

NEWS UPDATES



JUNE – JULY 2013

Drug Induced Changes in Mineral Concentration and Excretion In the Treatment of Non-Insulin-Dependent Diabetes – (Metformin)

Drugs are known to effect mineral concentrations in the body either by increasing excretion, enhancing retention, or by producing compartmental relocation and/or de-compartmentalize minerals. Metformin, also known commonly as Glucophage is the most widely prescribed oral anti-diabetic drug. It acts by suppressing glucose production by the liver. However, Dosa, et al recently published findings concerning the action of metformin on certain mineral concentrations in non-insulin-dependent diabetes mellitus patients (NIDDM). The study included a group of healthy adults and a group of NIIDM patients who had not taken anti-diabetic medication prior to the study. Plasma and urine levels of magnesium, copper and zinc were measured along with glucose, HDL, LDL, cholesterol, triglycerides, HbA1c and total red blood cell magnesium in both groups. There were major differences found in the NIIDM group for plasma and urine magnesium, zinc, copper and RBC magnesium compared to the control group. Following three months of therapy with metformin, these parameters were significantly modified. Urine magnesium loss was reduced and RBC magnesium concentration increased in the treatment group. The study suggests that these changes in mineral concentrations were due to the action of metformin therapy along with an improvement in glycemic control and reduction of HbA1c. *Dosa, MD, et al. Influence of Therapy with Metformin on the Concentration of Certain Divalent Cations in Patients with Non-Insulin-Dependent Diabetes Mellitus. Biol.Trace Elem.Res. 141, 1, 2011.*

Comment: We have often discussed the nutritional requirements of patients developing diabetes based upon HTMA studies. The authors in the above paper discuss the important contribution of mineral imbalances and their involvement in the development of NIDDM as well as other diseases. This study also demonstrates the impact of nutrient modification by metformin and may explain the mechanism for the effectiveness of metformin on NIDDM. If significant nutritional deficiencies and imbalances exist then the effectiveness of metformin may not be as significant and therefore, perhaps addressing nutritional imbalances can actually contribute to its effectiveness. This may be true for many other drugs as well.

Hair Mineral Concentrations and Insulin Resistance

A study by Chung, and Yum, investigated the relationship of hair mineral levels and insulin resistance in Korean adult males. Their study consisted of sixty-three patients with metabolic syndrome and sixty normal controls. Fasting glucose, total cholesterol, triglyceride, HDL, hair mineral levels and Homeostasis Model of Assessment - Insulin Resistance (HOMA-IR) were tested. They found a significant correlation between the hair calcium to magnesium ratio with HOMA-IR and insulin. Their findings concluded that insulin resistance was increased along with increased hair calcium to magnesium ratio and decreased concentrations of hair chromium. *Chung, J-H, Yum, K-S. Correlation of Hair Mineral Concentrations with Insulin Resistance in Korean Males. Biol.Trace Elem.Res. 150, 1-2, 2012.*



Comment: This important study correlates and substantiates many of our findings in HTMA tests related to diabetes. In fact, the following abstract also supports our findings here at TEI.

Suboptimal magnesium status in the United States: are the health consequences underestimated?

“Low magnesium intakes and blood levels have been associated with type 2 diabetes, metabolic syndrome, elevated C-reactive protein, hypertension, atherosclerotic vascular disease, sudden cardiac death, osteoporosis, migraine headache, asthma, and colon cancer. Almost half (48%) of the US population consumed less than the required amount of magnesium from food in 2005-2006, and the figure was down from 56% in 2001-2002.”

“Surveys conducted over 30 years indicate rising calcium-to-magnesium food-intake ratios among adults and the elderly in the United States, excluding intake from supplements, which favor calcium over magnesium. The prevalence and incidence of type 2 diabetes in the United States increased sharply between 1994 and 2001 as the ratio of calcium-to-magnesium intake from food rose from <3.0 to >3.0. Dietary Reference Intakes determined by balance studies may be misleading if subjects have chronic latent magnesium deficiency but are assumed to be healthy. Cellular magnesium deficit, perhaps involving TRPM6/7 channels, elicits calcium-activated inflammatory cascades independent of injury or pathogens. Refining the magnesium requirements and understanding how low magnesium status and rising calcium-to-magnesium ratios influence the incidence of type 2 diabetes, metabolic syndrome, osteoporosis, and other inflammation-related disorders are research priorities.”

Nutr Rev. 2012 Mar;70(3):153-64. doi: 10.1111/j.1753-4887.2011.00465.x. Epub 2012 Feb 15. [Rosanoff A](#), [Weaver CM](#), [Rude RK](#). © 2012 International Life Sciences Institute. PMID: 22364157 [PubMed - indexed for MEDLINE] Center for Magnesium Education & Research, 13-1255 Malama Street, Pahoa, HI 96778, USA. ARosanoff@gmail.com

Comment: This again shows the value of the HTMA as a useful screening tool and guide for assessing the nutritional needs of individuals developing diabetes.

Correlation of magnesium intake with metabolic parameters, depression and physical activity in Elderly type 2 diabetes patients: a cross-sectional study.

This report was designed to investigate the relationship of magnesium intake with metabolic findings, depression and physical activity in elderly patients with type 2 diabetes. The study included two-hundred and ten patients that were sixty-five years of age and above who were diagnosed with type 2 diabetes. The patients were interviewed and lifestyle information and 24-hour dietary recall were obtained. Clinical variables were measured, including anthropometric measurements, blood pressure, and determination of blood and urine samples. Assessment of depression was based on DSM-IV criteria. Linear regression was used to determine the relationships of magnesium intake with nutritional variables and metabolic parameters. Results found that over eighty-eight percent of the group had magnesium intake less than the dietary reference intake, and thirty-seven percent were found to have hypomagnesaemia. Lower magnesium intake was associated with depression, metabolic syndrome, central adiposity, higher body fat and BMI. <http://www.nutritionj.com/content/11/1/41> Huang et al. *Nutrition Journal* 2012, 11:41

Comment: Interestingly, another study of magnesium intake and depressive symptoms was conducted on a younger population group consisting of postgraduate students. The results also revealed an inverse relationship between daily dietary magnesium intake and depressive symptoms. *Yari, M, et al. Dietary Intake of Magnesium May Modulate Depression. Biol.Trace Elem.Res. 151,3, 2013.*



Insulin and Cancer Promotion

It has been noted for decades that people who are obese or people who have diabetes have a higher risk for the development of cancer as well as those who are on insulin therapy. Both of these conditions have one thing in common, the hormone insulin and its related hormone insulin-like growth factor (IGF) and is found elevated in individuals with these conditions. Vuk Stambolic, a cancer researcher at the University of Toronto found that normal breast cells grown in a culture when subjected to insulin and a growth factor EGF caused the growth and proliferation of tumor cells. When the insulin was removed the tumor cells die. Normal breast cells are not highly sensitive to insulin and do not have insulin receptors, but the tumor cells do have insulin receptors and actually thrive on insulin. The cancer cells change their metabolism from anaerobic to aerobic glycolysis and therefore, consume glucose in order to grow and multiply. This mechanism was described by Warburg in the 1920's. Oncologist Pam Goodwin of the University of Toronto has been studying the relationship between insulin and breast cancer for almost twenty years. She realized that insulin could mediate the effects of obesity on breast cancer outcome. She found that fasting insulin levels in non-diabetic patients were "predictive of breast cancer outcomes," and obese women have high insulin levels and "do badly".

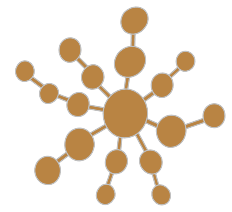
In 2005, Andrew Morris and other researchers at the University of Dundee in the United Kingdom were studying therapy for patients with type 2 diabetes and found that a drug used for lowering insulin levels was associated with a significant decrease in cancer incidence. The drug was metformin an oral anti-diabetic agent. Diabetic patients treated with metformin were found to have twenty-five to forty percent less cancer incidence than patients who were on insulin therapy or taking other drugs that increase insulin secretion. Metformin activates an enzyme in the liver that reduces the production of glucose thereby reducing insulin and IGF levels. *Taubes, G. Unraveling the Obesity-Cancer Connection. Science 335, 2012.*

Comment: As stated in the previous paragraph, Drug Induced Changes in Mineral Concentration and Excretion In the Treatment of Non-Insulin-Dependent Diabetes – (Metformin), the drug metformin impacted the mineral magnesium significantly. There was a reduction in urinary magnesium loss along with other minerals and an increase in RBC magnesium concentrations while improving glycemic control and HbA1c. Magnesium deficiency is known to increase insulin resistance in both diabetic and non-diabetic patients and reduce cellular glucose entry into cells. Magnesium deficiency is associated with abnormal lipid metabolism, cardiovascular and other complications in diabetes as well as in patients not having diabetes. Therefore, it is possible that the reduction in incidence of cancer rates related to the use of metformin may be secondary to its magnesium preserving properties.

Dietary Fat and Breast Cancer Risk

There have been many studies suggesting that high fat intake is associated with increased breast cancer incidence. Many of these studies have been inconsistent. A recent study reported by Key, et al, found no increase in risk for developing breast cancer with fat intake in middle-aged women. The study included six-hundred fifty-seven women who were diagnosed with breast cancer and a group of over one-thousand matched control women without breast cancer. The researchers utilized both a food frequency questionnaire as well as food diaries to assess dietary intake. Their results found no association between fat intake and overall breast cancer risk. *Key, TJ, et al. Dietary fat and breast cancer: Comparison of results from food diaries and food-frequency questionnaires in the UK Dietary Cohort Consortium. Am.J.Clin.Nutr. 94,4, 2011.*

Comment: Many studies have failed to show that saturated fat intake is associated with increased cancer risks. Inconsistencies also exist between the intake of saturated fat and heart disease. For decades there has been an assumption that red meat intake and the saturated fat content therein leads to atherosclerosis and cardiovascular disease. Jabr, recently cited twenty studies that found that the consumption of red meat was not statistically associated with any significant increase in risk of diabetes or heart disease. However, the studies did show a positive association with high intake of processed red meats. *Jabr, F. Meat of the Matter. Why steaks could be in, but hot dogs are still out. Sci.Amer.307,6,2012.*



High Calcium Intake and Heart Disease

More studies are revealing the adverse effect of high calcium intake. Kuehn, recently reported the results of multiple studies showing that women who consumed more than 1400 milligrams of calcium per day had a higher risk of death from cardiovascular disease and ischemic heart disease. Those who had a dietary intake of 1400 milligrams of calcium and who also took calcium supplements had an increased risk for all-cause mortality. The prospective longitudinal cohort study included over sixty one thousand women who were followed for up to nineteen years. *Kuehn, BM, High Calcium Intake Linked to Heart Disease, Death. J.A.M.A. 309,10, 2013.*

Comment: Excess calcium intake is of great concern today. The majority of middle aged women in the United States have been prescribed calcium and vitamin D supplements as a matter of routine for decades for the prevention of osteoporosis. This is typically done without any type of testing showing a need for more calcium and more importantly to show decreased needs.

Folic Acid and Reduced Risk of Autism

Folic acid not only aids in preventing neural tube birth defects, but researchers now feel it can also reduce the risk for autism spectrum disorder (ASD) in children. The study included over 85,000 children from a population-based prospective study in Norway and was from 2002 through 2008. The results concluded that the use of prenatal folic acid supplements near conception was associated with lower risk of autistic disorder and support the use of prenatal folic acid supplementation. *Suren, P, et. al. Association Between Maternal Use of Folic Acid Supplements and Risk of Autism Spectrum Disorders in Children. J.A.M.A., 309,6, 2013.*
