TRACE ELEMENTS

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Hormones and Nutrition

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I am often asked about the connection between minerals and hormones. One common question is, if minerals are affected by hormones can minerals in turn affect hormone levels?

Hormones influence the levels of minerals in the cells, blood, urine and other tissues throughout the body due to their impact on mineral absorption, excretion, distribution and redistribution or translocation to various cellular and tissue compartments. Minerals in turn can impact hormones by stimulating endocrine secretions, activity, cellular transport and tissue binding sites or cellular receptors.

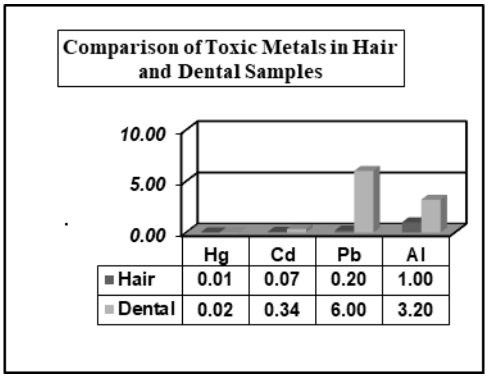
The relationship between iodine and the thyroid is well known and is required for thyroid hormone synthesis, but many other mineral-hormone relationships exist. A double-blind longitudinal study of women suffering from premenstrual syndrome (PMS) was reported by researchers from Johns Hopkins Health System. They found significant improvement of PMS symptoms in women who took nutritional supplements compared to those who took no supplements. Another study by Baylor Medical College found that women have an abnormally low zinc level during their symptomatic PMS phase. Their study suggests that since zinc is necessary for the production and secretion of progesterone and that too little zinc causes a reduction of progesterone during PMS and thereby altering brain chemistry, such as endorphin production. HTMA has shown a zinc deficiency in children of short stature which also correlated with low zinc in blood analysis. When these children were supplemented with oral zinc therapy their growth rate improved along with increased testosterone, growth hormone and somatomedin C levels. Hair and blood zinc level increased as well. Needless to say, other nutrient-hormone relationships exist, such as vitamin D and parathyroid activity. Copper, selenium and the thyroid. Chromium, zinc, magnesium and insulin, pantothenic acid and adrenal function. Riboflavin is known to affect the release of ACTH by the pituitary. Iron is required for the synthesis of epinephrine and norepinephrine.

Heavy Metals and HTMA

Another question often asked, why do we see heavy metals show up on a patient's retest when significant amounts were not reported on their initial test results?

Heavy metals have several different storage sites in the body. When exposure to a heavy metal or metals occur, the body's first response is an attempt to eliminate it from circulation. However, if there is a high exposure or recurring exposure that overwhelms the body's capability to respond in this manner, then the metal is sequestered as much as possible. In this case, they are first sequestered in tissues, or organs such as fat, liver, spleen, kidneys etc. Because lead and cadmium are bone seekers, they will eventually be transported and stored in osseous tissues. More than ninety percent of the lead in the body is found in bone. If the exposure to these metals has occurred in the past, a year or two previously for instance, the first HTMA may not show significant levels. They will eventually be revealed as the metal is mobilized from the storage sites for elimination. Fluctuation of heavy metals from one test to another can indicate removal from these storage sites.

Our study comparing heavy metals in dental samples to hair mineral levels illustrates the sequestering of heavy metals. Dental samples were collected along with hair samples for comparative analysis. The following graph show the results of one study. Since cadmium, lead and aluminum are bone seekers we can see a high level found in the dental sample. Mercury not being a bone seeker would not be expected to be present in significant amounts in dental or bone since it has an affinity for soft tissue, such as kidney, liver, etc…



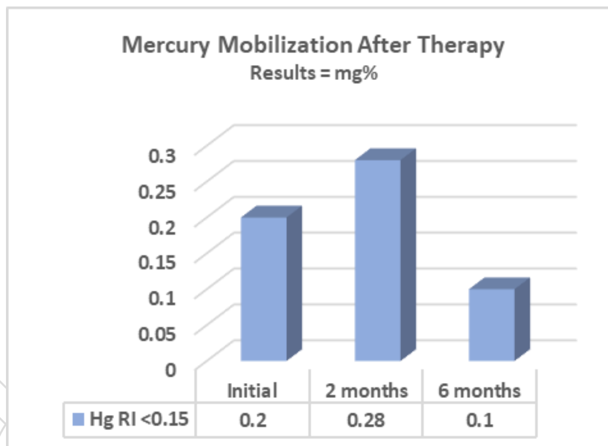
The cadmium content of the tooth in this comparison is almost five times the cadmium content of the hair sample, with over thirty times the lead. Studies of several other comparisons revealed similar findings.

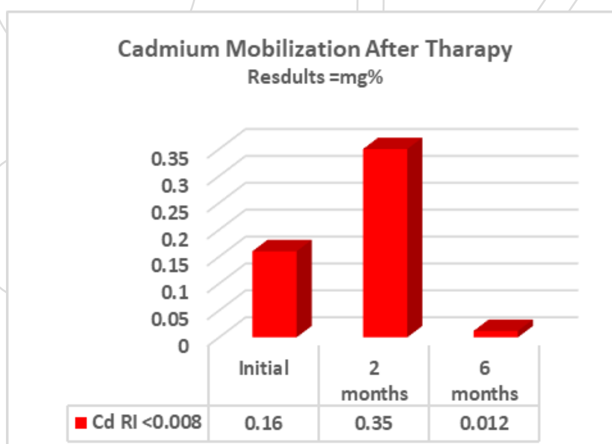
When heavy metals are found in the HTMA test results, will the recommendations in the lab report aid in removing them or is a specific heavy metal elimination protocol required?

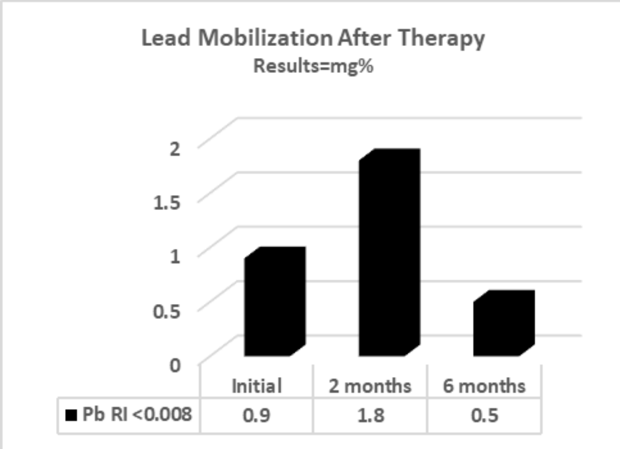
Recommendations in the reports from TEI take into consideration the patients overall metabolic profile including heavy metal status. Many practitioners may place a major emphasis simply on the presence of heavy metals from HTMA studies. However, other issues in the mineral pattern may be much more important to deal with. For example, if a patient is showing elevated mercury in conjunction with a severe copper deficiency, a generalized chelation protocol to address the mercury may also remove copper further exacerbating a copper deficit. In such an instance dealing with the copper deficit is more important than addressing the mercury exclusively. Often heavy metal accumulation or retention occur due to an imbalance in the biochemistry and may be a secondary issue. Also, heavy metal removal from tissues requires an ability of the body to remove it from tissue storage sites. These metals are not merely washed out of tissue but must be bound to protein ligands that attach to them for mobilization and transport to excretory organs. Detoxification is therefore protein dependent. The detoxification pathways of the excretory organ involved must then be efficient, after the metal is transported to the specific site for removal. The liver is the major excretory organ for toxic chemicals as well as excess copper, iron, lead and cadmium. The kidneys are the major excretory organs for mercury and to some degree for cadmium and lead. If the ability of the liver and kidneys are insufficient, then mobilizing heavy metals from tissues would only lead to more of a burden on these organs. Therefore, the overall ability of the body to mobilize and excrete heavy metals must be addressed.

The above comparison of the dental samples to HTMA results illustrates that even though the cadmium was elevated in the HTMA we would expect the cadmium level to increase as mobilization and excretion occurs. Over the course of therapy, the level of cadmium could rise and fall on subsequent tests. This would depend upon how much is present in storage as well as the priority of the body in mobilizing the metal in conjunction with lead. Eventually we would see the level of cadmium fall to within or below the cautionary reference interval. This of course would be seen with lead excretion as well even though the lead was not significantly elevated in the initial HTMA.

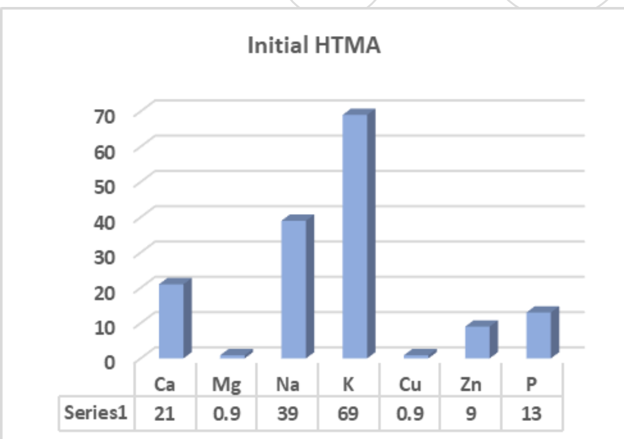
The illustrations below show the mobilization of heavy metals in an actual case study. The initial HTMA revealed a slight elevation of mercury, as well as the presence of cadmium and lead. The second column shows the impact after two months of therapy based upon the overall metabolic profile of the patient. The elevation of these metals indicate that more was present than indicated on the initial test due to their rise during therapy. Further testing and therapy revealed a reduction of heavy metals as the excess body stores are being eliminated.

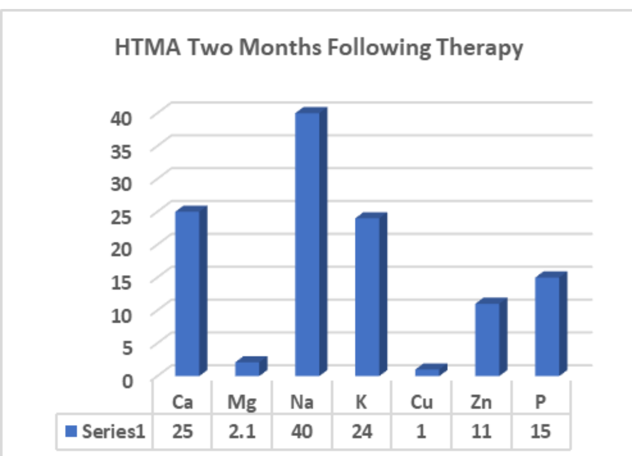






The next two charts show some of the significant mineral patterns found in the patients initial HTMA. The second chart shows changes in the mineral pattern following two months of therapy. One important aspect to note is the significant change in the sodium-to-potassium (Na/K) ratio. Initially the Na/K ratio was only 0.56:1. With therapy, the ratio increased three hundred percent to 1.66:1. Improvement in adrenal activity is essential for proper liver and renal function, protein synthesis, promoting heavy metal mobilization and removal.





The bottom line regarding heavy metal removal, is that the approach we have developed at TEI is extremely efficient and safe in mobilizing, excreting and detoxing heavy metals. It also allows the body to prioritize the detox of multiple heavy metals based upon the capability of each individual's unique metabolic status.

The dietary recommendations and specific dietary supplement recommendations in the report is sufficient for heavy metal mobilization and removal in the majority of individuals. By balancing the individual's metabolic profile, heavy metal removal will usually occur. This process enhances the body's ability to detox rather than trying to force a removal of heavy metals which could be harmful.

Case Studies of Past Heavy Metal Exposure

Lead Toxicity - Five Years Later

Ballardie, et al. reported the case of a war veteran presenting symptoms of abdominal cramps, morning stiffness, fatigue and paraesthesia with myoclonic jerks that progressed over a period of several years. Blood lead levels were not elevated, but symptoms of heavy metal poisoning were present. Biopsies showed abnormal mitochondria in liver and kidney tissues. Analysis of these tissues revealed lead and uranium levels up to one-hundred times higher than controls. For this individual, chelation therapy to date has resulted in the removal of twelve milligrams of lead, which is twenty-times higher than the amount required for toxicity. This study shows that blood levels of heavy metals after exposure do not adequately reflect tissue concentrations and that symptoms can persist years after an exposure. Ballardie, FW, et al. A man who brought the war home with him. Lancet, 372,2008.

Lead and Pregnancy

We are often asked about starting rebalancing programs during pregnancy. Some are concerned that heavy metal mobilization may occur during metabolic rebalancing. However, the fact is, even if therapeutic rebalancing is not undertaken, if heavy metals are present within the mother they can still be mobilized during pregnancy. These reports describe instances of lead mobilization in two mothers who had on-going and previous lead exposure. The first case involved an ongoing lead exposure in an expectant mother who was found to be anemic during her twenty-third week of gestation. Blood lead was slightly elevated at 31 mcg/dl (upper limit 25 mcg/dl). The mothers lead level was 75-85 mcg/dl after the baby was delivered by Cesarean section and the infants blood lead level was elevated as well. The source of the lead was from fifteen-year-old bullet fragments located in her lumbar region.

Another case involved a mother who had been exposed to lead seven years prior to conception. During pregnancy her blood lead level increased to 81 mcg/dl. The increase in lead was due to increased bone resorption during pregnancy. Raymond, LW, et al. Maternal-fetal lead poisoning from a 15-year-old bullet. J.Matern.Fetal Neonat.Med 11,1, 2002. Riess, ML, et al. Lead poisoning in an adult: Lead mobilization by pregnancy? J.Gen.Intern.Med. 22,8, 2007.
Comment: Lead and other heavy metals within the body can be present due to previous exposure, sometimes years previously. It is essential for those who want to become pregnant to be screened for the possibility of toxicities. If found to be elevated, it would be warranted to rebalance the chemistry in order to not only improve their health in general but to mobilize and excrete heavy metals prior to conception. However, from the present studies if heavy metals are found during pregnancy it would be wise to implement therapy in order for them to be excreted thereby reducing their exposure to the fetus.

Nutrition and Heavy Metal Removal

Elevated Heavy Metals in Hair Reduced with Nutritional Supplementation

An excess of toxic elements can cause impairments of metabolism particularly in the presence of nutrient mineral deficiencies. Hair tissue mineral analysis was performed on 120 individuals that included both sexes. Supplementation of magnesium and vitamin B6 was implemented in the treatment group and placebos in the control group. Supplementation was taken for three months. A repeat hair tissue mineral analysis revealed a positive influence as a result of supplementation. Magnesium levels were increased in the hair along with a significant reduction of the heavy metals lead and cadmium. Kozielec, T., et al. The Influence of Magnesium Supplementation on Concentrations of Chosen Bioelements and Toxic Metals in Adult Human Hair. Magnesium and Chosen Bioelements in Hair. Mag. Res. 17,3, 2004.

Reduction of Hair and Red Blood Cell Lead and Cadmium Following Nutritional Supplementation

A study was performed on 174 children to measure the concentrations of the heavy metals, cadmium and lead. Nutrient minerals calcium, magnesium, copper, zinc and iron were also tested. The study was performed to establish a relationship between elements in the serum, red blood cells and hair. Serum and RBC concentrations of lead and cadmium were within maximum allowable levels, but hair levels exceeded maximum levels. Children who were found to have elevated levels of lead and cadmium were supplemented with magnesium and vitamin B6. Follow-up tests showed a marked reduction in the lead and cadmium concentration in the hair and erythrocytes. Kedzierska, E. Concentrations of Selected Bioelements and Toxic Metals and Their Influence on Health Status of Children and Youth Residing in Szczecin. Ann.Acad.Med.Stetin. 49, 2003.