Copper Excess (Toxicity): Psychological Implications for Children, Adolescents, and Adults

Richard Malter, Ph.D.
Licensed Clinical Psychologist (Illinois)
Licensed Nutrition Counselor (Illinois)
2295 W. Trail Blazer Drive
Cottonwood, Arizona 86326
(928) 649-9343
www.malterinstitute.org
e-mail: rickmind@cableone.net

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INTRODUCTION

There is increasing evidence that significant environmental changes in biochemical factors are contributing to a wide range of psychological problems in children, adolescents, and adults. These problems include: ADD, hyperactivity, distractibility, and memory problems, learning disabilities, depression, anxiety and panic disorder, bipolar disorder, obsessive-compulsive disorder, anorexia, violent aggression, and suicidal tendencies. In fact, there is good reason to believe that there are increasing incident rates of these problems today that are best accounted for by nutritional/biochemical factors. In order to grasp the magnitude of the nutritional/ biochemical problems we are facing today requires a shift in perspective and a new paradigm. The old paradigms and psychological models have become obsolete and are much too limited in perspective.

During the past 20 years, data from hair tissue mineral analyses of children, adolescents, and adults (especially women) point to copper excess (or in extreme cases, copper toxicity) as a major factor associated with many of these psychological problems. The manifestations of these problems are different in preschool and elementary school children, in adolescents, and in adults. One of the major syndromes with which copper excess is associated in younger children is with Attention Deficit Disorder (ADD). Copper excess may be related to ADD with hyperactivity and also without hyperactivity.

The impact of copper excess seems to be much more severe in preadolescent and adolescent girls than in boys. As girls reach puberty, the increase in estrogen levels tends to exacerbate the effects of copper excess because estrogen raises the level of copper in the body's cells and tissues. When this occurs, there is likely to be an increased risk for behavior and emotional disorders: mood swings, depression and suicidal tendencies, anxiety and panic disorder, irritability and aggression, running away, promiscuity, and eating disorders. Memory, learning, and concentration problems may also increase. Copper excess can be a significant factor contributing to a dramatic increase in the numbers of teen age girls and young women being psychiatrically hospitalized and medicated for "bi-polar" disorder. I consider this diagnosis to be really a "pseudo"-bipolar disorder because the role of excess copper as a contributing underlying factor is rarely if ever identified or considered in the diagnosis and treatment. The eating of foods high in copper content is likely to exacerbate these conditions.

Copper excess also is frequently seen in adults, especially in women. Again, estrogen is a strong contributing factor because of high correlation between copper and estrogen. In addition to the normal increase of estrogen in the menstrual cycle, estrogen also tends to increase in the third trimester of pregnancy, thus contributing to post-partum depression and other psychological problems in some women. Furthermore, women (and adolescent girls) who use the "pill" for contraception increase the amount of estrogen in their system. This is strongly associated with an increased tendency to experience depression, panic disorder, and obsessive-compulsive disorder.

There are a number of environmental factors that further exacerbate the problem of copper excess. For the past forty or forty-five years, the use of copper pipes in household plumbing has contributed substantially to ingestion of increased amounts of copper, especially in the presence of "softened" water. Also, zinc deficient diets may lead to copper excess. Food processing and the deficiency of zinc in our soils are contributing directly or indirectly to the risk of copper excess.

There is some clinical evidence that suggests that copper excess in children with ADD and certain types of behavior disorders may begin *in utero.* Heavy copper excess in a mother may be strongly associated with copper excess in one or more of her children depending on how much stress she experienced during her pregnancy. The *in utero* transfer of significant amounts of excess copper to the fetus may also account for the dramatic increase in the number of babies being born with jaundice today. The excess copper is stored primarily in the liver and in the brain. The liver storage can be contributing to the increasing incident rates of jaundice in newborn babies. The brain storage can be contributing to the increasing incident rates of learning and attention deficit disorder.

Clinically, the hair tissue mineral analysis is the best available laboratory test for assessing copper excess or toxicity. However, there are some important technical and dynamic aspects to the identification of copper excess as a possible contributing factor to psychological problems. In some individuals, the first hair tissue mineral analysis may clearly show a high copper level regardless of what is seen in the rest of the mineral profile. In other individuals, what appears to be a near normal level of copper may actually be a very high level in relationship to zinc; that is, the zinc/copper ratio is significantly below normal. These are the two principle ways in which copper excess may manifest itself in the first hair mineral analysis.

In some cases, copper excess may be latent and not be seen so clearly in the first hair mineral analysis. This is because the high amounts of copper may be stored and locked in tissues so that the hair is not picking up the excess amounts. This may be due to the presence of other heavy metals that mask the excess copper. Lead, mercury, cadmium, and/or aluminum may show more readily in the first hair mineral analysis. However, after the individual goes on a nutritional program, the excess copper may be released from tissue storage and will be clearly seen in a subsequent hair mineral analysis.

At the present time, because copper excess is expressed in different ways as a part of a complex dynamic system of interacting nutrient minerals and heavy toxic metals, the review of individual cases is the best method for observing the role of copper excess in a variety of conditions. This is especially true when the copper is masked or hidden in the first hair mineral analysis. The role of latent copper is often missed in most studies using a cross-sectional rather than a longitudinal method of data collection. The nature of the copper excess phenomenon often requires repeated measures over time in order to clearly see the role of copper in many psychological problems.

CASE STUDIES

ADD with Behavioral Hyperactivity

This case illustration is that of a 9 year-old boy referred by his mother. The presenting problems included: "no concentration, can't remember, can't relate to friends, accidents, bumping into things, temper tantrums, chronic depression." Psychological testing indicated that he excelled in verbal concepts and in spatial relations; but visual-motor and auditory sequential memory problems were evident. On the Davids behavior rating scale, his mother rated him 36/36, which is the most hyperactive rating. White spots were observed on his fingernails. White spots often are associated with a zinc deficiency. Since a low zinc/copper ratio also is indicative of copper excess, white spots are often an indicator of copper excess.

The first hair mineral analysis showed that this boy was a very "fast oxidizer" with a significant sodium/potassium "inversion". This combination -- a fast oxidizer with a sodium/potassium inversion-- is the most common hair mineral analysis profile of hyperactive children. In addition, excessive amounts of lead, cadmium, and aluminum were reported in the first mineral analysis of this boy. However, copper was latent; it was .80 mg/%, a level far below normal (2.5 mg/%).

The second hair mineral analysis was done three months later and showed a major shift in the boy's profile. He had gone into "slow oxidation" with a significant improvement in the hyperactivity ratio of sodium/potassium. Lead, cadmium, and aluminum were still present. However, the copper level had increased from .80 to 24.0! Also, even in the presence of a doubling of the zinc level from 6.0 to 12.0, the zinc/copper ratio dropped from a near normal level of 7.5 (8.0 is the lab's normal zinc/copper ratio) to .50; this is indicative of extreme copper excess. The sharp increase in the hair copper most often indicates the elimination of copper from tissue storage. During this copper "dumping", the hair temporally picks up the increased amount of copper.

During this period of time, the boy's mother reported that she and others who knew the boy observed improvements in his behavioral control, increased calmness, and his ability to anticipate the consequences of his behavior.

Four months later, a third hair mineral analysis showed that his mineral pattern was becoming more balanced and stable with a greatly reduced tendency towards hyperactivity. Excess lead and aluminum had been eliminated along with a very large amount of copper that had dropped from 24.0 to 3.4. The zinc/copper ratio had improved from .50 to 2.95 (still indicative of copper excess, but not quite as severe).

Jim’s mother reported continued behavioral improvements. She also rated his behaviors again on the Davids scale. The new rating score was 25/36 as compared with 36/36, indicating a substantial decrease in hyperactivity. This case clearly illustrates the dynamics of latent copper excess that is only seen over time in two or more hair mineral analyses. It also illustrates how copper can be eliminated in stages from tissue storage.

Adolescent Behavior and Emotional Problems

This case illustrates the role of copper excess in exacerbating behavior and emotional problems in a very bright 13 year-old girl. One year prior to this tissue mineral analysis, the girl began running away from home. She continued to perform well in school, but home problems got worse and worse. She had always been a very difficult child to discipline, but her behavior became more unmanageable for her mother during the past year. The girl was admitted to a general hospital for a neurological and psychological evaluation. All medical tests administered were negative (a hair tissue mineral analysis was not performed.) The psychological evaluation indicated that the girl had a very high IQ, but there were emotional problems and therapy was needed.

The mother believed that there was a problem with the girl's body chemistry that got worse with the onset of puberty. The child had a history of reacting to milk with a runny nose, and she had a tendency to break out in a rash when she ate chocolate. She had dark circles under her eyes and the pediatrician suspected that she had allergies. However, she was never tested for them. The girl complained of being tired, and she tended to sleep a great deal.

After running away again, the girl was admitted to a psychiatric hospital where she stayed for four months. Immediately after being released from this hospital, she ran away again. Her hair mineral analysis showed that, as a slow oxidizer, she had very low energy reserves for coping with stress, Therefore, she tended to avoid stress by running away. The slow oxidation also accounts for her tendency to be chronically tired and to sleep a great deal. The slow oxidation with high copper is associated with depression and suicidal tendencies. She showed suicidal tendencies and was then placed in a state-supported psychiatric hospital. Today, many teenage girls with this high copper mineral pattern are being “diagnosed” with bi-polar disorder. I consider this to be a pseudo-bi-polar disorder because the key underlying factor is a copper excess in a slow oxidizer mineral pattern.

Estrogen Replacement Therapy

This case illustrates the relationship between estrogen, copper excess, and slow oxidation. A 49 year-old post-menopausal female was placed on estrogen one and-a-half years prior to the hair analysis described here. She reported being active and energetic prior to the start of the estrogen therapy. She now reports that she feels chronically fatigued and exhausted, has dry skin, has gotten chronic infections, is much more distractible, and has a problem with easily gaining weight. She reports that her mind has been "racing" during the past few months.

The hair mineral analysis chart shows that this woman has a very high copper level (14.8) with a very low zinc level (4.0). The resulting zinc/copper ratio of .27 is indicative of an extreme degree of copper excess. In addition, she is an extremely slow oxidizer with a tissue calcium level of 900! The normal calcium level is 40 mg/%. The high copper results in a lowering of potassium and an increase in tissue calcium. A high calcium/potassium ratio is one of the characteristic ratios of a "slow oxidizer".

The psychological effect of very slow oxidation with a very high copper level is that the person's mind is hyperactive and racing while the person's body feels chronically

exhausted and fatigued. The person has all sorts of ideas racing through the mind, but is too tired to act on any one of them. Such an individual easily becomes confused and frustrated. The low energy level of some depressed individuals is associated with very slow oxidation.

THE EXTENT OF COPPER EXCESS

There are a number of factors that suggest that copper excess may have already reached epidemic proportions. Many trends and developments that seem to be unrelated on the surface may have copper excess as an underlying common factor. A recent study reports a doubling of the rate of birth defects in the past 25 years. There appear to be increases in the numbers of children with learning and behavior disorders. The numbers of women with depression, anorexia, and suicidal tendencies seem to be on the increase. Hyperactivity rates among children seem to be increasing. The numbers of exhausted and fatigued young women are increasing. Behavior and emotional problems among adolescent girls are on the increase.

How are the contributing factors coming together to produce the trends which may be strongly related to copper excess? A number of these factors have been mentioned above. These include the extensive use of copper plumbing in homes during the past 25 to 35 years. Depending on the acidity of the water, copper may be leached into drinking and cooking water. Zinc deficient soils produce foods with inadequate zinc supplies to antagonize copper. Stress tends to deplete zinc that allows copper to become more toxic in a person's system. The use of the "pill" on such a massive scale increases the amount of estrogen in a female's system. This results in an increase in tissue copper levels, often resulting in copper excess and "slow oxidation". Pregnant copper toxic women give birth to copper toxic babies who may have birth defects, learning disabilities, and hyperactivity. A copper toxic female child will experience an exacerbation of her copper excess when she enters puberty. Behavior and emotional problems will frequently result. These may involve eating disorders, running away, depression, suicidal tendencies, mood swings, and violent episodes.

Because there is such a strong correlation between estrogen and copper, excess copper in the tissues of a pregnant female may strongly affect her fetus. The problem of copper excess can be passed on from one generation to another. As it is passed on, the problems are likely to become worse. It is suggested here that the problem of copper excess may be characterized by a cumulative effect. That is, as copper excess is passed from one generation to the next, the new generation begins life with a higher load of copper most likely transferred *in utero*. The quantity increases with continuous exposure to copper-loaded water and other sources of copper in the environment.

Copper excess predisposes one to psychological problems (Pfeiffer, 1975). However, the way in which these problems manifest themselves depends on other factors such as family dynamics, personality structure, physical health, neurological integrity, abilities, developmental history, etc. That is, "copper excess" is a general toxic condition found in many individuals, but the specific psychological and/or physiological problems manifested are unique to each individual. Therefore, the major underlying biochemical "common denominator" of a wide range of psychological and physiological disorders is "copper

excess". It is strongly recommended that the most effective treatment for any of these associated disorders must include a treatment for the "copper excess" (general condition) as well as for the specific psychological and/or physiological problem which is manifested in the presenting symptoms and problem (specific condition). The diagnosis and treatment of anorexia nervosa would be a good illustration of this principle. An even more important application of these concepts would be in the direction of preventing anorexia nervosa by the early identification of copper excess in children in the intermediate and junior high grades. By implementing appropriate nutritional programs, the copper excess in individual children can be significantly reduced or eliminated, thereby substantially eliminating a major contributing factor in the development of this disorder. Clinically, we know that the excess tissue copper levels can be significantly reduced with diet, exercise, and proper nutritional supplementation.

Until the extent of the problem of copper excess is recognized and effectively treated, we are likely to see higher incidence rates of related psychological problems. These problems are likely to involve expensive treatments that, at best, will only reduce the symptoms without getting at a major underlying contributing factor. On the positive side, there is nutritional/ biochemical knowledge and, also, the laboratory technology available that permit us to identify the copper excess condition and to effectively reduce its psychological and physical impact. A nutritional program will enable us to build a more solid underlying *biochemical foundation* on which to build other treatment and intervention programs. The resulting synergistic effect would very likely speed up treatment of many psychological problems related to copper excess and drastically reduce diagnostic and treatment cost. Treatments would also be much more effective and longer lasting in psychological improvement.

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