Eck Institute of Applied Nutrition and Bioenergetics, Ltd.

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Introduction

When medical science comes to understand the implications of a copper imbalance, it may be referred to as *the scourge of the late 20th century*. It is one of the most commonly encountered imbalances that we find on tissue mineral tests today. Many of the most prevalent metabolic dysfunctions of our time are related in some way to a copper imbalance.

Copper toxicity is a much overlooked contributor to many health problems; including anorexia, fatigue, premenstrual syndrome, depression, anxiety, migraine headaches, allergies, childhood hyperactivity and learning disorders.

The involvement of copper toxicity and biounavailability in such a wide range of health conditions may seem unusual. It is our intent in this paper to show how copper is regulated in the body and why it is such a key mineral in so many metabolic dysfunctions.

Sources Of Copper

Copper imbalance can result from:

- environmental copper exposure.
- adrenal gland insufficiency or exhaustion.
- zinc deficiency.
- congenital copper toxicity.
- the *copper personality*.

Environmental Copper

Copper Water Pipes

Copper plumbing was hailed as a great advance in the 1940's and today the majority of homes in the United States have copper plumbing. Especially in areas with acidic water, copper can be leached from pipes, leaving in severe cases, a greenish ring on bathroom fixtures. Water coolers and ice-makers in refrigerators also use copper tubing. Water that sits in these units can contain dangerously high levels of copper.

Copper Cookware

Copper tea kettles and other copper cookware can be a source of copper toxicity if used frequently over a period of time.

Drinking Water Contaminated With Copper

Some areas of the United States have high amounts of naturally occurring copper in their water supply. Also, copper sulfate is added to some municipal drinking water supplies to kill yeast and fungi.

Birth Control Pills and Copper Intrauterine Devices

One of the side effects of the pill is that it tends to raise copper levels in the body. This is due to the close association between the hormone estrogen and copper levels.

Several hundred milligrams of copper a year can easily be absorbed from a copper IUD. Many women still use the Copper-7 intrauterine birth control device, although it has been taken off the market. The only intrauterine birth control device sold today, however, is a copper-T. These devices can be very harmful for women prone to high copper levels.

Vitamin and Mineral Supplements

Copper is frequently added to vitamin supplements, particularly *prenatal vitamins*. Although this is a benefit for some people, it can be harmful for many other women.

Fungicides for Swimming Pools and Foods

Copper sulfate is added to swimming pools and may be sprayed on fruits and vegetables to retard growth of algae and fungus.

Vegetarianism and Other High-Copper Diets

Many diets today are high in copper. In particular, vegetarian proteins such as soybeans, nuts, seeds, tofu, avocados and grains are high in copper content. Fast food hamburgers and other popular foods are soy-based. Soybean protein is coming into wider usage, due to its low cholesterol level and lower cost.

Other high-copper foods are organ meats, shellfish, wheat germ and bran, yeast, corn oil, margarine and mushrooms.

Occupational Exposure

Plumbers, welders, machinists and others who work with copper are at risk for copper toxicity.

Dental Appliances

Copper is used in dental alloys in fillings, crowns and other appliances.

Adrenal Gland Exhaustion and Copper Toxicity

Diminished adrenal activity is perhaps the single most important physiological reason for copper problems today. The reason is that adrenal activity is required to stimulate production of ceruloplasmin, the primary copper-binding protein.

When adrenal activity is insufficient, ceruloplasmin synthesis in the liver declines. Copper that is not bound cannot be used and unbound copper begins to accumulate in various tissues and organs.

According to hair analysis research, 70–80 percent of people tested show weak adrenal glands!

Zinc Deficiency and Copper Toxicity

A widespread zinc deficiency in our population is another critical cause of a copper imbalance. Zinc and copper normally exist in a delicate balance. Zinc is a primary copper antagonist. When zinc is deficient, copper tends to accumulate in various storage organs.

Zinc deficiency is extremely common today. Dr. Carl Pfeiffer has stated that the entire American population is borderline deficient in zinc. A zinc deficiency may be due to:

- stress of any kind causing an increased excretion of zinc.
- a high sugar and carbohydrate diet which lowers tissue zinc levels.
- vegetarian diets which are lower in zinc inasmuch as a main source of zinc in the diet is derived from meat protein, particularly red meat.
- low levels of zinc in the soil resulting in lowered zinc levels in foods.
- refining of food which removes zinc.
- the fact that many children today are born deficient in zinc because their mothers are deficient.

Congenital Copper Imbalance

Mothers deficient in zinc, or high in copper, transmit these imbalances to their children through the placenta. Untold numbers of children today are born with a copper imbalance. Often they suffer from learning problems, developmental disability, chronic infections and other problems.

Mothers also pass on to their offspring other nutrient deficiencies and toxic metals, which impair the child's adrenal glands. Weak adrenal glands, in turn, results in a worsening of the copper imbalance in the child by the mechanism explained above.

The Copper Personality

The copper personality refers to the observation that certain individuals tend to accumulate copper, perhaps as a physical or psychological mechanism that is adaptive for these individuals. Copper accumulation results in various degrees of detachment from reality which some have labeled spaciness.

The detachment enables these individuals to better cope with stress. People with a copper personality tend to be intelligent, creative, childlike and artistic.

Detection Of Copper Imbalance

Blood Tests

Copper and ceruloplasmin levels can be measured in serum to detect copper poisoning. There will be some daily fluctuations as with all blood tests, but this is a useful meas-

ure. Unfortunately, few physicians run these tests routinely.

Hair Analysis

Hair analysis is a rapid, simple screening test that can reveal both direct and hidden copper imbalance. A copper level exceeding 2.50 mg% is considered elevated. However, there are several readings that indicate *hidden* copper toxicity. In other words, copper may not show up high on the hair test, but may be stored in various organs and will show up later as it is mobilized.

Indicators For Hidden Copper on a Hair Analysis

For these indicators to be valid, the hair sample must *not* be washed at the lab:

- calcium level elevated above 120.00 mg% (ideal Ca = 40.00 mg%).
- zinc/copper ratio less than 6.00/1.
- sodium/potassium ratio less than 2.20/1.
- copper level less than 1.00 mg%.
- potassium less than 3.00 mg%.
- calcium/potassium ratio greater than 10.00/1.
- mercury level greater than 0.40 mg%.

These criteria were derived by reviewing over 100,000 tests and noting that people with the above readings sooner or later began eliminating excess copper from their body tissues as they gained enough energy to correct their abnormal copper metabolism

Metabolism Of Copper

Absorption

Thirty to sixty percent of ingested copper is absorbed through the intestinal tract. Certain minerals and heavy toxic metals compete for absorption with copper, including calcium, iron, zinc, cadmium and mercury. Vitamin C inhibits copper absorption. Sulfur and molybdenum are intestinal sequestrants of copper that also apparently inhibit absorption of copper.

Absorption of copper is increased by the presence of amino acids. Diminished protein intake or impaired protein digestion (HCL and enzyme deficiency) inhibits copper absorption. Absorption is also hindered by an alkaline intestinal pH.

Retention

Normally copper is bound in the blood to ceruloplasmin (95 percent) and albumin. Organs with a high copper content include the liver, brain, heart and kidneys. However, excess copper can accumulate in almost every organ of the body.

Excretion

Copper is excreted mainly through the bile. Vitamin C binds or chelates copper and facilitates its removal. Zinc and manganese displace copper from the liver. Molybdenum and sulfur bind to copper and greatly facilitate its excretion.

Metabolic Effects Of Copper

Copper directly or indirectly affects virtually every body system. Many symptoms associated with copper toxicity are due to a copper-induced deficiency, or deficiency of vitamin C, folic acid, or other nutrients induced by copper toxicity. Copper also interferes with adrenal and thyroid gland activity, creating another set of symptoms relating to hypothyroidism and adrenal insufficiency.

Particular functions which are copper-dependent include:

- formation of melanin and keratin.
- synthesis of connective tissue and myoglobin.
- hemoglobin synthesis (incorporation of iron into hemoglobin).
- energy production (the electron transport system).
- synthesis of neurotransmitters (the catecholamines).
- free radical scavenging (superoxide dismutase).
- retention of calcium in the bone matrix.
- immune system (control of anaerobic organisms) and formation of reticuloendothelial cells.
- formation of the myelin sheath of nerves.
- fertility and maintenance of pregnancy.

Metabolic Dysfunctions Associated With Copper Imbalance

Acne

Acne is frequently associated with elevated copper levels, or a low imbalanced zinc/copper ratio.

Adreno-Cortical Hyperactivity

A low zinc/copper ratio is frequently related with adrenal-cortical hyperactivity.

Adrenal hypertrophy

The adrenal glands markedly increase in weight when the tissue levels of copper are high — this indicates excessive stress.

Adrenal Insufficiency

Copper accumulates in the liver of adrenalectomized rats; thus severe adrenal insufficiency may be accompanied by increased tissue copper levels.

The release of copper from the liver is controlled by the adrenal glands through its influence on the synthesis of ceruloplasmin; the protein needed for its removal.

A copper deficiency results in an increased ascorbic acid content of the adrenal gland.

Agoraphobia

A morbid dread of open spaces (agoraphobia) is often associated with copper toxicity. Phobias of various types are commonly associated with copper toxicity (see phobias).

Allergies

Allergies are commonly associated with a copper toxicity problem inasmuch as copper biounavailability (deficiency) results in a reduced output of both adrenal mineral corticoid and glucocorticoid hormones. These hormones normally help control allergy reactions.

Alopecia (hair loss)

Copper toxicity causes an excessive breakdown of all protein structures, including hair and nails. This is due in part, to a destructive effect on the disulfide bonds of proteins. Copper imbalance also inhibits an enzyme required for collagen synthesis — lysal oxidase.

Androgens

A low copper level, particularly an elevated zinc/copper ratio, suggests increased androgen secretion.

Anemia

A high copper/molybdenum ratio may contribute to iron deficiency anemias and possibly cause iron-storage disease.

Several anemias which do not respond to iron therapy have been found to be associated with biounavailable copper. Copper is required to convert iron from the ferric to ferrous form so it can be utilized. Copper is also required to incorporate iron into the hemoglobin molecule.

High tissue copper levels can cause a relative manganese deficiency. Manganese is necessary to stimulate hemoglobin formation; thus anemia can result from a copper-induced deficiency of manganese.

Anxiety

Anxiety states are frequently associated with elevated hair copper levels. This may be due to an excessive production of stimulatory neurotransmitters (catecholamines), which include epinephrine, norepinephrine, serotonin and dopamine.

Zinc deficiency due to copper toxicity can also result in anxiety states.

Arthritis

Copper levels in the synovial fluid of patients with rheumatoid arthritis are three or more times as high as normal.

A high tissue copper level is frequently associated with osteoarthritis. Copper tends to enhance calcium retention in body tissues. Excessive copper also has a destructive effect upon protein structures such as joint cartilages.

Autism

"Normally, the liver produces the normal copper protein, ceruloplasmin, which stores copper in the blood serum and prevents ex-

cess absorption. Ferritin, the iron-containing protein is made similarly.

Any abnormality which results in inadequate ceruloplasmin, or ferritin, could allow excess copper or iron to be absorbed, which would affect the brain. Both of these metals (copper and iron) are stimulants to the brain and might produce hyperactivity and/or autism." (Pfeiffer)

Calcium Level, Elevated

A hair calcium level above 120.00 mg% indicates a biounavailability of calcium. High calcium levels are frequently associated with elevated copper levels.

An elevated calcium level is frequently the result of a manganese deficiency caused by elevated copper levels.

Cancer and High Tissue Copper

In adult life, chronic tissue zinc and vitamin B_6 deficiencies due to copper toxicity may predispose cells to cancerous change.

Changes in serum copper concentrations with reticuloendothelial cancers are predictive of remissions and relapses. The copper levels rise during active phases of the malignancies and drop back to normal limits during remissions.

Cancer and Low Tissue Copper

A possible role for dietary copper in the metabolism of foreign compounds was first suggested by Sharpless in 1946. He observed that the addition of a copper supplement to the diet of rats had a marked protective effect against the hepatocarcinogenic action of the dye *butter yellow* (i.e., 4 dimethyl aminoazo benzene). Yamane et al. have demonstrated that this protective effect of copper is associated with the stimulation of the hepatic metabolism of this aminoazo dye to noncarcinogenic metabolites.

Candida Albicans (Yeast) Infections

Copper is a stimulant to oxidative or aerobic metabolism. A copper biounavailability, deficiency, or imbalance, often results in a tendency towards yeast infections.

Copper compounds are used commercially to inhibit growth of yeast and fungi.

Ceruloplasmin Levels, Elevated

High copper tissue levels are associated with or indicative of increased ceruloplasmin levels. Conditions that are associated with elevated ceruloplasmin levels include myocardial infarctions, lymphomas and rheumatoid arthritis.

Cholesterol, Elevated

When copper levels in the blood rise, fat levels decrease. Any contaminant that depresses copper and zinc, such as cadmium in the case of zinc, may cause elevated levels of lipids.

Clinical Syndromes

"The clinical syndromes (other than Wilson's disease) wherein elevated serum or tissue copper may be an important factor are paranoid and hallucinatory schizophrenia, hypertension, preeclampsia, stuttering, autism, childhood hyperactivity, premenstrual tensions, psychiatric depression, insomnia, senility and possibly functional hypoglycemia." (Pfeiffer)

Cystic Fibrosis

Unusually large amounts of copper have been found in the fingernails of infants with cystic fibrosis.

Depression, Mental

Mental depression is frequently associated with elevated tissue copper levels. An elevated copper level reduces tissue manganese levels which may result in depression.

Adequate copper is necessary for activation of biogenic amines. A deficiency of biogenic amines is frequently associated with mental depression.

Diabetes

Diabetes is frequently associated with elevated tissue copper levels. Excess copper frequently reduces zinc and manganese levels, thereby interfering with glucose metabolism.

Dysinsulinism

Dysinsulinism is frequently associated with elevated copper levels. An excess of tis-

sue copper reduces zinc and manganese values, thereby interfering with glucose metabolism.

Estrogen Levels, Elevated

Elevated copper levels often accompany elevated estrogens levels. A low tissue copper level frequently indicates a low estrogen level. This is particularly so when the zinc/copper ratio exceeds 12.00/l.

Administration of estrogens markedly increases both serum copper and ceruloplasmin concentrations.

'Failure To Thrive' Syndrome

Zinc deficiency and copper toxicity are intimately associated with developmental disability and *failure the thrive* syndromes.

Adequate levels of zinc are essential for protein synthesis, growth and development.

Fears

Excessive tissue copper levels are commonly associated with a wide variety of fears. Often, as copper is eliminated from tissue storage, one becomes increasingly aware of these fears and as a result, they are released.

Fractures, Bone

Bone fractures are frequently associated with an elevated copper level.

Headaches, Migraine

Elevated copper levels are frequently associated with migraine headaches.

Heart Attacks

A high tissue copper level, by causing a zinc deficiency, predisposes one to hypertension, heart attacks and strokes.

Copper deficiency results in sudden death from heart failure in livestock. The cattle suffer from anemia first.

Heavy Metal Toxicity

Heavy metal poisoning frequently accompanies copper toxicity. A copper imbalance can contribute to heavy metal poisoning by slowing the rate of metabolism, thereby reducing the body's ability to detoxify heavy metals.

Conversely, such metals as lead and mercury may interfere with the synthesis of ceruloplasmin or ferritin, contributing to copper toxicity problems.

Hemorrhaging

Hemorrhaging on the surface of the heart is commonly associated with a copper deficiency.

Hodgkin's Disease

Copper scores have proved to be a particularly sensitive index in Hodgkin's disease.

Hyperactivity, Childhood

Both copper and iron are stimulants to the brain. For this reason, both of these elements might play a role in the causation of hyperactivity and/or autism.

Hypertension

A high tissue copper level, by causing a zinc deficiency, predisposes one to hypertension, heart attacks and strokes.

Excessive aldosterone, a mineralocorticoid hormone which is produced by the adrenal cortex, is frequently responsible for elevated blood pressure, by raising sodium levels. Copper frequently raises sodium levels, indicating that copper has a stimulating effect on aldosterone levels.

Hypoglycemia

Functional hypoglycemia is frequently associated with elevated tissue copper levels. An excess of tissue copper reduces manganese and zinc, thereby interfering with normal glucose metabolism.

Hypothyroidism

An elevated copper tissue level is frequently associated with hypothyroidism, particularly when the zinc/copper ratio is greater than 10.00/1. The ideal zinc/copper ratio is 8.00/1.

Infections

A tissue zinc/copper ratio of less than 4.00/1 is frequently associated with an increased susceptibility to bacterial and viral

infections. Copper toxicity may predispose to infections by displacing zinc.

Normally, to combat infections, copper is mobilized from the liver. If copper is biounavailable and cannot be mobilized, susceptibility to infections increases.

Inflammation

Inflammation is commonly associated with an elevated tissue copper level, particularly when the sodium/potassium ratio is greater than 6.00/l.

Copper frequently acts as an analgesic and may rise in response to an inflammatory process. Copper combined with aspirin, for example, increases the pain-alleviating qualities of aspirin. However, copper's destructive effect upon protein structures can also cause inflammation in certain cases.

Iron Storage Diseases

The trace metal pattern of iron-storage disease suggests a relationship of iron, molybdenum, lead and possibly copper as a cause of these diseases.

Kidney Disorders

Kidney dysfunction is frequently associated with a zinc/copper ratio of less than 5.00/l.

The kidney problems are primarily due to displacement of zinc by copper.

Lead Toxicity

A low tissue copper level is frequently associated with an elevated lead level. It has been established that lead blocks copper enzymatic reactions. The blocking of enzymatic reactions has serious ramifications on many of life's most vital processes such as;

- normal functioning of the Krebs Cycle,
- production of biogenic amines such as dopamine, adrenalin, nor-adrenalin and serotonin,
- formation of thyroxin and
- production of the amino acid lysine, etc.

Libido (Decreased)

A high tissue copper level, or a low zinc/copper ratio is frequently associated with a decreased libido.

Liver Detoxification And Dysfunctions

A high level of tissue copper, or a low zinc/copper ratio (below 4.00/1) impairs the liver's ability to detoxify.

Excessive copper, by lowering manganese, permits iron deposition in the liver resulting in liver dysfunction.

A copper deficiency, as indicated by a low tissue copper level, also interferes with the ability of the liver to detoxify.

Alterations in dietary copper intake might modify the toxicity of various foreign chemicals which are activated or detoxified by hepatic microsomal enzyme systems.

Metabolic Dysfunctions

Metabolic diseases associated with elevated copper levels are:

- Hyperactivity
- Psychosis
- Depression, psychiatric
- Atherosclerosis
- Functional Hypoglycemia
- Stuttering
- Premenstrual Syndrome
- Senility

Multiple Sclerosis

Although many factors are involved as causative factors of multiple sclerosis, a common contributing factor may well be a low tissue copper level or a low copper level relative to some other metal such as zinc. Demyelination of nerves is known to result from a copper deficiency.

Cases of multiple sclerosis, all of which had in common a dietary exposure to lead, have been reported. Lead adversely alters copper metabolism as one aspect of its toxicity.

Myocardial Infarction: High Serum Copper Levels And Use of the Birth Control Pill

The copper level of the heart is higher than normal in those dying from heart attacks. Elevated serum copper due to use of the birth control pill may explain the higher heart attack rate of users of the pill.

Nervousness

Excessive biogenic amine levels are frequently associated with elevated tissue copper levels. An excess of biogenic amines is frequently responsible for nervousness, hypertension, etc.

High Copper and Osteoporosis

An excessive level of copper can result in a manganese deficiency. A manganese deficiency is one of the principal causes of loss of calcium from the bone. The end result is osteoporosis.

Low Copper and Osteoporosis

Adequate levels of estrogen appear to counteract osteoporosis. Low tissue copper levels are commonly associated with low estrogen levels.

Ovarian Dysfunction

A zinc/copper ratio of less than 4.00/l is frequently associated with ovarian dysfunction.

Pancreatic Dysfunction

Pancreatic dysfunction is frequently associated with elevated copper levels. Normal pancreatic function is highly dependent upon zinc and manganese, both of which are displaced by excessive levels of copper.

Panic Attacks

Panic attacks are highly associated with copper toxicity. Zinc deficiency due to copper excess may contribute to this problem.

Pantothenic Acid Deficiency

Excessive copper levels have been associated with low levels of pantothenic acid.

Phobias

Fears and phobias are commonly associated with copper toxicity. Fear may reduce adrenal gland activity, which causes a rise in copper levels.

Conversely, copper can affect thyroid and adrenal gland activity and induce anxiety feelings. Zinc deficiency due to copper toxicity may also play a role.

Pituitary Hyperactivity

A zinc/copper ratio less than 4.1 may be associated with anterior pituitary hyperactivity.

Premenstrual Tension

Premenstrual tension is frequently the result of a high tissue concentration of copper, especially when the zinc level in the tissues is depressed.

Schizophrenia

Pfeiffer and others have postulated that excessive copper and iron and/or zinc and manganese deficiency states are primary factors in one type of schizophrenia, namely histapenia.

Histaminase is a copper containing enzyme and both histaminase and ceruloplasmin can destroy histamines. Therefore, patients with high serum copper and ceruloplasmin levels have low levels of blood histamine. The histapenic individual responds to treatment which rids the body of excess copper and builds-up blood and tissue histamine.

"A possible factor in some of the schizophrenias is a combined deficiency of zinc and manganese, with a relative increase in iron and copper or both. The urinary copper excretion in schizophrenics is consistently less than in *normal* patients; zinc plus manganese in dietary doses is effective in increasing copper elimination and reducing copper to normal levels." (Pfeiffer)

Schizophrenia is not uncommon when the zinc/copper ratio is less than 3.00/l.

Sexual Inadequacy

Sexual inadequacy is frequently the result of excess copper in the tissues, resulting in a zinc deficiency.

Strokes

A high tissue copper level, by causing a relative zinc deficiency, predisposes one to hypertension, heart attacks and strokes.

Tooth Decay

High levels of lead, copper, zinc and chromium in the body tissues may tend to increase the tooth's susceptibility to decay.

Urinary Tract Infection

Elevated copper levels are frequently associated with urinary tract infections.

Vitamin Deficiencies

The following vitamin deficiencies in the body may be caused by a copper deficiency: vitamin C, inositol, folic acid, vitamin B6 and rutin.

Effects Of Copper On Other Minerals

Copper, in excess, tends to *lower* manganese, zinc and potassium levels. Copper toxicity can also result in deficiency of vitamin C and B6, inositol, folic acid and rutin.

Copper tends to *increase* tissue levels of calcium and sodium.

Copper can displace iron from the liver.

Effects Of Other Minerals And Vitamins On Copper

Mercury, cadmium and zinc – compete for absorption.

Molybdenum and sulfur – bind copper in the intestine.

Iron and manganese – remove copper from the liver.

Zinc – lowers copper levels in the blood.

Vitamin C – chelates copper in the blood.

Vitamin B_6, folic acid and niacin are also copper antagonists.

Cobalt is synergetic with copper.

Detoxification And Correction Of Copper Imbalance

Correction of a copper imbalance is accomplished by the following:

Exposure to Copper

Remove sources of exposure, including birth control pills, copper IUD's, contaminated water supplies and copper-rich diets.

Strict vegetarian diets are to be avoided, when possible, because of the high copper content of nuts, seeds, beans and grains. However, the copper-toxic individual may require a vegetarian-type diet for a period of time until he is able to adequately digest and assimilate animal protein.

Junk-food diets contribute to copper imbalance because they are low in zinc, manganese and other essential elements which are required for optimal adrenal gland activity. Deficiency of these nutrients therefore contributes to a detrimental buildup of excess copper.

Restore Adrenal Activity

Restore normal adrenal gland activity through nutrition and positive lifestyle changes.

Lifestyle. A reduction in stressful activity is advisable. Adequate rest, sleep and avoiding excessive exercise is beneficial.

Enhancing adrenal gland activity is aided by a tissue mineral analysis. This test provides an indication of adrenal activity; trace mineral deficiencies and toxic metals which serve to interfere with normal adrenal activity.

Nutritional supplement programs to enhance adrenal activity should include vitamin C and E, manganese, pantothenic acid and adrenal glandular substance. Specific dosages depend on individual cases.

A major goal of the nutritional supplement program is to balance the oxidation rate, which increases the body's *adaptive* energy thus allowing healing to take place. That is; internal stress on the body is removed by nutritional balancing, allowing the adrenal glands to return to more normal functioning.

Increase Energy Levels by Balancing Body Chemistry

Optimizing energy levels is essential to enable the body to eliminate toxic metals; including copper. This is best accomplished by balancing the oxidation rate as indicated on a hair analysis, using precise supplementation as indicated on the test.

Antagonists and Chelating Agents

Copper-lowering agents may be given, including mineral and vitamin antagonists, chelating agents and sequestrants. Specific nutrient antagonists and chelators are helpful depending on the individual's mineral balance.

These include vitamin C, molybdenum,

sulfur, vitamin B6, manganese, zinc and others. These nutrients need to be given in a manner that contributes to balancing the overall body chemistry.

> ***Note:*** There are times when it is not advisable to lower copper levels beyond a certain point. In these cases, a high copper level is serving as an adaptive mechanism.

Excessive lowering of even a very high copper level can result in anxiety or other symptoms. This is another reason why we recommend that copper-lowering nutrients be used in conjunction with a complete nutritional program based on mineral testing.

Special Considerations Regarding Copper Detoxification

Diet For The Copper-Toxic Individual

Copper-toxic individuals frequently have an aversion to eating protein, particularly red meat. It is important for such individuals to eat some protein at least twice a day, even if the quantity is small, otherwise progress is delayed. Strict vegetarian diets are not advisable, but may be necessary for a period of time in severe cases.

Many copper-toxic individuals have an insatiable craving for sweets, fruit and fruit juices. Such items should be limited as much as possible for optimal results. In many cases, a high carbohydrate diet is necessary until adrenal activity is increased.

The Time Factor

Six months to several years may be required to correct a copper imbalance, depending on the severity of the copper toxicity problem.

Copper Reactions (Copper Eliminations)

During the correction of a copper imbalance, copper elimination frequently causes transient symptoms including headache, skin rash, free-floating anxiety, insomnia, fatigue and a flare-up of chronic conditions related to a copper imbalance.

These reactions generally last a day or two and then subside. The supplement program may be temporarily reduced if a symptom becomes particularly annoying. These symptoms are indications of a healing process and should be welcomed!

Copper Eliminations and Increased Awareness

Elimination of excess copper often is accompanied by an increase in awareness. Not only may a person become aware of physical aches and pains, but also emotional conflicts may come into consciousness.

These reactions occur because many copper-toxic individuals are living in a lowered state of awareness. An increase in awareness is a necessary part of the healing process. Although there may be some temporary anxiety or pain, usually one feels much better after the process has been completed.

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Glossary

Adaptive Energy - biochemical energy that the body uses to adapt and respond to stress.

Androgen - any substance, e.g., androsterone and testosterone, that stimulates male characteristics.

Ceruloplasmin - a blood protein which binds and transports most of the copper in the body.

Histaminase - a widely occurring flavoprotein enzyme that oxidizes histamine and various diamines.

Histamine - a compound that is found in many animal tissues or made synthetically. Histamine is probably responsible for the dilation and increased permeability of blood vessels which play a major role in allergic reactions.

Histapenia - a condition characterized by low histamine levels. Slow oxidizers tend to have lower histamine levels.

Internal stress - stress that is generated from within the body. Causes of internal stress include nutritional imbalances, toxic metal poisoning, structural imbalances, or other internal dysfunctions.

Nigris-S - a nutritional supplement produced by Endo-Met Labs. Nigris-S contains organic sulfur, which has been found helpful in reducing copper and other heavy metal toxicity.

Oxidation rate - oxidation refers to the rate at which the body burns the food it consumes and converts to energy. This process occurs at different rates of efficiency, depending on glandular activity. The oxidation rate can be measured using the calcium/potassium.