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Hair Zinc Levels and Dermatitis

The purpose of this study was to determine if a relationship could be found between HTMA zinc levels and the incidence of atopic dermatitis. Further, if a relationship was found would oral zinc supplementation be helpful in those with the condition. The study consisted of fifty-eight children including males and females diagnosed with atopic dermatitis. The mean age was 6.2 years. A control group was also established. HTMA studies found that those affected with atopic dermatitis had significantly reduced zinc levels compared to controls. Zinc supplementation was begun for a period of eight weeks and then both groups were reevaluated. Clinical improvements were noted in the zinc supplemented group and HTMA zinc levels increased to normal values compared to controls. *Kim, JE, et al. Hair Zinc Levels and the Efficacy of Oral Zinc Supplementation in Children with Atopic Dermatitis. Acta Derm Venereol, 94, 2014.*

Hair Zinc and Copper Levels and Serum Testosterone

The minerals zinc and copper influence testosterone synthesis. Zinc is necessary for synthesis while copper can antagonize zinc and therefore, impact testosterone levels. This paper studied the association between the HTMA mineral concentrations of zinc and copper and serum testosterone levels in men. The study included eighty-eight men in a clinic of family medicine at a university hospital. Serum total testosterone was measured in the morning along with hair sample collection. Findings reported that individuals with normal serum testosterone levels had a significantly higher HTMA zinc level compared to a low testosterone group. Also, the study concluded that decreased testosterone was associated with a significant reduction of the zinc to copper ratio in hair samples. *Chang, CS, et al. Correlation between serum testosterone level and concentrations of copper and zinc in hair tissue. Biol.Trac.Elem.Res. 144, 2011.*

Fats and the Neuroendocrine System

The neuroendocrine system is affected by and affects the nutritional status of the body. Fatty acids are no exception. Dietary fatty acids can alter hormone and neuropeptide concentrations as well as hormone receptors. Neuropeptides are also involved in lipid metabolism in the brain. Hormones affect the metabolism of fatty acids as well as their composition, while fatty acids in turn affect the endocrine system. The major hormones involved in lipid metabolism include, insulin, glucagon, cortisol, growth hormone and catecholamines. The normal production and function of these hormones are disrupted during chronic disease conditions, such as heart disease and diabetes which lead to alterations in tissue lipids. *Bhathena, SJ. Relationship between fatty acids and the endocrine and neuroendocrine system. Nutr. Neurosci. 9, 2006.*



Hair Mineral Levels in Rheumatoid Arthritis Patients

This study involved the assessment of the minerals copper, iron, zinc in hair, blood and urine of patients diagnosed with rheumatoid arthritis to investigate the role of trace elements in the etiology and pathogenesis of this condition. There were two groups aged forty-six to sixty and sixty-one to seventy-five years of age, including males and females compared to aged matched healthy control groups. Results of the study revealed significantly lower levels of iron, copper and zinc in blood and scalp hair samples in arthritis patients compared to the health control groups. Conclusions of the study stated, “These data present guidance to clinicians and other professionals investigating deficiency of essential trace metals in biological samples (scalp hair and blood) of RA patients. *Afridi, HI, et al. Evaluation of status of zinc, copper and iron levels in biological samples of normal and arthritis patients in age groups 46-60 and 61-75 years. Clin. Lab. 58, 2012.*

Copper and Cancer

The BRAF gene is involved in making a protein kinase that through numbers of steps send messages to cells to direct cell growth. Mutation of the BRAF gene disrupts these various pathways that have been found to be involved in a number of human and animal cancers. The research of Brady and colleagues have found that the mineral copper is involved in tumor growth. Their research found that disruption of copper transporters decreased tumor growth in mice and human cells. They suggest the chelation of copper may be a treatment for cancers that contain the BRAF mutation and state that chelation of copper in patients with Wilson Disease reduced tumor growth of human or murine cells transformed by the BRAF mutation. *Brady, DC, et al. Copper is required for oncogenic BRAF signaling and tumorigenesis. Nature 509, 2014.*

Biomarkers of Mineral Status

This is an interesting report discussing the public health importance of minerals such as zinc, selenium iron and iodine, and the need for improved biomarkers of trace element status of individuals. Despite the extensive use of blood plasma or serum as biomarkers, only plasma/serum selenium is considered a primary choice as a biomarker. For instance, plasma copper and ceruloplasmin are the most often used biomarkers for copper status. They are both typically found low when there is a copper deficiency, but when levels reach a certain point due to adequate copper intake, they do not rise further and therefore, do not reflect copper intake beyond that point. Ceruloplasmin is an acute phase reactant and can be affected by stress, infections, estrogen, age and inflammation making their use as a biomarker for copper to lack specificity. Plasma zinc is the most often used biomarker of zinc status, but lacks sensitivity and specificity as well. No correlations between zinc intake or absorption and plasma zinc has been found. Additional biomarkers for minerals are discussed. *Hambidge, M. Biomarkers of Trace Mineral Intake and Status. J.of Nutr. 133, 2003.*

A Review of Hair Analysis for Minerals, Hormones and Drugs

The authors of this paper present extensive evidence of the value of testing hair for drugs, hormones and minerals. Drug testing of hair samples can provide evidence of various types of drug use, including compliance and abuse. It can provide a wide window of intake that often cannot be duplicated by urine testing. The paper reviews the extensive literature available showing the value of HTMA for assessing exposure of individuals to toxic metals and well as monitor the nutritional statuses of nutritional minerals. They state that “Various mineral imbalances as revealed by hair analysis can indicate meta-



bolic dysfunctions before any symptoms occur, and that hair analysis of minerals is used not only for diagnostic purpose but also to monitor the nutritional state of the patient until treatment benefits are achieved and the effects of the program have been stabilized.” *Ahmad, G. et al. A review Hair tissue Analysis: An analytical method for determining essential elements, toxic elements, hormones and drug use and abuse. Intl.Res.J.Appl.Basic Sci. 4, 2013.*

Zinc and the Common Cold

It has been known for some time that the mineral zinc has an antiviral effect. Rhinoviruses are associated with the common cold by attaching itself to the nasal epithelium by an intracellular adhesion molecule. The antiviral effect of zinc to the rhinovirus is that it blocks this receptor. The authors compared the outcome of zinc supplementation with a placebo to determine its effect on duration, severity and incidence of the common cold. Their results found that zinc supplementation was associated with shorter duration of the cold. Mean duration was 4.47 days compared to 8.68 days in the low-dose users and the incidence of cold was 38.2 percent in the zinc group and 61.8 percent in the placebo group. *Das, RR, et al. Oral Zinc for the Common Cold. JAMA, 311,14, 2014.*

Eggs And Cholesterol

I am sure most everyone has heard from national news programs that consumption of eggs will no longer be on the government dietary guidelines list to be avoided. They state that cholesterol found in foods such as eggs is no longer listed as a “nutrient of concern.” The proposed changes are now in line with recommendations from the American Heart Association and the American College of Cardiology who stated “there wasn’t definitive evidence to tell the average person to reduce how much cholesterol they consume.” Steven Nissen, chairman of cardiovascular medicine at the Cleveland Clinic stated, “It’s the right decision. We got the dietary guidelines wrong. They’ve been wrong for decades.” He further stated that only twenty percent of a person’s cholesterol comes from food and that the suggestion to avoid eggs was never based upon good science. *Szabo, L. USA Today Feb.12, 2015*

Comment: This supports our views as well as those of others over the past several decades. See [Cholesterol - Fat - Protein 1991](#)

High Protein Intake Aids Weight Loss and Reduces Cardio-Metabolic Disease

Studies are showing that high protein intake aids in healthy weight regulation and sustains lean body mass during weight loss. Diets high in protein and lower carbohydrates are known to reduce blood pressure, improve glucose regulation as well as blood lipid profiles. This study cites that in individuals consuming higher protein diets had a lower body mass index, waist circumference and higher HDL cholesterol levels compared with individuals consuming protein at RDA levels. The authors concluded, “our findings strongly suggest that consuming protein well above the RDA is safe and may be considered a valid nutritional strategy to improve cardiometabolic health.” *Pasiakos, SM, et al. Higher-Protein Diets are Associated with Higher HDL Cholesterol and Lower BMI and Waist Circumference in US Adults. J of Nutr. Nutr. Epidem. Jan, 21, 2015.*



Sugar and Heart Disease

The journal *Open Heart* suggests that sugar, especially fructose may have more of an impact on heart disease risk than the consumption of salt. Even though a reduction in salt intake has received the most attention for reducing heart disease risk, the authors state that the current recommendations may do more harm than good and that reducing salt in processed foods may actually promote higher intakes. The WHO recommends that sugars should make up less than ten percent of the total energy intake per day. *Guiang, AKA. Sci. Times. ASN_Highlights@INFOINC.COM. 12, 2014.*

Under-Nutrition and Infection

In developing countries where under-nutrition exists, infections are prevalent and each promotes the other. Poor nutrition impacts the cellular and humoral immune system adversely. Infection decreases absorption of nutrients and produces a loss of nutrients as well. The nutritional losses include iron, zinc, vitamin A and others. Protein losses lead to the permeability of the intestine to pathogens and abnormal immune cell populations. However, blood levels of nutrients are altered during the acute phase response to infections and may not accurately show nutritional deficiencies in populations with a high or unknown existence of infection. The acute phase response becomes active during infections and enhances the hepatic production of acute phase protein. The authors suggest that assessment of acute phase proteins in the blood may indicate the timing and severity of infections. *Bresnahan, KA, et.al. Undernutrition, the Acute Phase Response to Infection, and Its Effects on Micronutrient Status Indicators. Adv. In Nutr. 5, 2014.*

Antimony (Sb) Toxicity

A case study was presented of Sb toxicity in the *New England Journal of Medicine*. The case involved a thirty-four year old male who was admitted to the hospital due to the development of acute abdominal pain and vomiting. Eight hours before entering the hospital the patient experienced diarrhea and more than fifty episodes of vomiting. Laboratory results revealed abnormal renal and liver function. Nephro and hepato-toxicity were clues to a toxicological profile. The patient's history revealed that before the episodes of vomiting and abdominal pain began he took a packet of powder with orange juice. The packet of powder was from Central America where it is commonly used as an emetic for alcohol abuse. The product contained high levels of antimony potassium tartrate. Urine analysis showed Sb levels of 4314, (ref. range 0.39-0.56 ug/liter). The patient was treated with BAL (dimercaprol) chelation therapy initially and then switched to DMSA (succimer) and activated charcoal. The DMSA was then discontinued and therapy with vitamin K, N-acetylcysteine (NAC), potassium and phosphorus was begun. The patient recovered and was released from the hospital eleven days later.

Konstantopoulos, WM, et al. Case 22-2012: A 34-Year-Old Man with Intractable Vomiting after Ingestion of an Unknown Substance. NEJM 367;3 2012.

Hair Zinc, Copper and Iron in HIV Patients

Nutritional deficiencies have been associated with increased risk of HIV-1 disease progression and mortality. Hair tissue mineral analysis (HTMA) was performed on hospitalized patients with acquired immune deficiency syndromes (AIDS) to see if an association existed between hair and blood levels of zinc, copper and iron and development of opportunistic infections. The study included sixty-two HIV-1 patients who were divided into two groups. One group consisted of those with secon-



dary infections including tuberculosis, high fever and diarrhea. Tests were performed on a healthy group of one hundred-twenty subjects of the same age, socio-economic status, localities and dietary habits. Results revealed a significant reduction of iron and zinc and high levels of copper in the both the blood and scalp hair of HIV-1 patients compared to the control group. *Afridi, HI, et al. Evaluation of zinc, copper and iron in biological samples (scalp hair, blood and urine) of tuberculosis and diarrhea male human immunodeficiency virus patients. Clin. Lab., 57, 9-10, 2011.*

Prenatal Programming and Adult Mineral Patterns

Evidence is suggesting that health conditions that develop during adulthood may be influenced during prenatal development. This study using University students explores the impact of prenatal hormones on specific health conditions and their impact on mineral metabolism in adults. The second-to-fourth digit length ratio of the index to ring finger (2D:4D) on the right hand were measured. A relatively longer ring finger – lower 2D:4D – indicates higher prenatal testosterone exposure levels. Men typically have scores below 1, women above 1. Therefore the measurement is a reflection of sex steroid action and compared with hair sodium, potassium magnesium and calcium concentrations. Results of the study suggested that variation in mineral metabolism reflected in hair samples could be predicted by the digit length measurements. Men showing more masculine characteristics had higher sodium to potassium, sodium to magnesium and sodium to potassium ratios compared to their counterparts. Sodium levels and sodium to potassium ratios also correlated with systolic blood pressure findings. *Schulter, G, et al. Prenatal Programming of Adult Mineral Metabolism: Relevance to Blood Pressure, Dietary Prevention Strategies, and Cardio Vascular Disease. Am.J.Hum.Biol. 24,1, 2011.*

Comment: This is an interesting study in that it supports many findings from HTMA tests of families that show that health conditions that may develop later in life can be influenced during prenatal development. Here at TEI, we have performed thousands of tests on entire families, as well as having performed twin studies. Typically we find that children will have a similar mineral pattern as one of their parents. It can be similar to either the father or mother. For instance, the charts below show the HTMA nutritional minerals and heavy metal results on one set of identical twins. As can be seen, the twins show a very similar metabolic pattern and mineral balance. In reviewing the HTMA patterns of both parents it can be noted that the children show a predominant mineral pattern as the father. Even the heavy metals are similar to those levels found in the father's HTMA profile.

