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Induced Copper Deficiency

By Dr David L Watts, Director of Research

While induced copper deficiency is a real cause for concern, it is not likely to be caused by therapy based upon hair mineral analysis (HTMA) studies, unless proper clinical protocol is not being followed. Nutritional supplement and dietary recommendations based upon hair mineral analysis provides a highly specific and targeted therapy aimed at addressing nutritional imbalances. These recommendations are based upon a time frame of approximately three/four months, after which a follow-up analysis is suggested. If a follow-up is not performed in order to follow progress and make the necessary modifications, it is suggested that the targeted supplementation be discontinued. Of course, there are exceptions based upon the clinician's evaluation and monitoring of their patients.

Testing for Copper Status in Individuals

Interpretation of plasma or serum levels of copper or zinc is problematic. Concentration of zinc and copper in circulation are affected by time of day, hormonal changes, inflammatory conditions, illness and acute conditions and medications. An acute phase response increases ceruloplasmin synthesis that can dominate metabolic demands for depleted copper reserves and mask any tendency to hypocupremia, rendering the assessment of circulating copper as an unreliable indicator of copper nutritional status. RBC copper is remarkably stable regardless of dietary intake and its use as a nutritional indicator of copper is also questionable. It is apparent that whole blood, blood cells or plasma levels of copper do not reveal significant information regarding the nutritional status of copper in man.

A comprehensive laboratory index of copper nutriture has been described by Rabbini:

Plasma or Serum Copper
Erythrocyte Copper
Hair Copper (HTMA)
24 Hour Urinary Copper
Red Cell Superoxide Dismutase
Serum Amine Oxidase
Leukocyte Cytochrome C Oxidase
Copper-64 or Copper-67 Turnover
Copper Balance Studies
Fingernail Copper
Skin Elastin Morphology

Routinely performing these tests or organ biopsy would be prohibitively expensive and time consuming for the average practitioner and patient. Therefore, a simpler and economical tool such as HTMA would be more practical.

Incidence of Copper Deficiency in the Australian Population

In reviewing HTMA studies of the general Australian population tested over the past decade we can see statistically that the incidence of copper deficiency is relatively rare compared to copper sufficiency and copper excess.

The HTMA reference interval for copper established at Trace Elements Inc. is 0.9 – 3.9 milligrams percent (mg%) with a mean of 2.4 mg%. If we arbitrarily assign a deficiency threshold of copper existing at, or below 1.0 mg%, we find that out of 35,000 individuals tested only about 7 percent fall below the deficiency threshold. To be less conservative using another deficiency threshold based upon an elevated zinc/copper (Zn/Cu) ratio greater than 15:1 regardless of the copper level, we find only about 10.5 percent of the general population exceeding this threshold and having a potential copper deficiency.

On the other hand, approximately 34% of the

Australian population has copper levels elevated above our upper limit of 3.9mg%.

Looking at copper excess based upon a zinc/copper ratio lower than the ideal 8:1, we found that approximately 60% has a Zn/Cu ratio below 8 and approximately 35% has a ratio below 4.

Studies more specifically related to the Western Australia (WA) population are based on results from more than 1600 individual samples. Approximately 1.5 percent of the WA population falls below the 1.0 mg% copper deficiency threshold. Approximately 8 percent fall in the less conservative copper deficiency threshold having a Zn/Cu ratio greater than 15:1. However, approximately 40 percent has copper levels elevated above the upper limit of 3.9mg%.

Generally speaking we can estimate statistically that copper excess is much more prevalent in today's societies compared to the incidence of copper deficiency. Conservative estimates using the above criteria would suggest that approximately 80% of the general Australian populations are sufficient and/or excessive in the mineral copper. Regarding the WA population specifically, over 90 percent of the individuals tested have an adequate and/or excessive copper status. I should note that these findings are similar to population groups of other developed countries as well. In the United States many segments of the population fail to consume adequate amounts of zinc to maintain optimal zinc status. From the above preliminary studies the same can be said of many segments of the Australian populations.

Factors Contributing to Copper Deficiency

Genetic disorders are well recognized in contributing to copper deficiency. Intestinal disorders and reduced dietary intake of the mineral may also contribute to poor copper status. Drugs, hormone therapy, as well as illness, metabolic and endocrine disturbances can induce deficiencies. Chelating agents such as BAL (Dime-rcaprol), EDTA, PCA (Penicillamine) and DMPS can also contribute to copper deficiency. Excessive intake of certain foods as well as prolonged intake of dietary supplements may also contribute.

The following factors or elements can contribute to copper deficiency individually or collectively with high, prolonged intake or exposure:

Fructose	Ascorbic Acid	Niacin
Molybdenum	Vitamin A	Iron
Zinc	Pantothenic Acid	Vitamin B6
Lead	Mercury	Cadmium
Sulfur	Bioflavinoids	NAC
Tin	Manganese	Selenium

Factors Contributing to Copper Excess

Copper is extremely abundant in the environment. Probably the most common source of this element is from water supplies. High copper may naturally occur in water supplies, but more commonly it is introduced into the water supply through copper plumbing. Higher concentrations are noted in soft water regions. Soft water readily leeches copper from pipes that can reach concentrations well above acceptable levels. Diet is also a significant sourceparticularly vegetarian diets that contain up to five times the amount of copper contained in non-vegetarian diets. Grains are a high source of copper, even though grains contain phytic acid. Phytates act antagonistically on the absorption of zinc thereby, increasing the availability of copper. Soy proteins are also significant sources of copper.

Metabolic disturbances, illness, hormonal and endocrine disturbances and therapies can contribute to increased body burdens of copper. Xenobiotics that mimic hormones can contribute to increased retention of copper.

Contributors to increased body burdens of copper include:

Hormonal Disturbances	Vitamin Deficiencies
Mineral Deficiencies	Liver Disturbances
Vegetarian Diets	Hormone Therapy
Viral Conditions	Medications
Occupational Exposure	Pregnancy
Cu Interuterine Devices	Chololilthiasis
Errors of Metabolism	Dialysis
Primary Biliary Cirrhosis	

Conclusion:

The use of HTMA in assessing nutritional zinc and copper status has been proven over several decades through extensive research. HTMA when used with the *proper application and appropriate clinical judgment* is a useful adjunct in assessing the zinc and copper status of an individual.

Statistical evidence shows that the incidence of copper excess is far more prevalent in Australian society than copper deficiency. Copper sources are abundant in our environment, water and foods. Hair tissue mineral analysis has been shown to be an acceptable, cost effective laboratory-screening tool for assessing not only nutritional mineral status, but mineral interrelationships as well as heavy metal exposure.

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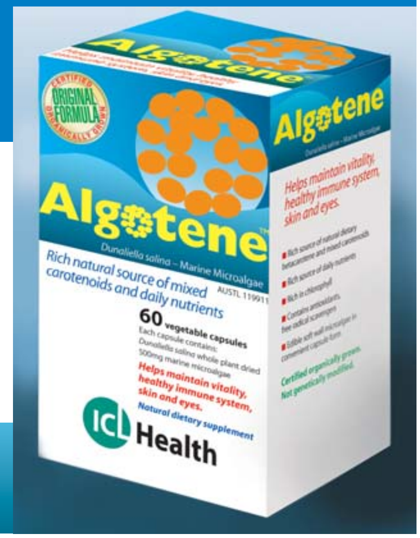

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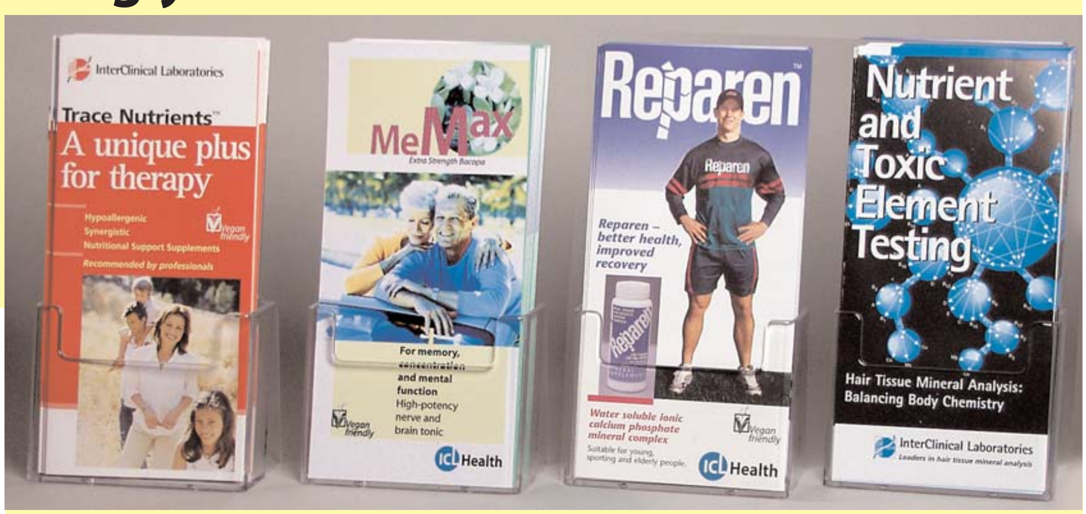

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