the brain. Intravenous glutathione may reach the intracellular environment, even in the brain, but is fairly ineffective in removing mercury from the gut. Each agent has a primary place of action, which determines when, how much and for how long it is used. Agents that have multiple effects on compounds of different metals in the various body compartments are the basis for our detox program. Most specific agents are used for special situations only.

High protein, mineral, fatty acid and fluid intake

Rationale:

- Proteins provide the important precursors to the endogenous metal detox and shuttle agents, such as coeruloplasmin, metallothioneine, glutathione and others. The branched-chain amino acids in cow and goat whey have valuable independent detox effects. Amino acid supplements, especially with a concentrate of brached chain amino acids are valuable.
- Metals attach themselves only in places that are programmed for attachment of metal ions. Mineral deficiency provides the opportunity for toxic metals to attach themselves to vacant binding sites. A healthy mineral base is a prerequisite for all metal detox attempts (selenium, zinc, manganese, germanium, molybdenum etc.). Substituting minerals can detoxify the body by itself. Just as important are electrolytes (sodium, potassium, calcium, magnesium), which help to transport toxic waste across the extra cellular space towards the lymphatic and venous vessels.
- Lipids (made from fatty acids) make up 60-80 % of the central nervous system and need to be constantly replenished. Deficiency makes the nervous system vulnerable to the fat soluble metals, such as metallic mercury constantly escaping as odorless and invisible vapor from the dental amalgam fillings.
- Without enough fluid intake, the kidneys may become contaminated with metals. The basal membranes swell up and the kidneys can no longer efficiently filtrate toxins. Adding a balanced electrolyte solution in small amounts to water helps to restore intra-and extra cellular fluid balance

Pharmaceuticals

- **DMSA.** Developed in China in the late 50s. Action via sulfhydryl group. Needs to be given every 4 hours around the clock to prevent redistribution of Hg and lead into the CNS. Approved for use in lead toxicity. Causes major brain fog, memory problems during

detox, depression and in children sometimes seizure disorders due to redistribution of metals. Indiscriminate use in the US. Common dose: 50-100 mg q4h – 3 days on, 11 days off for 3-12 months

- **DMPS:** developed in Russia as further development of BAL. Available both injectable and oral. The oral form is the most effective oral chelator commercially available. 1 tabl TID. Common dosage: 3 days on, 11 days off. The injectable form can be used to mobilize Hg and lead from hard to reach places, such as the autonomic ganglia, joints and trigger points. The iv injection works primarily on the endothelium (several hundred square meters) and the kidneys. Common dosage: 3 mg/kg body weight once/month. The iv form should never be used unless the patient is “covered” with intestinal binding agents such as chlorella, cholestyramine, apple pectin or chitosan.
- **Desferal:** good subcutaneous detox agent for aluminum and iron. More severe possible anaphylactic reactions than with other common detox agents. Research by Canadian-German researcher Kruck showed good results with AD patients. Dosage: 1 vial/week s.c – 3 weeks on, 3 weeks off
- **Ca EDTA:** most information available at www.gordonresearch.com. Given as 1 minute push 5-10 ml once/week. Originally developed to remove calcium deposits, recently found to also be effective for mercury and other metals including aluminum. Side effects are so far underreported and can be serious –mostly due to redistribution. The more conventional use of sodium EDTA over a 2 hr period was used to increase nitric oxide in the arteries causing vasodilation and increased perfusion of diseased heart muscle.
- **Intravenous Vitamin C.** Recent book by Tom Levy, MD. Detoxes mercury, lead and aluminum mostly over the colon which is desirable. I use 37.5 g with 500 ml distilled water and 10 ml Ca gluconate over 1 hr. Can be used daily. Once a week is common, especially during amalgam removal. Irritating to veins. Causes hypoglycemia. No serious side effects. Safe to use for most dentists. Oral vitamin C works less effectively. Must be given to bowel tolerance.

Natural Oral Agents

Cilantro (chinese parsley)

This kitchen herb is capable of mobilizing mercury, cadmium, lead and aluminum in both bones and the central nervous system. It is probably the only effective agent in mobilizing mercury stored in the intracellular space (attached to mitochondria, tubulin, liposomes etc) and in the nucleus of the cell (reversing DNA damage of mercury). Because cilantro mobilizes more toxins than it can carry out of the body, it may flood the connective tissue (where the nerves reside) with metals that were previously stored in safer hiding places. This process is called re-toxification. It can easily be avoided by simultaneously giving an intestinal toxin-absorbing agent. A recent animal study demonstrated rapid removal of aluminum and lead from the brain and skeleton superior to any known other detox agent. Even while the animal was continuously poisoned with aluminum, the bone content of aluminum continued to drop during the observation period significantly.

Dosage and application of cilantro tincture: give 2 drops 2 times /day in hot water in the beginning, taken just before a meal or 30 minutes after taking chlorella (cilantro causes the gallbladder to dump bile - containing the excreted neurotoxins - into the small intestine. The bile-release occurs naturally as we are eating and is much enhanced by cilantro. If no chlorella is taken, most neurotoxins are reabsorbed on the way down the small intestine by the abundant nerve endings of the enteric nervous system). Gradually increase dose to 10 drops 3 times/day for full benefit. During the initial phase of the detox cilantro should be given 1 week on, 2 –3 weeks off. Fresh organic Cilantro works best (as much as person can compress in one hand), when given in hot Miso soup. Miso contains synergistically acting amino acids.

Other ways of taking cilantro: rub 5 drops twice/day into ankles for mobilization of metals in all organs, joints and structures below the diaphragm, and into the wrists for organs, joints and structures above the diaphragm. The wrists have dense autonomic innervation (axonal uptake of cilantro) and are crossed by the main lymphatic channels (lymphatic uptake).

Cilantro tea: use 10 to 20 drops in cup of hot water. Sip slowly. Clears the brain quickly of many neurotoxins. Good for headaches and other acute symptoms (joint pains, angina, headache): rub 10 –15 drops into painful area. Often achieves almost instant pain relief.

Chlorella:

Both *Chlorella pyrenoidosa* (better absorption of toxins, but harder to digest) and *Chlorella vulgaris* (higher CGF content – see below, easier to digest, less metal absorbing capability) are available. Chlorella has multiple health inducing effects:

- **Antiviral** (especially effective against the cytomegaly virus from the herpes family)
- **Toxin binding** (mucopolysaccharide membrane)
all known toxic metals, environmental toxins such as dioxin and others
- Repairs and activates the body's **detoxification functions**:
- Dramatically increases reduced glutathion,
- Sporopollenin is as effective as cholestyramin in binding neurotoxins and more effective in binding toxic metals than any other natural substance found.
- Various peptides restore coeruleplasmin and metallothioneine,
- Lipids (12.4 %) alpha-and gamma-linoleic acid help to balance the increased intake of fish oil during our detox program and are necessary for a multitude of functions, including formation of these peroxisomes.
- Methyl-cobalamin is food for the nervous system, restores damaged neurons and has its own detoxifying effect.
- Chlorella growth factor helps the body detoxify itself in a yet not understood profound way. It appears that over millions of years chlorella has developed specific detoxifying proteins and peptides for every existing toxic metal.
- The porphyrins in chlorophyll have their own strong metal binding effect. Chlorophyll also activates the PPAR-receptor on the nucleus of the cell which is responsible for the transcription of DNA and coding the formation of the peroxisomes (see fish oil), opening of the cell wall (unknown mechanism) which is necessary for all detox procedures, normalizes insulin resistance and much more. Medical drugs that activate the PPAR receptor (such as pioglitazone) have been effective in the treatment of breast and prostate cancer.
- **Super nutrient**: 50-60% amino acid content, ideal nutrient for vegetarians, methylcobalamin - the most easily absorbed and utilized form of B12, B6, minerals, chlorophyll, beta carotene etc.
- **Immune system strengthening**
- **Restores bowel flora**
- **Digestive aid (bulking agent)**
- **Alkalinizing agent (important for patients with malignancies)**

Dosage: start with 1 gram (=4 tabl) 3-4 times/day. This is the standard maintenance dosage for grown ups for the 6-24 months of active detox. During the more active phase of the detox (every 2-4 weeks for 1 week), whenever cilantro is given, the dose can be increased to 3 grams 3-4 times per day (1 week on, 2-4 weeks back down to the maintenance dosage). Take

30 minutes before the main meals and at bedtime. This way chlorella is exactly in that portion of the small intestine where the bile squirts into the gut at the beginning of the meal, carrying with it toxic metals and other toxic waste. These are bound by the chlorella cell wall and carried out via the digestive tract. When amalgam fillings are removed, the higher dose should be given for 2 days before and 2-5 days after the procedure (the more fillings are removed, the longer the higher dose should be given). No cilantro should be given around the time of dental work. During this time we do not want to mobilize deeply stored metals in addition to the expected new exposure. If you take Vitamin C during your detox program, take it as far away from Chlorella as possible (best after meals).

Side effects: most side effects reflect the toxic effect of the mobilized metals which are shuttled through the organism. This problem is instantly avoided by significantly increasing the chlorella dosage, not by reducing it, which would worsen the problem (small chlorella doses mobilize more metals than are bound in the gut, large chlorella doses bind more toxins than are mobilized). Some people have problems digesting the cell membrane of chlorella. The enzyme cellulase resolves this problem. Cellulase is available in many health food stores in digestive enzyme products. Taking chlorella together with food also helps in some cases, even though it is less effective that way. Chlorella vulgaris has a thinner cell wall and is better tolerated by people with digestive problems.

Chlorella growth factor

This is a heat extract from chlorella that concentrates certain peptides, proteins and other ingredients. The research on CGF shows that children develop no tooth decay and their dentition (maxillary-facial development) is near perfect. There are less illnesses and children grow earlier to a larger size with higher I.Q and are socially more skilled. There are case reports of patients with dramatic tumor remissions after taking CGF in higher amounts. In our experience, CGF makes the detox experience for the patient much easier, shorter and more effective.

Recommended dosage: 1 cap. CGF for each 20 tabl. chlorella

NDF and PCA

Both are extracts from Chlorella and Cilantro and very effective in detoxing. They are well tolerated, but very expensive

Garlic (*allium sativum*) and wild garlic (*allium ursinum*)

Garlic has been shown to protect the white and red blood cells from oxidative damage, caused by metals in the blood stream – on their way out – and also has its own valid detoxification functions. Garlic contains numerous sulphur components, including the most valuable sulph-hydryl groups which oxidize mercury, cadmium and lead and make these metals water soluble. This makes it easy for the organism to excrete these substances. Garlic also contains alliin which is enzymatically transformed into allicin, nature's most potent antimicrobial agent. Metal toxic patients almost always suffer from secondary infections, which are often responsible for part of the symptoms. Garlic also contains the most important mineral which protects from mercury toxicity, bio active selenium. Most selenium products are poorly absorbable and do not reach those body compartments in need for it. Garlic selenium is the most beneficial natural bioavailable source. Garlic is also protective for against heart disease and cancer.

The half life of allicin (after crushing garlic) is less than 14 days. Most commercial garlic products have no allicin releasing potential left. This distinguishes freeze dried garlic from all other products. Bear garlic tincture is excellent for use in detox, but less effective as antimicrobial agent.

Dosage: 1-3 capsules freeze dried garlic after each meal. Start with 1 capsule after the main meal per day; slowly increase to the higher dosage. Initially the patient may experience die-off reactions (from killing pathogenic fungal or bacterial organisms). Use 5-10 drops bear-garlic on food at least 3 times per day.

Fish oil:

It is clear that the high consumption of fish oil protects the client from the damage caused by the amalgam fillings. The same is true for the high intake of selenium.

The fatty acid complexes EPA and DHA in fish oil make the red and white blood cells more flexible thus improving the microcirculation of the brain, heart and other tissues. All detoxification functions depend on optimal oxygen delivery and blood flow. EPA and DHA protect the brain from viral infections and are needed for the development of intelligence and eye-sight. They also induce the formation of peroxisomes and helps protect them. The most vital cell organelle for detoxification is the peroxisome. These small structures are also responsible for the specific job each cell has: in the pineal gland the melatonin is produced in the peroxisome, in the neurons dopamine and norepinephrine, etc. It is here, where mercury and other toxic metal attach and disable the cell from doing its work. Other researchers have focused on the mitochondria and other cell organelles, which in our experience are damaged much later. The cell is constantly trying to make new peroxisomes to replace the damaged ones– for that task it needs an abundance of fatty acids, especially EPA and DHA. Until recently it was believed, that the body can manufacture its own EPA/DHA from other Omega 3 fatty acids such as fish oil. Today we know that this process is slow and cannot keep up with the enormous demand for EPA/DHA our systems have in today's toxic environment. Fish oil is now considered an essential nutrient, even for vegetarians. Recent research also revealed that the transformation humans underwent when apes became intelligent and turned into humans happened only in coastal regions, where the apes started to consume large amounts of fish.

The fatty acids in fish oil are very sensitive to exposure to electromagnetic fields, temperature, light and various aspects of handling and processing. Trans fatty acids, long chain fatty acids, renegade fats and other oxidation products and contaminants are frequently found in most commercial products. Ideally, fish oil should be kept in an uninterrupted cooling chain until it ends up in the patient's fridge. The fish-source should be mercury and contaminant free, which is becoming harder and harder. Fish oil should taste slightly fishy but not too much. If there is no fish taste, too much processing and manipulation has destroyed the vitality of the oil. If it tastes too fishy, oxidation products are present. There are 5 commercially available grades of fish oil. Grade I is the best.

Dosage: 1 capsule Omega 3 taken 4 times/day during the active phase of treatment, 1 caps. twice/day for maintenance

Best if taken together with chlorella

Recently a fatty acid receptor has been discovered on the tongue, joining the other more known taste receptors. If the capsules are chewed or liquid oil is taken, the stomach and pancreas start to prepare the digestive tract in exactly the right way to prepare for maximum absorption. To treat bipolar depression, post partum depression and other forms of mental disease, 2000 mg of EPA are needed/day (David Horrobin). For the modulation of malignancies, 120 mg of EPA 4 times/day are needed. The calculations can easily be done with the information given on the label.

Balanced electrolyte solution (Selectrolyte)

The autonomic nervous system in most toxic patients is dysfunctional. Electric messages in the organism are not received, are misunderstood or misinterpreted. Toxins cannot be shuttled through the extra cellular space. Increased intake of natural ocean salt (celtic sea salt) – and

avoidance of regular table salt - has been found to be very effective in resolving some of these problems. Most effective is a solution pioneered by the American chemist Ketkovsky. He created the formula for the most effective electrolyte replacement, which was further improved by Morin Labs, and is now called "selectrolyte".

Dosage: 1 tsp in a cup of good water 1-3 times/day. During times of greater stress the dosage can be temporarily increased to 1 tbsp 3 times/day

Adjuvant therapies:

Lymphatic drainage

Mobilized metals and toxins tend to get stuck in the connective tissue and lymph channels. They can no longer be reached by biochemical agents. A mechanical approach is needed. Dr. Vodder's MLD approach is very good. We are using a superb group of microcurrent instruments developed by a Japanese researcher. The results are often astounding. The device can also be applied transcranially to mobilize metals from the brain with ease and with no side effects, when the patient is simultaneously on a good detox program. I call this process electro mobilization.

Photomobilization

I found that the release of metals from the CNS can be rapidly achieved with the use of narrow band polarized light stimulation of the eyes. Each metal can be defined by its spectral emissions when it is heated up (Fraunhofer lines). When light of the exact same frequency is beamed into the eye (using a special instrument) the release of this exact metal from the intracellular environment into the blood stream is triggered.

Sauna therapy

Peer reviewed literature shows that sweating during sauna therapy eliminates high levels of toxic metals, organic compounds, dioxin, and other toxins. Sauna therapy is ideal to mobilize toxins from its hiding places. However, during a sauna, toxic metals can also be displaced from one body compartment into another. This means mercury can be shifted from the connective tissue into the brain. This untoward effect is completely prevented when the patient is on chlorella, cilantro and garlic. The addition of ozone can be used to deliver an effective anti-microorganism hit while in the sauna. The moment mercury and other metals are removed from the body, microorganisms start to grow. We use an ozone steam cabinet which allows us to combine the effects of hyperthermia and ozone therapy in a very safe and comfortable way.

Colon hydrotherapy

Colon hydrotherapy removes not only fecal matter from the bowel but also sludge and debris that has attached itself to the wall of the colon. It has been shown that these residues can be years even decades old and often leaked out toxic doses of many different chemicals during those years of residue collection. During a metal detoxification program, many toxins appear on the bowel surface and shifted from bowel surface into the fecal matter. However, since many of the toxins are neurotoxins, and the colon is lined with nerve endings, many of the mobilized toxins are reabsorbed into the body on the way down. To intercept these toxins while in the colon, colon hydrotherapy is the ideal method.

Recommended use: 1-2 colonics per week during active phase of detox.

Acupuncture and Neural therapy

Both are closely related techniques that balance the autonomic nervous system (ANS). Compartmentalized metals are often trapped because of specific dysfunctions of the ANS. Both can be resolved with either technique.

Exercise

To facilitate in the detoxification process, exercise is absolutely needed. Many patients with chronic disease are unable to engage in vigorous exercise e.g. jogging. We help our clients to find the right level of exercise appropriate to their level of illness. Without exercise,

mobilized toxins accumulate in the connective tissue, kidneys, lungs and skin and can cause a new set of symptoms and perpetuate the patient's illness. A good exercise program should include 3 components: a) muscle strength training b) aerobic training c) stretching.

Recommendation: 20 minutes twice a day is the minimum requirement during the active detox phase

Kidney protection

When metals are mobilized a certain portion travels through the kidneys. The kidneys may react with swelling of the basal membranes and decrease in filtration rate. To prevent damage to the kidneys the patient has to drink increasing amounts of water (with electrolyte solution). The kidney has a filtrating surface equal to a ping-pong table, the gut that of a soccer field. The nephrons - like brain cells - live long and cannot be replaced once damaged. The gut membranes are renewed every 3 days. It is foolish to push toxic metals through the kidneys and wise, to push them out through the gut. Chlorella pulls toxic metals through the mucosal surface of the intestines from the blood and protects the kidneys.

Additional recommended supplement: Renelix 15 drops three times a day

Bowel flora:

When metals are moved out of the body through the feces, the bowel flora is damaged. During the active phase of the detox, chlorella works as an excellent pre-probiotic: It selectively feeds the good bowel flora. In addition, we recommend taking HLC (Acidophilus/Bifidus) two capsules with each meal.

Psychological issues:

There is a strange but largely overlooked association of metal toxicity and psychological issues.

I found that often when the client has a breakthrough in psychotherapy her/his symptoms become temporarily worse. This is often falsely believed to be a healing crisis (immune system activation). In this situation the client's urine will often show high levels of toxic metals without a provocative agent being used. The psychological intervention has led to a release of deeply stored toxins. I developed a targeted rapid approach to resolve related psychological issues called "applied psychoneurobiology" or APN, which is a form of muscle biofeedback assisted counseling.

The Klinghardt Axiom and the Triad of Detoxification:

By experience I found the following to be true: each unresolved psycho-emotional conflict or each unresolved past trauma causes the body to lose the ability to successfully recognize and excrete toxic substances. Also each entanglement or limiting connection with another family member, unhealed relationships and unhealthy, non-life affirmative attitudes limit the organisms ability to detoxify itself. In fact, the type of retained metal or other toxin and the body compartment, where it is stored, can be predicted with a high degree of certainty by knowing what type of unresolved psycho- emotional conflict is present in a client and at what age the associated event occurred.

For each unresolved psychological issue there is an equal amount of toxins stored in the body.

When the patient starts to effectively detoxify on the physical level, repressed emotional material moves from the unconscious to the more superficial subconscious part of the brain. Instead of feeling better from the lessened toxin burden, the patient will often start to experience unpleasant inner states of being, e.g. tension, anxiety, sadness or anger. This is commonly mistaken as a side-effect of the medications used for detoxification or as an

unspecified “detox reaction”. When this emotional material is not dealt with, the body stops releasing further toxins - the tension or discrepancy between the unresolved psycho-emotional material and the already released physical toxins is too large. Both are out of balance – the toxin container is less full than the container with the unresolved emotions. Unless appropriate psychological intervention is chosen as the next step in treatment, detoxification cannot progress.

Things are further complicated by the increased activity of microorganisms such as fungi and molds, bacteria, viruses, prions and different species of mycoplasma during a detox program. Insecticides, herbicides, wood preservatives, mercury, and other toxins are used by us with a single purpose – to stop the growth of microorganisms and other unwanted pests in the outside world (farm fields, materials and furniture made from wood, to preserve food, etc.). When these toxic agents have entered our inner environment (via the food chain, air, water, skin contact or amalgam fillings) they have the same effect in us. They stop the growth of microorganisms – at a price: they also harm the cells of our body. As the patient is detoxifying from these agents, microorganisms may grow out of control, since the growth of the microbes is no longer inhibited by the poison. Paradoxically, it is the toxin induced impairment of our immune system that enables the microorganisms to enter our system in the first place. Once established, they are hard to conquer and removing the causative toxin is no longer enough. The organism needs help with the elimination of the infectious agents.

The flare-up of previously hidden infections occurs regularly during mercury detoxification. Historically, this fact is well known: mercury was used quite effectively for treatment of the bacterial spirochete causing syphilis. Some people died from side effects of the treatment, but many people lived after eradication of the infection. The reverse happens, when we withdraw mercury from the body: spirochetes, streptococci and other microorganisms present in many hiding places (such as the red blood cells, the jaw bone, inside the lateral canals of a root filled tooth, inside the calculus of a bone spur, in the soft tissues of a whip-lash injured neck, in the gray matter of the brain etc.) may start to grow and extend their hold on us. Microorganisms use their respective neurotoxins to gradually achieve control over our immune system, our behavior, our thinking, and every aspect of our biochemistry. It is the microbial neurotoxins that are responsible for many, if not most poison related symptoms, not the poisons themselves.

For each equivalent of stored toxins there is an equal amount of pathogenic microorganisms in the body (Milieu theory of Bechamp)

Patients who are infected with *Borrelia burgdorferi*, the spirochete which causes Lyme disease, often are unaware of their illness. They may have some joint pains or fatigue, but nothing that alarms them. However, frequently they start to become more symptomatic during or after a successful mercury detoxification program: they may experience MS-like symptoms such as muscle weakness, increased levels of pain, numbness, fatigue or mental decline. The same is true for infections with mycoplasma, streptococci, tuberculosis and others. Therefore, it is important to anticipate the temporarily enhanced growth of microorganisms during a successful detox program. There is a latent period in which the microorganisms are already recovered, but the host's immune system is not. During this time the practitioner has to prescribe appropriate antifungal, antibacterial, antiviral, and antimycoplasma medications. I prefer natural solutions which are often sufficient - or even better in the long run than medical drugs - such as freeze dried garlic, bee propolis, colloidal gold, and microbial inhibition microcurrent frequencies.

The immune system in a client with unresolved psychoemotional material and compartmentalized toxins is unable to recognize and eliminate the microorganisms present in the toxic areas of the body. Those areas serve as hiding and breeding places for these organisms. Unfortunately they have been termed “stealth organisms”, implying that they behave in secret unpredictable ways and that they have learned to evade a perfectly evolved and functional immune system. There is a fear, that they are slowly gaining control over us and that there is really nothing we can do about it. We can, if we understand the triad of detoxification.

The Detoxification Axiom:

For each unresolved psycho-emotional conflict or trauma there is an equivalent of stored toxins and an equivalent of pathogenic microorganisms. To successfully detoxify the body the three issues have to be addressed simultaneously.

The triad of detoxification:

- Detoxification of the physical body
- Treatment of latent microorganisms and parasites
- Treatment of unresolved psycho-emotional issues

D. Conclusion

Detoxing the patient from heavy metals can be an elegant smooth experience or a rollercoaster ride. The problems that occur can always be resolved with the use of autonomic response testing (ART). Without the use of ART and addressing the psychological issues with APN, embarking on a heavy metal detox program can be unsatisfying, incomplete, sometimes dangerous and may not lead to resolution of the underlying medical condition. We recommend that each patient undergoing a metal detox program stays under the supervision of an experienced and qualified practitioner. There are many more ways to approach metal detox. However, many roads I have witnessed also did not lead to complete resolution of the underlying problem and are shortsighted. The practitioner should avoid short term interventions for long term issues and should not underestimate the depth and magnitude of the underlying problem.

E. References and recommended reading about mercury from dental fillings and related issues

The references for chlorella, CGF, Fish oil, cilantro, garlic, ART, APN and others can be obtained from the American Academy of Neural Therapy: aant@neuraltherapy.com and at www.neuraltherapy.com

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