

## **NEWS UPDATES - FOR THE HEALTHCARE PROFESSIONAL**

January - December 2006

### **Hair Mineral Analysis, A Noninvasive Bio-Monitor of Environmental Exposure**

Hair samples were collected and analyzed from five countries with known arsenic sources, both low and high. Countries included the United States, Canada, People's Republic of China, Bangladesh and Nepal. Hair arsenic concentrations in all hair samples correlated with the amount of arsenic in drinking water and revealed the low intake of selenium in areas of high arsenic concentrations. Selenium can be protective against arsenicosis by its binding of arsenic. Selenium also increases glutathione peroxidase activity and reduces arsenic-induced oxidative stress. Pallholz, JE, et al. Arsenic and Selenium in Human Hair; A comparison of Five Countries With and Without Arsenicosis. *Biol. Trace Elem. Res.* 106, 2, 2005.

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### **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. Repeat hair 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. Koziolec, 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.

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### **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.

## **Hair Mineral Patterns Reflect Disturbances in Endocrine Activity Related to Bone Metabolism**

A study was conducted on 900 women whose ages were greater than 40 years. Investigations of these patients with recognized endocrinopathies that included hyperthyroidism, hyperparathyroidism and hypo-parathyroidism and osteomalacia resulted in statistical support for the hypothesis that hair mineral concentrations of calcium, phosphorus as well as other trace elements are influenced by these diseases. Miekeley, N., et al. Elemental Anomalies in Hair as Indicators of Endocrinologic Pathologies and Deficiencies in Calcium and Bone Metabolism. *J. Trace Elem. Med. Biol.* 15,1, 2005.

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## **Hair Mineral Patterns and Body Mass Index (BMI)**

Hair mineral analysis was performed on over 300 adult females with BMI's ranging between low, normal and high. The lean group had BMI's less than 18 while the obese group's BMI was greater than 35. It was found that there were significant differences noted in zinc levels between women with a low BMI compared to those with a high BMI. The obese group had the lowest zinc levels as well as the lowest ratios of sodium/potassium, iron/copper and zinc/copper. Wang, CT, et.al. Concentrations of Calcium, Copper, Iron, Magnesium, Potassium, Sodium and Zinc in Adult Females Hair with Different Body Mass Indexes in Taiwan. *Clin.Chem.Lab.Med.* 43,4, 2005.

Comment: Elevated copper and low zinc/copper and iron/copper ratios found in HTMA studies are associated with a reduction in the metabolic rate. Minerals in this particular configuration contribute to low thyroid expression, weight gain and therefore, an increase in the body mass index.

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## **Sub-clinical Hypothyroidism and the Risk of Heart Failure, Other Cardiovascular Events and Death**

This study found that the risk of congestive heart failure was increased in older adults with a sub-clinical hypothyroid condition. Those at risk were found to have TSH levels greater than 7.0 mIU/L or greater.

Another study found that a sub-clinical hypothyroid condition might be an independent risk factor for coronary artery disease as well. *JAMA* 295,3, 2006.

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## **Correlation Between Umbilical Cord Blood Selenium and Newborn's Hair Selenium**

A study of selenium levels was carried out on human placenta, maternal and umbilical cord blood that included fifty mothers and newborns. The study concluded that selenium concentrations reflected the influence of habitat with a significant confidence level of 95%. A positive correlation of selenium levels was found between samples of umbilical cord blood and

the newborn's hair. Correlation was also found between placenta and umbilical cord blood, and between cord blood and maternal blood. Lorenzo, A., et al. Selenium Levels In Related Biological Samples: Human Placenta, Maternal and Umbilical Cord Blood, Hair and Nails. *J. Trace Elem. Med. Biol.* 19,1, 2005.

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### **Synergistic Supplementation And Type 2 Diabetes**

A study was performed to assess the impact of minerals, vitamins and the combination of vitamins and minerals on the serum lipid and lipoprotein profiles in patients with Type 2 diabetes. The study was a randomized trial made up of 4 groups of type 2 diabetic patients. One group served as a placebo group, one group was supplemented with the minerals magnesium and zinc. Another group was supplemented with vitamins, C, and E and the fourth group was given both vitamins and minerals. Results after 3 months revealed that those who were supplemented with both the vitamins and minerals had the most response. The vitamin-mineral group showed a 24% increase of HDL-c and apoA1. There were no significant changes found in the other 3 groups. The study concluded that co-supplementation of magnesium, zinc, vitamins C and E significantly increased HDL-c and apo A1, and that micronutrients could be recommended for type 2 diabetic patients based upon their daily requirements. Another study by Farvid, showed that a combination of nutrients also significantly impacted blood pressure in Type 2 diabetic patients. Farvid, MS, et al. The Impact of Vitamin and/or Mineral Supplementation on Lipid Profiles in Type 2 Diabetes. *Diabetes Res.Clin.Pract.* 65,1, 2004. Farvid, MS, et al. The Impact of Vitamins and/or Mineral Supplementation on Blood Pressure in Type 2 Diabetes. *J.Am.Coll.Nutr.* 23,s 2004.

Comment: This illustrates Trace Elements philosophy of our Trace Nutrients supplement line which are not only synergistically formulated for improved absorption, but contain co-factors for more effective nutritional therapy. Trace Nutrients aids in improving metabolic function and performance while achieving a more normal nutritional balance resulting in the mobilization and excretion of toxic and heavy metals.

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### **The Importance of Magnesium During Pregnancy**

Smeczuk, et al, states that during pregnancy the requirement for magnesium usually exceeds its supply and that pregnancy should be considered a condition of 'physiological hypomagnesemia'. Excess heavy metal accumulation can have adverse consequence not only on the mother but fetal exposure can lead to irreversible developmental disorders. Magnesium supplementation is important during pregnancy and influences fetal development as well as protects mother and fetus from the adverse effects of heavy metals. Complications of pregnancy can increase the toxicity to even low concentrations of heavy metals. Therefore, magnesium supplementation is important during these times as well. Semczuk, M, et al. New Data On Toxic Metal Intoxication (Cd, Pb, and Hg. in particular) and Mg Status During Pregnancy. *Med.Sci.Monit.* 7,2, 2001.

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## **Lead Toxicity and Abdominal Pain**

A woman thirty-five years of age was presented with severe, peri-umbilical abdominal pain associated with weight loss, nausea and lethargy. She had a history of arthritis and was consuming herbal liquids and herbal tablets that were prescribed by an Ayurvedic specialist. Eventually, a repeat blood film showed basophilic stippling, a sign of lead toxicity. Oral chelation of succimer was then instituted. Within three weeks her pain was resolved and she was feeling normal within two months. As it turns out, the herbal preparations were analyzed and were found to contain 1.75 milligrams of lead per tablet. Frith, D, et al. Lead Poisoning – A differential Diagnosis For Abdominal Pain. Lancet, Vol. 366, 2005.

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## **Copper Deficiency and Hypertension**

A study by Kedzierska, et al. found that plasma copper concentration can significantly affect activity of the erythrocyte sodium transport system, and that copper supplementation may have therapeutic benefits for hypertensive patients. Higher activity of Na/K ATP-ase, Na/Li and Na/H exchanger was seen in the erythrocyte membrane with low plasma copper. Copper Modifies the Activity of Sodium-Transporting Systems in Erythrocyte Membrane in Patients with Essential Hypertension. Kedzierska, K, et al. Biol. Trace Elem.Res. 107, 2005.

Comment: In HTMA studies, we typically see copper deficiency in patients with hypertension. Most patients with hypertension do in fact show an elevated sodium and potassium tissue concentration along with a low tissue calcium and magnesium. The benefits of copper supplementation not only lies in the increase of copper-activated free radical scavenging enzymes such as superoxide dismutase (S.O.D.) and increased availability of nitrogen oxide, but in its calcium retention effects as well. An increase in tissue calcium would aid in the reduction of sodium retention and thereby reduce elevated blood pressure. It should also be noted that excess tissue copper can result in decreased zinc-activated S.O.D. activity and thereby, contribute to hypertension. This biphasic effect emphasizes the need to assess individual need and treat the patient accordingly instead of merely treating symptoms.

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## **Zinc: The New Antidepressant?**

Serum zinc levels have been found low in patients with major depression. Treatment with zinc appears to have an antidepressant effect. Human trials found that zinc supplementation augmented the effects of antidepressant drugs by over fifty percent. Levenson, CW. Zinc: The New Antidepressant? Nutr. Rev. 64,1, 2006.

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## **A Case Of Aluminum Toxicity**

A 42-year-old man suffered from aluminum toxicity due to boiling methadone in an aluminum pot in order to increase its concentration. Symptoms included seizures and incoordination with dysarthria, myoclonic jerks, postural tremor, emotional instability and fluctuation in short-term

memory. His serum aluminum level was sixteen times the reference interval. Aluminum exposure during dialysis treatment due to contaminated water has been well documented. This case shows excess aluminum exposure through intravenous substance use. Yong, RL, et al. Aluminum Toxicity Due to Intravenous Injection of Boiled Methadone. N.E.J.M. 354, 11, 2006.

Aluminum is known to adversely impact a number of enzyme and endocrine systems within the body. (1) The mineral is most notably associated with varying degrees of cognitive dysfunction and is associated with skeletal, immunological and neurological disorders.(2) (3) (4) (5) (6) (7) Hair mineral analysis has proven a useful screen for assessing excess aluminum accumulation in individuals.

- 1) Massaro, EJ, Ed. HUMAN TOXICOLOGY.1997. CRC Press.
- 2) Boyce, BF, et. al. Hypercalcaemic Osteomalacia Due To Aluminum Toxicity. Lancet, 1982.
- 3) Birchall, JD, et.al. Aluminum, Chemical Physiology, and Alzheimer's Disease. Lancet, 1988.
- 4) Altmann, P., et.al. Disturbance of Cerebral Function By Aluminum In Haemodialysis Patients Without Overt Aluminum Toxicity. Lancet, 1989.
- 5) Perl, D. et.al. Intraneuronal Aluminum Accumulation in Amyotrophic Lateral Sclerosis and Parkinsonsm-Dementia of Guam. Science. 217, 1982.
- 6) Nordal, KP, et. al. Aluminum Accumulation and Immunosuppressive Effect in Recipients of Kidney Transplants. Brit. Med. J. 297, 1988.
- 7) Garrett, PJ., et.al. Aluminum Encephalopathy: Clinical and Immunological Features. J. of Med. 69, 1988.

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### **Autoimmune Disease and Sex Hormones**

In past TEI Newsletters we have discussed the increased incidence of cellular autoimmune disease in women compared to men. The mechanism is reflected in hair mineral patterns and is closely associated with estrogen. A recent article appearing in the Archives of Dermatology discusses the relationship between estrogen and Lupus, an autoimmune condition more prevalent in women than men. Lupus incidence dramatically increases in women following puberty and diminishes following menopause. The condition varies in severity throughout the menstrual cycle and during pregnancy, thus reflecting an association with estrogen fluctuations. Controlled trials using opposing hormones have shown a decrease in flatsoever without the express written permission of Trace Elements, Incorporated. re-ups and a reduction in corticosteroid requirements. The study suggests that in the future, hormonal therapy may be used therapeutically in controlling and altering the disease cause, rather than just treating its symptoms. Autoimmune Disease and Women. TEI Newsletter 14,1, 2002 The Immune System and Hair Tissue Mineral Patterns. TEI Newsletter 7,1, 1994 Sex Hormones and the Genesis of Autoimmunity. Ackerman, L. Arch. Dermatol. 142, 2006.

## **Vitamin D Reduces Inflammatory Markers in Congestive Heart Failure (CHF)**

Schleithoff, et al reported that vitamin D reduces the inflammatory markers in patients with CHF. They also found an impaired vitamin D-parathyroid hormone axis in the progression of CHF. Supplementation of 50 micrograms of vitamin D daily over a period of nine months resulted in suppression of pro-inflammatory cytokines and an increase in anti-inflammatory cytokines in patients with CHF. Schleithoff, SS., et al. Vitamin D Supplementation Improves Cytokine Profiles in Patients with Congestive Heart Failure: A Double-Blind, Randomized Placebo-Controlled Trial. *Am.J.Clin.Nutr.* 83,4,2006.

Comment: Typically, we have found CHF in patients having a Fast Metabolic HTMA Pattern. The CHF profile includes copper deficiency in most cases as well as low tissue calcium and magnesium levels and increased tissue concentrations of sodium and potassium. Vitamin D acting synergistically with calcium aids in reducing the excessive sodium retention and reduce the pro-inflammatory response of the adrenals. This mechanism would be enhanced with the co-administration of magnesium. Of course, copper status needs also to be addressed as a severe copper deficit can lead to cardio-myopathy.

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## **Fluoride Caution**

Government limits on the fluoridation of water supplies do not protect the public from the possibility of tooth and bone damage. The Environmental Working Group, a research organization in Washington, D.C, states that the addition of fluoride should be limited to toothpaste and not added to water supplies. The concentration of fluoride added to water supplies is four times higher than the amount actually needed to fight tooth decay. In areas where there is natural fluoride concentration in the water, individuals may be exposed to much higher levels. It is estimated that at such high levels ten percent of the children living in those areas will get severe enamel fluorosis and adults are at risk of developing bone fractures and crippling bone-joint conditions called skeletal fluorosis. Report Raises Flag on Fluoride. Weise, E. *USA Today*. Mar. 23, 2006.

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## **Systemic release of cobalt and chromium after uncemented total hip replacement**

Abstract: Researchers measured the levels of cobalt and chromium in the serum in three groups of patients after uncemented porous-coated arthroplasty. Group 1 consisted of 14 consecutive patients undergoing revision for aseptic loosening. Group 2 comprised 14 matched patients in whom the arthroplasty was stable and group 3 was 14 similarly matched patients with arthritis awaiting hip replacement. Specimens were analyzed using atomic absorption spectrophotometry. Aseptic loosening of a component resulted in a significant elevation of serum cobalt ( $p < 0.05$ ), but not of serum chromium. The relative risk of a component being loose, if the patient had serum cobalt greater than 9.0 nmol/l, was 2.8. Kreibich DN, et el. *J Bone Joint Surg Br*, 18, 21, vol. 78, 1996.

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## **Incidents of HIV Increase During Pregnancy**

A prospective study was carried out in Malawi involving a group of pregnant and non-pregnant women who had exposures to HIV. Incidence rates were found to be higher in women during pregnancy. They concluded the reasons for an increased acquisition risk during pregnancy could be attributable to hormonal changes that could affect the genital tract mucosa or immune responses. Some studies have shown that hormonal contraception has been associated with increased risk of HIV acquisition. Gray, RH, et al. Increased Risk of Incident HIV During Pregnancy in Rakai, Uganda: A Prospective Study. *The Lancet*. 366, 9492, 2005.

Comment: At TEI we have noted a specific HTMA pattern commonly found in HIV infected groups who were in the ARC and AIDS stages of the disease. All individuals tested showed a Slow Metabolic Type 1 HTMA pattern with a markedly elevated copper and severely low zinc-to-copper ratio. This pattern of a reduced zinc-to-copper ratio indicates estrogen dominance and the Slow Metabolic pattern indicates a compromised humoral immune response due to over-activity or dominance of the cellular immune system, creating an autoimmune condition in individuals who develop progressive HIV symptoms leading to AIDS.

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## **Vitamin C Levels Reduced In Patients with HIV Infection**

Oxidative stress during HIV infections can cause rapid disease progression and impair immune function. This study by Stephensen, et al found low plasma ascorbate levels in patients who were HIV positive. This suggests that vitamin C requirements are significantly higher in those with HIV infection. Stephensen, CB, et al. Vitamins C and E in Adolescents and Young Adults With HIV Infection. *Am.J.Clin.Nutr.* 83,4, 2006.

Comment: As discussed previously, the typical HTMA pattern seen in individuals with progressive HIV infection is associated with a marked elevation of copper and a low zinc-to-copper ratio. Increased tissue copper accumulation is an indication of increased vitamin C needs, whether HIV infection is present or not. This pattern also reveals an increased need for the mineral zinc and zinc co-factors such as vitamins A, B3, B6, potassium, phosphorus, magnesium and manganese.

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## **Lead Toxicity in Hunters Using Shotguns**

Excessive lead exposure can be a hazard in hunters. Lead-shot used in shotgun shells for hunting fowl can often be ingested. Schep, et al describes a case of lead toxicity in an Alaskan native who was found to have lead-shot in his appendix. The hunter's blood lead level was 67.4 ug per dl. This particular patient had accumulated over 29 lead pellets in this appendix, however ingestion of only one or two pellets can raise blood lead levels to twice that of controls. Shep, LJ, et al. Lead Shot In The Appendix. *N.E.J.M* 354,16, 2006.

Comment: Sometimes it can be difficult to ascertain the source of a heavy metal found on a patient's HTMA test. This emphasizes the need for a thorough history of a patient that includes not only his occupation but hobbies as well.

## **Hair Zinc and Copper Levels in Myocardial Infarct Patients and Their Descendants**

Zinc and copper concentrations were measured in the hair and urine of patients who were hospitalized for myocardial infarction (MI). Mineral concentrations were also determined in the patient's descendants and compared to a control group who had no family history of MI. Zinc was found to be higher and copper was lower in the descendants of patients with MI suggesting a consistent rise in zinc and lowering of copper reserves in genetically predisposed individuals. The study suggests that in MI patients, a genetic disorder of mineral imbalance at a younger age can be used in predicting susceptibility to heart disease in individuals prior to onset and diagnosis in asymptomatic patients. Taneja, SK, et al. Detection of Potentially Myocardial Infarction Susceptible Individuals in Indian Population: A Mathematical Model Based on Copper and Zinc Status. *Biol.Trace Elem. Res.* 75, 2000.

Comment: This study reinforces the early work of Prasad that showed a relationship between an elevated zinc-to-copper ratio in the hair and susceptibility toward cardiovascular disease.

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## **Soy Decreases Calcium Bio-Availability**

A study by Kerstetter, et al. showed that increasing protein in the diet produced an increase in calcium absorption. Decreasing protein intake and substituting soy produced a decrease in calcium absorption. The data from their study indicates that when soy protein is substituted for meat protein a decline in dietary calcium bioavailability occurs. Kerstetter, JE. et al. Meat and Soy Protein Affect Calcium Homeostasis in Healthy Women. *J.Nutr.* 136, 2006.

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## **Hair Loss, Hypertension, Hypercholesterolemia, elevated CPK caused by Hypothyroidism**

This was a very interesting Case Report appearing in February's issue of *Lancet*. The case involved a 39-year-old physician who decided to have a check up. Over the past year, he had experienced hair loss. The check up revealed that his cholesterol was high which was a family characteristic, and his blood pressure was 160/105. Other laboratory findings included an elevated creatine phosphokinase (CPK) of 745 U/L. Electrocardiogram findings were also abnormal. The hair loss and elevated CPK lead his doctors to suspect a hypothyroid condition. His thyroid-stimulating hormone (TSH) was elevated, 146 mU/L (normal <5 mU/L) and his thyroxin was 3.1 pmol/L (normal 11-22).

The doctor was treated with 100 ug of thyroxin and after 3 months his blood pressure was down to 135/80, and CPK returned to normal. After 6 months his hair loss subsided and growth had returned to normal. His electrocardiogram also returned to normal.

It is interesting that we do not often associate hypertension with hypothyroidism, but high blood pressure is found in 10 to 25 percent of patients with hypothyroidism, due to vascular resistance. The authors state that years ago when TSH measurements were difficult to perform routinely and were very expensive, CPK was referred to as "poor man's thyrotropin" since it is often elevated in patients with hypothyroidism. Smulders, Y., et al. Hair Loss and Cardiovascular Health. *Lancet* 365 2005.

## **Increase in Anti-Psychotic Drug Prescriptions in Children**

The use of anti-psychotic drugs prescribed to children and teenagers has risen from 201,000 since 1993 to over 1,200,000 in 2002. The drugs include risperidone, clozapin, olanzapine and quetiapine. None of these drugs have been endorsed by the FDA for use in youngsters. These drugs, which can produce weight gain and diabetes could be contributing to the epidemic of diabetes developing in the U.S. Sharp Rise Noted In Meds for Youths. Sci.News. 169, 2006.

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## **The Immunological Properties of Breast Milk in Infants**

Human breast milk is considered a perfect food for newborns. Typically one thinks of the nutritional content of breast milk, but it also contains immune protective properties. Field describes breast milk as “the communication vehicle between the maternal immune system and the infant.” This excellent paper describes the many properties of human milk including its antimicrobial properties due to the presence of macrophages, neutrophils, lymphocytes and cytokines. Human milk also contains growth factors, long-chain PUFA and aids in microbial colonization as well as other immune modulatory components. Field, C. The Immunological Components of Human Milk and Their Effect on Immune Development in Infants. The J. Of Nutr.135,1, 2005.

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## **Pollution and Diabetes**

Studies in the United States have found that persistent exposure to organic pollutants may contribute to the cause of diabetes. Organic pollutants commonly found in humans include dioxins, polychlorinated biphenyls, dichlorodiphenyldichloroethylene (DDE), DDT, trans-nonachlor, hexachlorobenzene and hexachlorocyclohexanes. The pollutants are present in virtually all individuals and stored in lipids. The study revealed that prevalence of diabetes was more than five times higher in groups with higher concentrations of some of these pollutants compared to groups with lower concentrations. The prevalence of diabetes doubled or tripled in those in the upper quintiles of DDE and other compounds. Interestingly no association was found between obesity and diabetes in individuals with non-detectable levels of persistent organic pollutants. Porta, M. Persistent Organic Pollutants and the Burden of Diabetes. Lancet 368,9535, 2006.

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## **Medical Geography and Hair Analysis**

Hair analysis has been used on population groups for mapping of large territories for estimating the local environment and health status of the population. Hair analysis was performed on population groups in Uzbekistan living in the vicinity of the Aral Sea and repeated after 10 years. The Aral Sea is drying up leaving contaminants from mining sources exposed on the surface that are now exposing populated areas. Comparison of the data using hair element concentrations reveal data that can predict health changes in polluted areas. In some areas the relationship between hair mineral content and death rate has been shown in relationship to

biogeochemical anomalies. Kist, AA, et al. Mapping of Ecological Unfavorable Territories Based on Human Hair Composition. Biol.Trace Elem.Res. 64, 1998. Zhuk, LI, et al. Mapping Technique Based on Elemental Hair Composition Data. Biol. Trace Elem.Res. 1990.

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### **Magnesium Supplementation and the Effects on Toxic Metals From Hair Mineral Analysis.**

The study involved sixty-five individuals who were divided into two groups. One group was supplemented over three months with magnesium, and vitamin B6. The results found that hair magnesium concentrations were positively influenced by supplementation. Magnesium supplementation also produced a significant decrease in hair lead and cadmium levels. Kozielec, T, et al. The Influence of Magnesium Supplementation on Concentrations of Chosen Bioelements and Toxic Elements in Adult Human Hair. Magnesium and Chosen Bioelements in Hair. Mag.Res. 17,3, 2004.

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### **Hair Analysis, An Indicator of Uranium Ingestion from Drinking Water**

The content of uranium in hair, urine and nails was studied to determine the effects of continuous uranium exposure from drinking water. Subjects included 205 individuals from 134 different households who obtained their drinking water from private wells. The uranium content of drinking water, urine, hair and nails was analyzed. Uranium levels were found to be associated with the uranium content of the drinking water. There were no statistical differences between men and women, however absorption was higher among younger subjects. Karpas, Z. et al. Urine, Hair, and Nails as Indicators for Ingestion of Uranium in Drinking Water. Health Phys. 88,3, 2005.

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### **Hair Analysis and Eating Disorders**

Researchers at Brigham Young University developed a test analyzing the carbon and nitrogen content in hair. Since the body records your eating habits in the hair it can be used to determine the nutritional health of an individual. Researchers stated, "Each strand of hair is a chemical "diary" that is a record of day-by-day nutrition." By analyzing the carbon-nitrogen ratios the researchers have been able to determine if a person may be suffering from an eating disorder such as bulimia or anorexia. Hair Analysis May Help Detect Eating Disorders. <http://www.nlm.nih.gov/medlineplus/news>.

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### **Laboratory Reference Ranges and Age**

In a recent issue of Medical Laboratory Observer, a question was asked about the necessity for laboratory reference ranges for the elderly. Dr. Joseph Knight, at the University of Utah, Department of Pathology, responded. Quoting Dr. Baer, "I seriously doubt that these should be different from younger adults. Just because aberrant lab values are common in the so-called

“healthy elderly,” they are not related to aging per se. No one has ever shown that aging results in aberrant lab results. It is critical that we recognize that aging and disease are not the same. Rather, aging predisposes one to many disease/disorders. Subclinical diseases are extremely common in the elderly, as is poor nutrition, physical inactivity, obesity, and many are on multiple drugs. Lab results are far more sensitive and specific than how one looks, feels or performs. The average diabetic has the disease four to seven years before it is diagnosed; the earliest atherosclerosis lesions have been seen in children as young as four years. As a result, I believe that the target reference intervals for the elderly are the same as those for younger adults.” Elderly Reference Ranges. M.L.O. 38,8, 2006.

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### **Boron and Calcium Metabolism**

It has been reported that boron may be beneficial for optimal calcium metabolism and, thus, optimal bone metabolism. Therefore, a study was designed to determine the effects of boron supplementation on blood and urinary minerals in athletic subjects and sedentary control subjects consuming self-selected typical Western diets. It was found that serum phosphorus concentrations were lower in boron-supplemented subjects than in placebo-supplemented subjects. Compared with all other subjects, serum magnesium concentrations were greatest in the sedentary control subjects supplemented with boron and increased with time in all subjects. Exercise training diminished changes in serum phosphorous concentrations caused by boron supplementation. Calcium excretion increased over time in all groups combined, and boron excretion increased over time in all boron-supplemented subjects. The findings suggest that boron supplementation modestly affected mineral status, and exercise modified the effects of boron supplementation on serum minerals. Meacham SL, et el. Effect of Boron Supplementation on Blood and Urinary Calcium, Magnesium, and Phosphorous and Urinary Boron in Athletic and Sedentary Women. Am J Clin Nutr, 341, 345, vol. 61, 1995.

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### **Emission Spectrophotometric Analysis of Titanium, Aluminum, and Vanadium Levels in the Blood, Urine, and Hair of Patients with Total Hip Arthroplasties.**

Abstract: Emission spectrophotometry was used to measure the levels of titanium, aluminum, and vanadium in the blood, urine, and hair of 30 patients with total hip arthroplasties. The patients were divided into three groups of ten; one group was studied two years after total hip replacement, one at four years, and one at six years. High levels of titanium and aluminum were found in the hair, especially in the group studied after six years of implantation, while the levels of the three ions in the blood and urine were not significant. Tirnchi, V et el. Ita. J. Orthop Traumatol, 331, 339, vol. 18, 1992.

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### **Cadmium, Copper, Lead, and Zinc Concentrations in Human Scalp and Pubic Hair**

Abstract: Cadmium, Cu, Pb, and Zn concentrations were measured in the first 3 cm of the proximal end of scalp hair and in pubic hair of 41 humans, by atomic absorption spectrometry. Data are presented as geometric means. Scalp hair (SH) metal levels were higher than those in

pubic hair (PH), (Cd, 85.1 vs 60.8 ng g<sup>-1</sup>; Cu, 17.7 vs 11.9 micrograms g<sup>-1</sup>; Pb, 1.72 vs 1.05 micrograms g<sup>-1</sup>; Zn, 148.8 vs 133.3 micrograms g<sup>-1</sup>) with correlation coefficients of: Cd, r = 0.474; Cu, r = 0.549; Pb, r = 0.576; and Zn, r = 0.263. Further correlations were established between Cd and Pb levels (SH, r = 0.691; PH, r = 0.621) as well as between Cd and Zn levels (SH, r = -0.268). In PH the Cd, Cu, and Pb levels of males were higher than those of females, whereas the Zn levels were lower in SH PH of males. Scalp hair Zn contents were inversely related to age. Cadmium and Pb levels in SH and PH were higher in summer than in winter, whereas the SH Zn contents were higher in winter. An influence of place of residence, smoking habit, hair color and hair structure on SH and PH metal levels is identified. It is concluded that hair metal analysis in samples close to the scalp is not seriously invalidated by sources of external contamination. Wilhelm M et al. Institute of Toxicology, University of Dusseldorf, West Germany, 199-206, Vol. 92, 1990.

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### **Nickel in Nails, Hair and Plasma from Nickel-Hypersensitive Women**

Abstract: The concentrations of nickel in fingernails, toenails, hair and plasma from 71 nickel-hypersensitive women and 20 non-hypersensitive women were determined. Nickel concentrations in fingernails were significantly higher than in toenails in both the nickel-hypersensitive group and the control group. Nickel-sensitive women had significantly higher levels of nickel in toenails, hair and plasma than had control subjects, whereas there was no significant difference in nickel concentration in combination of nails, hair and plasma in the nickel-hypersensitive or in the control group. Gammelgaard, et al. Acta Derm Venereol, 417, 420, vol. 70, 1990.

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### **Antacids Causing Magnesium Deficiency and Cramps**

Cases of carpopedal spasms in conjunction with severe magnesium deficiency and hypocalcemia have been reported with the use of proton pump inhibitors (PPI). PPI's are used to block the production of hydrochloric acid and are used in the treatment of dyspepsia, gastric reflux and other stomach conditions. The main action of PPI's is a pronounced and long-lasting reduction of gastric acid production and is the most potent inhibitors of acid secretion available today. Common adverse effects include: headaches, nausea, diarrhea, abdominal pain, fatigue, weakness, rash, itching, flatulence and constipation. PPIs have been shown to raise risk of C. difficile infection. A reduction of vitamin B12 absorption is associated with long-term use. Muscle spasms and metabolic abnormalities associated with the use of PPI's were found to be related to the reduction in normal parathyroid activity. Epstein, M, et al. Proton-Pump Inhibitors and Hypomagnesemic Hypoparathyroidism. NEJM, 355,17, 2006.

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