Gentle Detoxification- The Use of Natural Chelating Agents

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The Metal Binding of Nutrients

Nutritional chelation is one of the oldest means to detoxify the body, and there are various means of natural metal binding.

The sulfhydryl-containing amino acids, also called the thiol groups are natural chelators capable of binding heavy metals. A **thiol** is a compound that contains the functional group –SH, which is composed of a sulfur atom and a hydrogen atom. Being the sulfur analogue of an alcohol group (-OH), this functional group is referred to as a *thiol group* or a *sulfhydryl group*. More traditionally, thiols are referred to as **mercaptans**. The term *mercaptan* comes from the Latin *mercurius captans*, meaning 'laying hold of mercury.' As the name suggests, the –SH group binds tightly to the element mercury. It can, of course, bind to other elements such as lead. Synthetic mercaptans are DMPS (Dimercaptopropansulfonic acid) or DMSA (Dimercaptosuccinic acid). A nutritional mercaptan is the amino acid cysteine.

Detoxification can also be achieved through antioxidants including Vitamin C, E and nutrients such as the bioflavanoids. Dr. Earl B. Dawson of the University of Texas Medical Branch at Galveston found that adult smokers who took 1,000 mg daily of Vitamin C dramatically lowered lead levels in their blood within one week. Dr. Dawson reported that Vitamin C was given to 75 men aged 20 to 35 years. The men were randomly divided into three groups, receiving either 200 mg/day, 1,000 mg/day or a placebo which had no Vitamin C content. The study lasted one month, and a weekly evaluation by Dr. Dawson and colleagues found no changes in the placebo test group or in the group receiving only 200 mg daily. But the group receiving 1,000 mg/day saw blood levels of lead drop sharply after only one week of the vitamin supplementation. Their blood lead levels remained low throughout the remainder of the test period.[1]

Scientists at the University of California at San Francisco also found that Vitamin C helps reduce dangerous blood levels of lead. Dr. Joel A. Simon and Dr. Esther Hudes revealed that high dosages of Vitamin C are associated with reduced blood levels of lead in both young children and adults. The researchers said they believe the results of their studies on lead in blood can have "public health implications" for controlling lead toxicity, particularly for children. Their studies indicated that high levels of Vitamin C in blood correlated with lower levels of lead in blood.[2]

"Vitamin C levels are an important independent correlate of blood lead levels among Americans," says Joel Simon, MD, MPH, SFVAMC staff physician and UCSF assistant professor of medicine, epidemiology & biostatistics. "To our knowledge, this report is the first population-based study to establish such an association. If a causal relation is confirmed, increased consumption of ascorbic acid may have public health implications for the prevention of lead toxicity."

Much information has been accumulated by ortho-molecular medicine to demonstrate that mineral replacement or detoxification through nutrients takes place. Shinji Yoneda and Kazuo T. Suzuki of the Faculty of Pharmaceutical Sciences, Chiba University, Japan reported in Toxicology and Applied Pharmacology, Volume 143, Issue 2, April 1997, Pages 274-280 that the toxicity of mercury (Hg) can be reduced by co-administration with selenium. The study of Greenland animals by Dietz et al (see Abstract below) suggests that methyl mercury is detoxified by a chemical mechanism involving selenium.

The role of chelating agents for the prevention, intervention, and treatment of exposures to toxic metals was the topic of a conference held at the National Institute of Environmental Health Sciences, 22-23 September 1994. The objective of the conference was to review experimental and clinical studies concerned with the effectiveness and potential toxicity of chelating agents used to reduce the body burden of various metals and to identify research needs in the area of chelation. The conference was prompted by emerging evidence that low-level exposures to toxic metals may result in toxic effects not previously recognized.

The Case of Oliver S

I have used nutritional intervention in the treatment of chronic metal exposure long before I got involved in the teaching of synthetic chelation protocols. One of my most memorable cases was that of Oliver S., a Dutch teenager suffering from aplastic anemia. The cause was

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Let me continue in first person, simply because this is more than a dramatic case.

'I went into his room, saw this comatose young man and my heart sank. I went out to look at his charts, talked with the nurses and a doctor whom I considered a friend. He advised me to stay out of this hopeless case. With this thought I went home and then my daughter, friend of his friend, all of about the same age, said, "You must, at least try and I will help." So I got my case of nutritional supplies and asked her to come along. How else do you respond as a parent?

After we had received the consent of all involved, we started. Since Steve was on feeding tubes, we added amino acids and a simple multimineral, vitamin E and vitamin C under his tongue, every half an hour or so. We worked through the night, taking turns. We sat on his bed and we talked, we did not pray as one does in church, but we provided energy and loving thoughts.

I took his blood, went to the laboratory to spin it down, separating cells. We did metal testing, and found great deficiencies and intoxications and stepped up the simple program, meaning we supplied the same nutrients more often. At that time (early 1990s), IV nutrition or chelation was looked upon hesitantly and I didn't know what else to do. Nobody wanted to get involved in anything considered 'risky'.

It took about 24hrs of continued support until he woke.

We continued, and after one week, the day of his planned funeral, he was released from the hospital. He improved and went on with schooling, later getting in some university program."

Nutritional support does not have to be complicated or expensive. It is important, however, that the nutrients are delivered in a fashion that allows appropriate absorption. Since the beginning of orthomolecular medicine, we have seen a phenomenal expansion of nutritional supply companies, and nearly all of them became tremendously effective in marketing. Do we really need to provide the patient with expensive zinc orotate or something of that order when the simple and inexpensive zinc gluconate can do? A deficient bodily system in need of a given nutrient will take and synthetize whatever comes along. For instance, Vitamin C can be given as ascorbic acid. One teaspoon dissolved in water provides about 4gram of vitamin C. It is much more inexpensive than all the other products on the market. The highly effective antioxidant Glutathion, which is not well absorbed when taken by mouth, can be synthesized from the amino acids L-cysteine, L-glutamic acid, and glycine.

The following simple detoxification program can be adjusted for children or sensitive patients, depending on need. It should be noted that excessive vitamin C or magnesium will cause diarrhea. If that happens, stop providing the nutrient until the stool is normal again and then resume with a lower dose. While severely ill patients often have high requirements for vitamin C and other nutrients, bowel function can be used for monitoring nutritional needs, but it is safe to start with low doses and increase accordingly. Most importantly, the patient must have adequate fluid consumption to support renal function.

Oral Nutritional Detox Program for Adults, 3 months or longer

1. Probiotics: 1 capsule 3x daily, 30 min before meals
2. Amino Acid complex, 1 capsule 3x daily, 30 min before meals
3. Vitamin C, 1000mg 3x daily or ½ teaspoon ascorbic acid or Natriumascorbat, 2x daily
4. Vitamin E, 200mg 3x daily (taken with Vit.C)
5. Carrot juice and/or tomato juice, 1/2 to one glass, mornings and noon
6. Magnesium before bedtime, depending on need
7. Zinc and/or Selenium as needed

To assess the metal status, a hair mineral analysis is recommended to check long term exposure to metals. Hair analysis provides some nutritional information i.e. how nutrient absorption functions. In Western populations, nutritional deficiencies are rarely due to a lack of food. Malnutrition due to processed food may be the cause, but in general nutritional deficiencies are mostly linked to digestive disorders. Alcohol abuse and smoking are common causes of biochemical imbalances, leading to nutritional deficiencies. Improper infant nutrition i.e. too early introduction to solid food easily disturbs digestive functions, resulting in an inability to properly detoxify.

Blood testing provides important information about acute nutritional deficiencies and intoxications, but is a poor parameter to locate chronic intoxication.

Urine alone is not a good indicator of a nutritional deficiency or a chronic metal intoxication.

Research:

The following research abstracts speak for themselves (*italics provided by the author*); but clearly more analytical and clinical proof is needed.

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Dietz R., Riget F, Born E.W. **An assessment of selenium to mercury in Greenland marine animals.** The Science of The Total Environment, Volume 245, Issues 1-3, 17 January 2000, Pages 15-24

Abstract
Information on mercury and selenium molar relation in muscle, liver and kidney tissue of Greenland marine animals is presented. In the majority of the samples selenium was present in a molar surplus to mercury. This was most clear in molluscs, crustaceans, fish and seabirds. A 1:1 molar ratio was found in tissues of marine mammals with high mercury concentrations (above approx. 10 nmol/g). This was most clearly demonstrated for liver and kidney tissue of polar bear and for ringed seal with high mercury concentration in the liver. These findings support previous results found in liver tissue of marine mammals, suggesting that methyl mercury is detoxified by a chemical mechanism involving selenium. If the anthropogenic release of mercury to the environment increases in the future due to increasing energy demands, species such as polar bears and seals with high tissue mercury concentrations should be monitored to elucidate whether this protective mechanism can be maintained in target organs.

Ercal N, Gurer-Orhan H, Aykin-Burns N.**Toxic metals and oxidative stress part I: mechanisms involved in metal-induced oxidative damage.** Curr Top Med Chem. 2001 Dec;1(6):529-39.

Abstract
Toxic metals (lead, cadmium, mercury and arsenic) are widely found in our environment. Humans are exposed to these metals from numerous sources, including contaminated air, water, soil and food. Recent studies indicate that transition metals act as catalysts in the oxidative reactions of biological macromolecules therefore the toxicities associated with these metals might be due to oxidative tissue damage. Redox-active metals, such as iron, copper and chromium, undergo redox cycling whereas redox-inactive metals, such as lead, cadmium, mercury and others deplete cells' major antioxidants, particularly thiol-containing antioxidants and enzymes. Either redox-active or redox-inactive metals may cause an increase in production of reactive oxygen species (ROS) such as hydroxyl radical (HO.), superoxide radical (O2.-) or hydrogen peroxide (H2O2). Enhanced generation of ROS can overwhelm cells' intrinsic antioxidant defenses, and result in a condition known as "oxidative stress". Cells under oxidative stress display various dysfunctions due to lesions caused by ROS to lipids, proteins and DNA. Consequently, it is suggested that metal-induced oxidative stress in cells can be partially responsible for the toxic effects of heavy metals. Several studies are underway to determine the effect of antioxidant supplementation following heavy metal exposure. Data suggest that antioxidants may play an important role in abating some hazards of heavy metals. In order to prove the importance of using antioxidants in heavy metal poisoning, pertinent biochemical mechanisms for metal-induced oxidative stress should be reviewed.

Patrick L. **Toxic metals and antioxidants: Part II. The role of antioxidants in arsenic and cadmium toxicity.** Altern Med Rev. 2003 May;8(2):106-28.

Abstract
Exposure to toxic metals has become an increasingly recognized source of illness worldwide. Both cadmium and arsenic are ubiquitous in the environment, and exposure through food and water as well as occupational sources can contribute to a well-defined spectrum of disease. The symptom picture of arsenic toxicity is characterized by dermal lesions, anemia, and an increased risk for cardiovascular disease, diabetes, and liver damage. Cadmium has a significant effect on renal function, and as a result alters bone metabolism, leading to osteoporosis and osteomalacia. Cadmium-induced genotoxicity also increases risk for several cancers. The mechanisms of arsenic- and cadmium-induced damage include the production of free radicals that alter mitochondrial activity and genetic information. The metabolism and excretion of these heavy metals depend on the presence of antioxidants and thiols that aid arsenic methylation and both arsenic and cadmium metallothionein-binding. *S-adenosylmethionine, lipoic acid, glutathione, selenium, zinc, N-acetylcysteine (NAC), methionine, cysteine, alpha-tocopherol, and ascorbic acid have specific roles in the mitigation of heavy metal toxicity. Several antioxidants including NAC, zinc, methionine, and cysteine, when used in conjunction with standard chelating agents, can improve the mobilization and excretion of arsenic and cadmium.*

References:

1) Dawson et al. Journal of the American College of Nutrition in 1999. http://www.pslgroup.com/dg/69f56.htm
2) UCSF News Office, 1999 http://pub.ucsf.edu/newsservices/releases/2004010728/

For more information:

The above is an An excerpt from the new book TOXIC METALS AND ANTIDOTES, available through *Micro Trace Minerals, P.O.Box 4613, Boulder, Colorado 80306-4613. USA www.microtrace.eu or eblaurockbusch@googlemail.com.* ◆