

THE AFIB REPORT
Your Premier Information Resource for Lone Atrial Fibrillation
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VIRTUAL LAF CONFERENCE

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SUBJECT: **Copper: The Missing Link?**

Welcome to our new and freshly “painted” Conference Room. I hope you like the colour scheme.

It is time to introduce a brand new subject so here it is!

Copper: The Missing Link?

Ever since I discovered that the average afibber (myself included) has a dietary copper intake about one fifth of that of our benchmark (Fran's) diet I have become increasingly intrigued by the possibility that copper and the ratio of zinc:copper in the diet (zinc inhibits the absorption of copper) could be a key factor in lone atrial fibrillation. I would like to propose a new hypothesis for your scrutiny and comments.

In my book (pages 137-138) I discussed the possibility that oxidative stress could play a major role in LAF. Here is the relevant quote (see the book for references):

“Mapping of fibrillating atria has shown that ectopic (premature) beats and fibrillation itself originate in clearly discernible agglomerations of individual heart cells that are beating to their own rhythm rather than to the rhythm generated in the SA (sino-atrial) node. It is thought that these agglomerations are actually inflamed heart tissue and that atrial fibrillation originates here and is sustained by scar tissue (fibrosis) generated by previous inflammations[9,10,16,17,55]. It is also clear that the junctions between the left atrium and the pulmonary veins are the most common locations for these “rogue”, inflamed cell agglomerations.

What, apart from size, is different between the left and right atrium, or for that matter, between the junctions of the left atrium and the pulmonary veins and the junctions of the right atrium and the venae cavae?

In a nutshell, oxygen concentration (partial pressure) and shear stress. The blood returning to the right atrium is relatively low in oxygen content and flows fairly sedately through the venae cavae into the heart. The blood flowing from the lungs to the left atrium, on the other hand, is highly oxygenated and flows more forcefully through the pulmonary veins thus generating a significant amount of shear stress, especially at the junctions with the left atrium.

The combination of a high oxygen pressure and shear stress is a potent breeding ground for reactive oxygen species (ROS). The superoxide anion, singlet oxygen, nitrogen dioxide (peroxynitrite) and hydroxyl radicals are all members of the ROS family. They share the dubious distinction of being able to cause inflammation and inflict considerable damage in tissues, cells and individual DNA strands.

One would expect vigorous exercise to markedly increase oxygen concentration and shear stress and thus promote the formation of ROS. Indeed, there is evidence that orienteering, marathon running, and cross-country skiing are associated with an increased incidence of arrhythmias and asthma[57-59]. Finnish researchers found that middle-aged, elite orienteers had a 5 times higher incidence of lone atrial fibrillation than did the general population[57]. Breathing air polluted with nitrogen dioxide has also been found to increase the incidence of inflammation and arrhythmias[60-62]. Other forms of air pollution (particulate matter) has been linked to the formation (in the lungs) of inflammatory cytokines that are released into the blood circulation[63].

Under normal circumstances any ROS attacking the heart lining or adjacent lung tissue would quickly be rendered harmless by the body's own antioxidants or by antioxidants obtained through the diet. However, if antioxidant defenses are inadequate, the immune system is compromised, or if the autonomic nervous system is highly dysfunctional or stressed, it is likely that the ROS could get the upper hand and initiate an inflammatory response and subsequent arrhythmia. Researchers at the Cleveland Clinic and the Ohio State University have found that AF patients show signs of extensive oxidative injury to their myofibrillar creatine kinase (MM-CK). MM-CK is involved in the control of the contraction of individual heart cells (myocytes). The researchers also determined that the oxidative damage was caused by peroxynitrite, a highly potent free radical. They conclude that peroxynitrite-induced oxidative stress can damage individual heart cells to such an extent that their normal function is disrupted and atrial fibrillation results[64]."

Although dietary antioxidants such as vitamin C, gamma-tocopherol (vitamin E) and lycopene may help prevent oxidative damage there is no question in my mind that the body's own naturally produced antioxidants superoxide dismutase and glutathione peroxidase would be far more effective in preventing oxidative damage than would the dietary antioxidants.

Superoxide dismutase comes in two varieties: one containing copper and zinc and one containing manganese. For the purposes of this discussion I'll leave out the manganese-based version and concentrate on the Cu/Zn superoxide dismutase. Glutathione peroxidase contains selenium (Se) and is vital in defusing the hydroperoxide formed when superoxide dismutase breaks down superoxide to oxygen and hydroperoxide. In other words the two antioxidants work together and need an adequate supply of Cu, Zn and Se in order to be produced by the body.

The free radicals, superoxide and peroxynitrite have both been shown to cause damage to heart tissue leading to fibrosis, a well-known player in the LAF drama. Peroxynitrite is formed through a reaction between superoxide and nitric oxide and experiments have shown that peroxynitrite formation is completely suppressed in the presence of adequate amounts of superoxide dismutase. HOWEVER, adequate amounts of superoxide dismutase cannot be produced unless the body receives an adequate and balanced intake of copper and zinc.

The consequences of a copper deficiency were discussed in the October 2003 issue of *The AFIB Report*. Here are the relevant paragraphs:

"Copper deficiency is widespread in the western world. A daily intake of between 0.65 and 1.02 mg (based on analyses of actual food consumed) has been found to lead to deficiency symptoms and it is estimated that approximately one third of the populations of Belgium, Canada, the UK, and the United States have daily intakes in this range[1]. A copper deficiency has been linked to osteoporosis, high cholesterol levels, hypertension, cardiac rhythm abnormalities, increased tendency to blood clotting (thrombosis), an increase in the oxidative stress on the heart tissue and the development of fibrosis[1,2,3,4,5].

Of particular interest to afibbers is the finding of an association between a copper deficiency and fibrosis of the heart muscle (a suspected important player in afib), cardiac arrhythmias, and in particular, a tendency to experience an increased level of premature ventricular complexes (PVCs)[1,6,7]. While PVCs have not been linked directly to the initiation of atrial fibrillation it is possible that they could be involved indirectly. PVCs do cause anxiety, particularly when they come in runs and may also disturb the mechanical, if not electrical, balance of the heart. Both could lead to increased anxiety and thus provoke an afib episode.

A copper deficiency also reduces the level of superoxide dismutase (copper-zinc superoxide dismutase)[1,4,5,8,9,10]. Superoxide dismutase is one of the body's most effective antioxidants and is particularly adept at neutralizing the superoxide radical, a potent free radical generator and initiator of oxidative stress. It is likely that the superoxide radical would be particularly plentiful in the blood entering the left atrium through the pulmonary veins and thus could be

involved in the etiology of afib episode initiation[11].

Blood (erythrocyte) levels of superoxide dismutase can be increased by copper supplementation, but commensurate high intakes of zinc or ascorbic acid (vitamin C) reduce the effectiveness of the supplementation[12,13].

Several experiments have shown that the frequency of PVCs can be markedly reduced by supplementation with copper. As early as 1979 it was observed that daily supplementation with as little as 4 mg of elemental copper (from copper gluconate) completely eliminated PVCs in less than 2 weeks in three individuals suffering from PVCs[6]. Again it was pointed out that a high zinc intake would be detrimental because it interferes with copper absorption.

The average copper intake among the 65 afibbers participating in the 2001 diet survey was 1.3 mg/day. However, this is a value calculated from the USDA nutrition database. According to research yet to be published calculated values are at least 52% higher than the values obtained by actually analyzing meals consumed[2]. So the calculated 1.3 mg/day would actually correspond to an analyzed value of about 0.86 mg/day. This is well within the deficient range; considerably below the official "Adequate and Safe Intake" of 1.5 to 3.0 mg/day, and even below the recently established RDA of 0.9 mg/day (many scientists feel that this value is way too low)[3].

So not only could many afibbers be deficient in copper, but it would also seem that the average Zn:Cu ratio in the afibbers diet is undesirably high at 7.8:1 compared to 3.1:1 in the benchmark diet (Fran's diet) and the RDA of 6:1. Many researchers consider the Zn:Cu ratio in human milk to be ideal[2]. This ratio is 3:1, very close to the benchmark diet, but substantially lower than the RDA and the average ratio found in the afibbers diet survey. Considering that many men take zinc supplements for prostate health without a commensurate intake in copper would further push the Zn:Cu ratio in an undesirable direction.

Nuts, legumes, and dark chocolate are excellent dietary sources of copper and chelated copper and copper gluconate are effective supplements[14,15,16]. Copper intakes up to 10 mg/day are considered safe, but intakes of 6 mg and more may produce stomach upsets[2].

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What I am now proposing is that a copper deficiency and an elevated Zn:Cu ratio could result in suboptimal levels of superoxide dismutase which in turn could result in an increased level of PVCs and – perhaps – an increased frequency of afib episodes.

I believe it is quite possible that copper may prove to be as important as magnesium for afibbers and probably even more important for those of us with a high level of PVCs. I have been experimenting a bit recently with copper and zinc supplementation and for the time being (I may cut back a bit later) have settled on 5 mg chelated copper (Albion Process) at lunch (no zinc or vitamin C at this time) and 25 mg of zinc citrate at dinner (with 500 mg of vitamin C). My two most recent Holter monitor recordings showed a total of 2600 PVCs over a 23-hour period or 113 PVCs per hour. I am now down to 10 per hour or less and expect to eliminate them completely within the next week or so. I should point out that hair analyses carried out in 1993 and 1998 (my afib career began in late 1989) showed my copper levels to be well below normal.

Whether elimination of PVCs will influence afib episode frequency remains to be seen. I'll keep you posted on that. In the meantime it sure feels good not to miss what seemed to be every second heart beat.

The session is open for what I hope will be a lively and fruitful discussion.

Hans

A wonderfully-evocative lead-off, Hans. I have put copper supplements on my health-food-store list and am looking forward to a month's yarns on this topic.

Michael in SF

Hans,

I want you to know that I read, right along side of Richard, about everything that transpires on your BB, and we are constantly brainstorming and researching whenever we can. Sometimes I worry that I will get AF, because I feel for all of you, so emotionally, that I have become a part of you all in mind and spirit, and I WANT MY HUSBAND HEALED!!

Anyway, upon speaking with Richard, he said that his copper and zinc levels were actually normal; not what his hair analysis indicated, although much time has passed since that test in April. What he did say, was that Dr. Gersten stated that the most profound finding of his analysis of all the tests, was Richard's almost nil levels of molybdenum. I thought it important enough, to post in the conf. room, in case anyone comes across information on this trace mineral, while studying copper and zinc. Here are a few studies I found, when trying to educate myself tonight.

Multifocal myocardial necrosis: a distinctive cardiac lesion in cystic fibrosis, lipomatous pancreatic atrophy, and Keshan disease.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12056507&dopt=Abstract

Distribution and pathophysiologic role of molybdenum-containing enzymes.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9151140&dopt=Abstract

Molybdenum requirement of female rats.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1552358&dopt=Abstract

Effects of sodium molybdate on guinea pig atria contractility]

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2087999&dopt=Abstract

This, by far, was the most interesting. This should really interest Mike F. This is based on research, for personal reasons, by Dr. Cooter, a Ph.D. in health journalism.

<http://www.mall-net.com/cooter/moly.html>

Information about molybdenum deficiency is limited as well. Low soil levels of molybdenum lead to increased soil and plant levels of nitrates and nitrosamines, which increase risk of cancer, especially in the esophagus and stomach. Increased sensitivity to sulfites used in foods may be related to low molybdenum and deficient sulfite oxidase enzymes. In animals, molybdenum-deficient diets seem to produce anorexia, weight loss, and decreased life span. In humans, deficiency may lead to visual problems, rapid heart rate and breathing, and depression of consciousness.

<http://www.healthy.net/asp/templates/article.asp?PageType=article&ID=2076>

I hope it was alright to post this in the conference room. If not, you can move it to the BB. Richard will be home tomorrow evening, and then we'll look over all his tests results. I do know, however, that his neurotransmitter pathways are disrupted, and the doctor wants him on tryptophan and tyrosine. I'll let him explain the rest. Thank you all, for what you do.

Rhonda

I found this to be very interesting, from the book, "The Healing Nutrients Within".

DIMETHYLGLYCINE: A MIRACULOUS METABOLITE?

Dimethylglycine (DMG) is a derivative of glycine and a normal compound found in low levels in cereal grains, seeds, and meats. DMG serves as a building block for many important compounds, including methionine, choline (a B vitamin derivative important to the synthesis of the neurotransmitter acetylcholine), hormones, and DNA. The quantities of DMG in the body are almost too small to measure except by special techniques, yet it can have a wide range of beneficial effects.

DMG was originally manufactured in vitro through a Russian patent as part of a formula known as calcium pangamic acid, incorrectly referred to as vit. B15. Calcium pangamate is the ester formed between DMG and calcium gluconate. The formula contained significant amounts of DMG, and the calcium gluconate was found to rapidly hydrolyze to DMG when given orally. Hence, it was deduced that the active effects of pangamic acid were due to DMG, not the calcium gluconate, though common usage has led to the acceptance of the term vit. B15. This DMG based formula demonstrated to aid cardiovascular function by reducing angina and high triglyceride and cholesterol levels and improving oxygen utilization by the body. It was also found to improve liver function.

Research began in 1975 in the US, to support many of the health benefits found in the Russian studies. Many claims have been made about DMG for strengthening immune response; boosting physical and mental performance in athletes and older people; and enhancing cardio function in people with ARRHYTHMIA, circulatory problems, angina, blood pressure, and elevated triglycerides. Additional research indicates that DMG can protect the liver, aid in detoxification, reduce seizure activity in some individuals, promote improvement in children and adults with autism; increase stamina and sex drive; and aid in the treatment and prevention of HYPOGLYCEMIA, lupus, fatigue, diabetes, allergy, muscle cramps, arthritis, pain, and melanomas.

Claims for DMG are mostly attributed to its conversion to glycine. In the body, DMG is produced in the one-carbon transfer cycle from choline via betaine in an enzyme-controlled transmethylation reaction. Sequentially, choline is converted to betaine, DMG, sarcosine (a sweet crystalline amino acid), and finally glycine. DMG acts as a methyl donor that assists in methylation similar to the metabolic pattern of betaine, methionine, and folic acid. DMG's effects generally could also be attributed to methionine and glycine by themselves.

In this breakdown process, DMG generates two carbon molecules, including sarcosine, glycine, serine, and the

ethanolamines, all of which are beneficial to the cell. It also stimulates oxidative enzyme activities that may help protect DNA from mutation and inhibits enzymes for cholesterol and triglyceride synthesis, thereby lowering cholesterol and triglycerides in serum. The increase in oxidative enzymes is brought about by certain nutrients such as COPPER, and the lowering of cholesterol is done by glycine, lecithin, or choline. DMG may prolong the effects of choline by slowing its breakdown. Hence, we see that the effects of DMG are probably those of a composite of nutrients, including copper, methionine, glycine, choline, or lecithin. The possibility exists, however, that DMG in therapy may have properties greater than the sum of its parts.

Studies on the use of nutritional supplements in racehorses, including DMG; vit. A, E, and D; and the minerals iron, copper, and manganese, have found that beneficial effects occurred after one month of therapy with 1200mg of DMG per day. The study is difficult to evaluate because the horses were being given many other nutrients as well. However, the authors suggest DMG could lower blood lactic acid levels, make the horses more aggressive, and improve their appetites.

Many pharmacological actions of DMG have been identified. Some of the most interesting have been the creation of increased reserves of glycogen, creatinine phosphate, and phospholipid in skeletal and cardiac muscle fibers. DMG's reported benefits in aging may also be due to glycine. DMG, like glycine, probably contributes to the synthesis of glutathione, an important antioxidant made primarily from cysteine. Also, as people age, methyl groups can decrease. DMG acts as an antidote in its role as a methyl donor.

Other reported effects of DMG relate to glycine as an osmoprotectant in plant life, like betaine and proline. That is, as salt levels increase, glycine, as well as betaine and proline, increase. They are useful amino acids, protecting life from the stress of deficient amounts of water. For this purpose, DMG would have no advantage over glycine.

Thus, many of the effects of DMG can be attributed to glycine. An average person ingests 3-5g of glycine daily. DMG is available in 100mg to 125mg tablets. Although DMG is very effectively absorbed from the digestive tract, data further suggest current dosing of DMG is far too small to expect any positive effects. The recommended dose of DMG can range from 125mg to over 1,000mg a day, depending upon the condition being treated.

Ironically, we have tried doses of 3g in fasted human controls, with no elevation in plasma glycine levels or change in amino acids. Even if the DMG were converted to glycine, this would not be enough of a dose to raise glycine levels acutely. DMG in these large doses may produce depression.

DMG may have many interesting effects. The most interesting effects of DMG are its possible role in controlling autism and epilepsy and a more likely role as an immunostimulant. However, it might be cheaper and easier to obtain these effects from supplementation with glycine, choline, and methionine.

This sure did cover a lot of what you all have been discussing.

Rhonda

Rhonda and all

Some tit bits taken from a Google search of copper and molybdenum ratio.

Molybdenum helps maintain the proper ratio of copper to molybdenum in the body, excess doses of molybdenum (up to 0.54 mg/day) can cause an excessive loss of copper in the urine. Excess copper decreases molybdenum levels. High sulfur intake decreases molybdenum concentrations in the body.

RDA. Not known for humans, but too little may lead to premature aging and impotence in older men. Excess copper, sulfur and tungsten in the diet reduces molybdenum utilization in the body - is Richard not focussing on sulphur...

Molybdenum deficiency symptoms include:

Irritability

Irregular heartbeat.

All minerals can be involved in interactions, but the effect other minerals have on the need for copper appears more specific and unique than with many of the other minerals. For example, the levels of molybdenum, sulfur, and iron both in the diet and water can affect the availability of copper.

Specific minerals in ionic form compete for the same absorption pathways and hence an excess of one mineral can impede uptake of others (i.e. competition between zinc and calcium, iron, phosphorus-sulphur, selenium-sulphate, copper-molybdenum, etc).

Mineral deficiencies can be precipitated by the over zealous use of fertilizer additives, eg: excess molybdenum applied to ensure legume growth. This can produce copper and cobalt deficiency.

Availability of minerals can be affected by moisture. High soil moisture and/or reduced soil aeration can increase the availability of molybdenum, iron and manganese to plants which in turn affects the plants uptake of other minerals. In contrast the same conditions reduce the plants selenium concentration.

Molybdenum <http://www.mlmanonymous.com/Disease.htm>

Molybdenum is a little-known, though essential, trace mineral. It is instrumental in regulating pH balance in the body. For each pH point increase (e.g., 6.1-6.2), the oxygen level is increased ten times, thus increasing the metabolism and enhancing the body's ability to burn fat.

Although very small amounts are needed, molybdenum is a vital part of three important enzyme systems and is necessary for the proper function of certain enzyme-dependent processes, including the metabolism of iron. When the iron stored in the liver is freed, it can then carry oxygen to body cells and tissue. Molybdenum works with the enzyme systems to help eliminate toxic nitrogen waste by turning it into uric acid. The uric acid then can be converted and more easily flushed out of the system.

Molybdenum promotes general well being, aids in carbohydrate metabolism, has proven itself useful in MSG (or other chemical) sensitivity, increases libido, and may enhance the effect of fluorine in tooth decay prevention (dental enamel is rich in molybdenum). It also induces sleep.

Because of molybdenum's ability to raise the body's pH, it may be beneficial in the treatment of cancer, viruses, and parasites.

There is no recommended dietary allowance (RDA) established for molybdenum, and it is considered safe up to 15 mg. per day. It has been found to interfere with the absorption of copper.

Fran

Hi Fran,

That was quite interesting in regards to MSG sensitivities. Could this be a missing link, to the other applications that people are using here, who have partial success. The difficulty I see here is trying to keep all these minerals in balance. Richard's vitamins that I have been taking have 100mcg. of moly picolinate. Richard hasn't been taking any supplements, as he was waiting for his appt. with the doctor. I did start taking aminos about 2 weeks ago, in combination, with vitamins, because I smoke. I was already taking vits. but added the aminos, and dropped 10#'s. Richard and I had been reading about MSM, and I've been doing that as well, but didn't notice anything different, other than the dark circles under my eyes, start to partially disappear. I started that before aminos. I guess, in your case, you probably need to focus on a daily food with high moly, but I'm not sure you're not already doing that. Anyway, thank you for a very good post, Fran.

Rhonda

Mmmm,

Good interesting reading, and in my usual rash 'bull-in-a-china-shop' manner I just ordered up a batch of chelated copper and chelated molybdenum..... and now find myself wondering how much of each to take each day so as to maintain some kind of balance. Also I already take selenium..... but should I be introducing some zinc too?? Any ideas/knowledge anyone out there as my best strategy as regards in what proportions to take the aforementioned supplements??

I keep on doing this supplement thing, then get confused as to how to achieve the right mix/ratio, and end up thinking Fran's way is best..... i.e. get EVERYTHING naturally balanced in food. But this copper and moly thing has really peaked my interest (and I don't want to get Cu from chocolate since I still need to lose a little more weight!).

Mike F.

Hi again,

Here's a web page listing all the good things in 1 oz of sunflower seeds..... including 0.4mg of copper.

<http://www.parrothouse.com/sunflower.html>

Mike F.

More information on molybdenum:

Functions

Aldehyde detoxification
DNA metabolism
Haemoglobin production
Iron metabolism
Sulphate production
Sulphite inactivation
Methionine and cysteine metabolism
Taurine synthesis
Uric acid production

My note: Methionine is important for the breakdown of norepinephrine to epinephrine which is important for the release of glucagon, which balances insulin.

<http://www.health-diets.net/healthsearch/molybdenum.htm>

Sulfur:

Functions: The reason that sulfur does not have a DRI, UL, or RDI is because it does not function alone as a nutrient. It is a component of certain amino acids (cysteine and methionine) and the vitamins biotin and thiamin. Further it is a component in insulin. Its function is to stabilize nutrient shape. In amino acids, sulfur helps form protein structure by forming disulfide bridges.

Chromium:

Deficiency: The effect of chromium deficiency in humans has not been fully established although evidence suggests that decreased insulin-mediated glucose cellular uptake, decreased insulin sensitivity, increased blood glucose and insulin, and abnormal lipid profiles may occur.

Copper:

Functions: Copper functions as a cofactor for antioxidant enzymes and in the electron transport chain. It is important for melanin (a skin pigment), collagen and elastin (connective tissue proteins) biosynthesis and is a component of the

enzyme ceruloplasmin which is instrumental in iron oxidation and incorporation into transferrin. Further, it is important for immune and cardiovascular functioning.

Could copper be responsible for the coloration of skin pigment, when out in the sun?

<http://www.wsuonline.weber.edu/course.nutri.classnotes/mod3n3.htm>

Rhonda

High copper could explain why I get so many freckles out in the sun. Also I suppose my face looks a copper colour despite me being very fair skinned. I know that meds and maybe a sort of adrenal exhaustion caused the big brown marks.

Fran

It certainly fits Hans, a few months ago my copper tested low 0.50, lab range of 0.53-0.77 mg/L and my zinc level was on the high end of the lab values 14.0, (9.0-14.7 mg/L). I was taking a zinc supplement and not taking copper which could interfere with copper utilization. They must be taken in balance, I have read that you should take in 10 times as much zinc as copper and they should be taken at different times, too much zinc and too little copper can cause PVCs according to an old book I happened to start reading again "Dr. Wrights' Healing with Nutrition".

According to the Food and Nutrition Board of the National Research Council the recommended range for copper intake is 1.5 to 3 milligrams. Leslie M. Klevay, M.D. of the U.S. Dept of Ag.'s Human Nutrition Research Center in Grand Forks, North Dakota say: Consuming too little copper may contribute to numerous health problems, such as heart rhythm problems, increased blood pressure and glucose intolerance.

Good food sources are: Nuts, cocoa, cherries, shellfish (especially oysters), crustaceans, mushrooms, whole-grain cereals and gelatine.

Liz

Liz,

Actually when I spoke to Dr. Klevay recently he suggested that the optimum zinc:copper ratio was the ratio in human milk. This ratio is 3:1; the ratio in Fran's diet was 3.1:1. I think 10:1 is way too high. You are absolutely correct that copper and zinc supplements should be taken at different times of the day; I take my copper at lunch (5 mg) and my zinc at dinner (15 mg). Also copper should not be taken together with vitamin C as both vitamin C and zinc interferes with its uptake.

Hans

Hans,

These are my results on some key minerals. What do you think, when you have the time? Elemental Analysis (Packed Erythrocytes)

Copper Ref range .53-.72 Result .63
Magnesium Ref range 30.8-40.4 Result 40.9
Manganese Ref range .011-.028 Result .024
Molybdenum Ref range .0004-.0019 Result <.0002
Potassium Ref range 75.6-95 Result 90.0

Zinc Ref range 7.3-10.6 Result 8.7

I have not been taking any supplements since May. This test was completed in July.

My levels of mercury and tin were high, on the same test. I started the process of having my amalgams removed (two so far). I would venture to guess, that because of my low levels of methionine, that I'm not naturally chelating the toxic metals.

Thanks Hans for any input.

Richard

Fran,

I don't know if this occurred to you, but a deficiency in molybdenum is also linked to esophageal cancer. Being that moly has success in helping ones with MSG sensitivities, and your sister having this type of cancer, struck a chord with me, in thinking this might be one of your culprits. How is your sister doing?

Richard

Thanks Richard. I didn't know about molybdenum being linked to E. Cancer. I do know however, even though she won't admit it, she is very sensitive to MSG - as was my father who did acknowledge it. Joan is waiting for a scan and more biopsies on 29th Oct. Her last biopsies showed no evidence of disease (NED). So that was great news. Of course she is very nervous about the one coming up. So am I.

I've been waiting to see what Hans thinks about your Zn:Cu ratio. From what he wrote it looks like your ratio is too high. Roughly 8:1 as opposed to 3:1. From standard RDA lab values this would look good - but with the research Hans has been digging up - it looks like it should be about 3:1. It could be that it makes all the difference.

I suspect that my molybdenum levels must be in the OK range now. I can't remember if fitday records this one. I will check tonight. I think liver is quite high in it - and am wondering if after forcing myself to eat it - whether the craving I get for it now - is down to just that. It seems to straighten me up if you know what I mean.

I was wondering in a previous post to Rhonda (above) whether you had been focussing too much on sulphur. Sulphur and tungsten can reduce molybdenum utilization in the body and again would affect Cu.

You are lucky you have a good Dr guiding you through all this. I would worry so much about introducing any minerals etc because they all use the same pathways and high levels of one can totally knock the rest off balance.

Keep us informed. If you discover your 'normal' Zn:Cu ratio maybe out dated will you ask Dr Gersten about it and see what he thinks?

Fran

Just read an article (albeit connected with promoting/advertising an 'elemental' moly supplement) which stated amongst other things that moly can interfere with the absorption/uptake of copper. The article in full can be viewed at: <http://www.healthcatchers.com/molybdenum.html>

Mike F.

Further to my brief posting above, I think it's worth you folks having a look at many of the inter-site links from the web address given above, since the same commercial concern involved offers other water-soluble elemental supplements - including copper - along with advice as to what to not take with what etc. The company also offers extensive testing profiles - go to:

<http://www.healthcatchers.com/mineral-analysis.html>

The tests offered do - on-the-face-of-it - look comprehensive and reasonable priced. Maybe Richard could comment since the principal test offered (by post for \$75) include inter alia amino acid and mineral profiles.....

Having had a further look around the site for 15 minutes, my opinion is that it's well worth at least a cursory look in the context of the current CR topic.

Mike F.

Hans and all,

I have just printed out the pages of this "brain storm" and am shocked by what I have found out about copper deficiency, since you all have pointed me toward looking toward. I have downloaded a few studies to read and will be posting shortly... in the mean time, I wanted to share some striking similarities with me and "copper deficiency".... heretofore unknown to me.....

About 3 years ago a large portion of the hair on the backside of my head turned white..... and some of my skin turned white as well, nobody was able to tell me why.... I assumed stress. Recently the rest of my hair is "graying" at a rapid rate, I'm 31.

Copper is a key component of the enzyme tyrosinase which is fundamentally required for processing tyrosine in pigment production so it is not surprising that copper deficiency leads to reduced hair pigmentation. So I have now found out! Hmmm....

I also have many of the other problems seemingly associated with copper deficiency....reactive hypoglycemia, sporadic high blood pressure problems, somewhat low oxygen count in my hemoglobin..as checked during my initial visit to the ER the first time with Afib....

Interestingly enough, hair will go back to it's normal, color many times, once this deficiency is stopped, maybe I can use this as a barometer..... :)

Anyway it was on my mind, and a coincidence too coincidental for me not to share.....I started on copper supplementation 3 days ago.... along with my standard supplements.....Placebo effect maybe, but as I type this I feel good..... Have not felt this good in months.....

I hope to be active in this post in the near future.

Thanks all,
Joe

Joe,

While you're searching, you might want to see what you find out about pantothenic acid and PABA, as well. My wife said that she tried that years back, and she pulled a gray hair that had started growing back to its normal color, at the root end, when taking these supps. She had read that lack of these nutrients was the cause of graying hair. Maybe they work with copper.

Richard

Mike,

Thanks for the link. I'm going to do some more reading there, as I found it quite interesting. As far as testings go, I just don't know. I do know that Great Smokies has a very good reputation, but they definitely charge more. Sometimes you get what you pay for. I'll post back after reading more.

Richard

Good Morning, Fran,

My interest in sulphur has only, so far, been interest only, due to my low values. I have not been taking any supps, up until a few days ago, when I added B12 and Folate. I was especially low in folate. I posted to PC on the BB, that not only are my sulphur levels low, but my homocysteine levels are low, and this is tied to moly levels, as I'm reading. Here's my post:

PC,

That goes to show that I didn't know about the differences in NE's versions. I keep getting distracted on the home front, but I'm trying to focus on my Metabolic Analysis Profile test, and get a more in depth understanding.

I'll present one finding that I've not heard of.

Formiminoglutamic Acid (FIGlu) Ref range ≤ 9.0 My result 22.6

This is what it said:

It is an intermediate in the histidine-to-glutamic acid pathway, and it is elevated if tetrahydrofolate is deficient. Tetrahydrofolate (from folic acid) is the coenzyme that helps convert FIGlu into glutamic acid. Elevated FIGlu can be consistent with: megaloblastic anemia, birth defects (facial clefts, neural tube defects), and homocystinuria/emia with increased susceptibility for cardiovascular disease. Additionally, if folic acid dysfunction affects the metabolism of methionine, causing homocystinuria, many diverse disease conditions could be related to this dysfunction. Such conditions include mood disorders, neurological problems and diseases associated with vitamin B12 disorder, because B12 activity depends upon folate function in many instances.

Dr. Gersten's schedule of supplements includes a multi vitamin by Montiff, 1 @ 3x's day with meals, TriPhos B - 2 @ 2x's day before and aft. breakfast (Montiff), Intrinsic B12/Folate 1 @ 3x's days w/meals (Metagenics), and B-Complete 1 @ 2x's day at bkft/dinner (Montiff). This is just 4 items of 25. He's hitting me big time with B-s.

I was low in methionine, again, but not as much as on the urine amino analysis.

Serum amino Methionine - Ref range. 2.5-4.9 Result 2.7

Urine amino Methionine - Ref range 7-35 Result 2.1

Homocysteine(HS) - I was at the lowest risk w/0.6 (I made a mistake here - this was my C reactive protein result)

Homocysteine(HS) - Ref range 3.00-10.00umol/L Result 4.58

I'm adding this bit for the CR and the explanation below:

OXIDATIVE STRESS PANEL

Reduced Glutathione Ref range ≥ 32 mg/dl Result 28

Lipid Peroxides Ref range ≤ 3.4 Result 4.1

Glutathione is a major antioxidant, anticarcinogen and marker of antioxidant status of the body. Reduced glutathione is used by the body to prevent or minimize damage by oxidative free radicals. A low level indicates reduced ability of the

body to remove free radicals and shows increased oxidative stress. Frequently, low levels of glutathione are associated with endo- and exotoxicity, autoimmune diseases and chronic inflammation.

Sustained exposure to reactive oxygen species results in damage to tissues. An elevated serum peroxide level indicates the amount of serum lipid damaged by oxidants, a reflection of excessive free radical activity. Free radical tissue damage is thought to underlie many pathological processes such as atherosclerosis, aging, chronic fatigue, cancer, Parkinson's and Alzheimer's.

A continuation of my previous post:

So this tells me that I'm just not getting enough methionine in my diet, and it has nothing to do with pathway disruption, otherwise I'd have a higher level of HS, or I'm simply passing it through, but then you'd think my urine levels would be higher. I was reading a rather interesting site last night about autism, www.newtreatments.org/fromweb/sulfur.html (it's worth a read, but lengthy), of the importance of sulphur and molybdenum. As you may have read in the CR, my very low level of molybdenum was possibly the most important finding in my tests.

I may not do it now, but Dr. Braley (I think that's his name) and Metagenics are located right here in Gig Harbor, and I may approach his clinic about doing a clinical trial on arrhythmias. They use nutritional approaches. The last time I spoke with them, they were doing a clinical trial on rheumatoid arthritis. My daughter's best friend's dad just went to work for Metagenics. I believe there is a connection between the two companies.

PC, I can't completely substantiate my stand on methionine, but based on my own findings, common sense of lacking foods and diseased animals using up their own stores, and what I've read, I feel that this is an important component of our needs. Maybe by simply adding more B-6 (coenzymated) B-12 and folate to our diets, this could help, but by way of methylcobalamin or a coenzymated form, as cyanocobalamin may be too large of a molecule. You get your highest content of methionine from meat, and I've been eating that 2-3x's per day, since Feb., and I'm still low, even with organic meat. So why is that?

More added now:

Why are my CRP levels low, which indicate NO inflammation, but my oxidative stress results, indicate inflammation????? This is very confusing. Fran, I also agree with you, that my copper/zinc ratios are off, and I'm going to email the doctor and pose the discussion here, and see what he has to say. I'd like to know how Hans is still getting along with copper supps., before doing so. I'll then have some results of success, to give the doc food for thought.

Also, Fran, the studies of the Chinese that were getting high rates of esophageal cancer, among the families, was found to be a moly deficiency. So it wasn't a genetic trait that was being passed down. I'll see if I can find it again, but I know it was at pubmed.com, as well. If you're soils are low in moly, and you're eating local foods, you are not replenishing your moly stores, by way of eating moly deficient meats or foods, because the animals/foods are moly deficient, as well, unless they're being supplemented.

Richard

Thanks Richard for clarifying.

Reading between the lines of your post I keep seeing a connection with oxidative stress caused by free glutamate which contributes to overall oxidisation of other things - which does disrupt mineral utilisation. This is all seemingly tied up with Cu and Methionine is known to be partially effective in glutamate toxicity for such conditions as mercury overload, ALS, Alzheimer's.

The Chinese EC study also puts me in mind of the Chinese AFib study (high free glutamate diets) both now seem to be associated with molybdenum. The link in my mind obviously comes from my family history as well. Everything I read now comes back to this one common denominator - glutamate toxicity.

I know that ALS and AF are not the same disease but PC has brought up the similarity a few times. read on

<http://www.lef.org/protocols/prtcl-008.shtml>

ALS is highly linked with glutamate. One proposed mechanism is a defective glutamate transport system that permits neurotoxic levels to build up (Onion 1998). A study showed significant elevations (by about 70%) of plasma levels of glutamate in ALS patients as compared to controls (Plaitakis et al. 1993).

Phase II detoxification then attaches molecules such as glutathione, methionine, and sulfur compounds in a process called glucuronidation. The body is then able to excrete these modified toxins in stool, urine, or sweat.

The process of detoxification requires several nutritional cofactors including magnesium, zinc, and manganese. The glutathione, methionine, and sulfur molecules are a component in the Phase II detoxification process and are used up in the process. As the detoxification pathways become overloaded, any further toxic challenge, however slight, can cause symptoms. This is often referred to as chemical sensitivity.

This site also indicates that zinc and copper should be used as Superoxide Dismutase.

Zinc and Copper

Zinc supplementation should be considered in addition to SOD. A study showed that the loss of zinc from SOD was sufficient to induce apoptosis (programmed cell death) in cultured motor neurons. When replete with zinc, SOD was not toxic. Both protected motor neurons from growth factor withdrawal (Estevez et al. 1999).

Mitochondrial SOD requires manganese, while the cytoplasmic (cellular) form requires copper and zinc. Patients with familial ALS possess a defective gene that decreases cytoplasmic SOD (Bowling et al. 1993; Brown et al. 1993; Ince et al. 1998).

<http://www.naturdoctor.com/Chapters/Research/ALS/ALS3.html>

ALS

In a study published in the European Journal of Pharmacology, it was shown that chronic exposure of rat cortical neurons to methylcobalamin protected against glutamate-, aspartate-, and nitroprusside- induced neurotoxicity. This study also showed that S-adenosyl-methionine (SAME) protected against neurotoxicity. [75]

The facilitation of these amino acids into neurotransmitters particularly requires the presence of two B vitamins, niacin and B6, and minerals such as magnesium and copper. The lack of adequate levels of any of these required substances can result in a deficiency of specific neurotransmitters. The good news is that supplementation with specific amino acids can raise the production of these neurotransmitters to levels that can result in increased learning capacity, improvements in focus and concentration, improvement in immune response, better moods, less pain and increased sex drive. (Part II of this article will discuss supplementation of specific amino acids.)

<http://www.mwt.net/~drbrewer/brainfunction1.htm>

PROTECTION AGAINST FREE RADICALS & GLUTAMATE TOXICITY

The accompanying article on Neurological Disease provides a description of one of the main conditions that causes brain cell death. When excessive amounts of glutamate (a chemical messenger in the brain) accumulate, it causes a depolarization of the cell membrane. This depolarization results in an influx of calcium and sodium ions into the cell, which causes potassium ions to be displaced out of the cell. This unbalanced condition starts a cascade of hyperactivity of the neurons, with this depolarization escalating throughout many neuronal cells, resulting in the death of many brain cells. As this same condition occurs over and over throughout many years some areas of the brain become more dysfunctional than others. Usually, the area involved with short-term memory is affected.

Alzheimer's, Parkinson's, and Huntington's disease, as well as brain strokes have all been linked to this destructive chemical cascade.

The accompanying article in this newsletter presents some European research showing that vitamin B12, as methylcobalamin [note the above article saying that S-adenosyl-methionine (SAME)], is capable of protecting animal brain cells from glutamate toxicity.

LITHIUM ALSO PROTECTS AGAINST GLUTAMATE TOXICITY

In his writings on lithium orotate, Dr. Hans Nieper stressed how the primary function of lithium was the restoration of the proper electrical membrane potential by removing excess sodium from the inside of the cell. In the orotate form he was able to obtain results using small dosages, about 7% of the carbonate form, to successfully treat manic depression, migraine headaches, juvenile epilepsy, and alcoholism. Using calcium and lithium orotate together, Dr. Nieper obtained significant results in chronic hepatitis and liver cirrhosis. He reported that 5 mg of lithium orotate are closely equivalent to 100 mg of the carbonate form. According to Dr. Nieper, the lithium orotate releases lithium ions at the lysosomal membranes (structures within the cells), and withdraws sodium from them. The net result is a stabilization of the lysosomal membrane. If lysosomal enzymes are released within the cell they cause a cascade of destruction that leads to cellular death. The stabilization of the lysosomal membranes within the cell is a vitally important part of maintaining cellular health.

In 1998 a break-through discovery was reported by researchers from the National Institutes of Health in Bethesda, Maryland. They discovered that neurons (from rat brains) that were treated with lithium for six to seven days were completely protected from glutamate toxicity. It seems that the lithium attached itself to the receptors where the glutamate normally docks. This prevented the hyperactivity and resultant overload of calcium into the cell.

This exciting new understanding of one of lithium's protective actions against neurotoxicity from excessive glutamate opens the doorway for increased utilization of low dose lithium orotate. It appears that both lithium and B12 (in the methylcobalamin form) have a very beneficial role to play in protecting the human brain from this destructive neurotoxic process.

Don't know if I have confused you more or added to your understanding.

Fran

Very interesting, Fran. I went back to my hair analysis of May and my lithium levels were below normal. They don't really use this marker for diagnostics, and these levels are usually low anyway, but mine were below low.

Lithium analysis by hair

Ref. range .007-023

Result .004

I'm beginning to wonder if I have any trace minerals left in my body. Thank you for an informative post. I'll now go back and read your links.

Richard

Hans -

I'm curious as to what your stats indicate about copper deficiency and afib. I've looked in a few of my natural health references and find that a copper deficiency isn't all that common...or maybe just not very obvious.

About 10 or more years ago, the man who promulgated the Dead Doctor's Don't Lie tapes and colloidal minerals, indicated the major condition resulting from copper deficiency was aneurysm. He did many experiments with farm animals and diets and proved his theory repeatedly.

He says the following are symptoms of copper deficiency.

White hair
Gray hair
Dry brittle hair - "steely wool" in sheep
Ptosis - sagging tissue, eye lids, skin breasts, stomach etc.
Hernias - congenital and acquired
Varicose veins
Aneurysms - large artery blowouts, cerebral artery blowouts
Kawasaki Disease - congenital aneurysms with Streptococcal infection
Anemia in vegan and high milk diets
Hypo and hyper thyroid
Arthritis
Ruptured vertebral disc
Liver cirrhosis
Violent behavior, blind rage, explosive outbursts, criminal behavior
Learning disabilities
Cerebral palsy and hypoplasia of the cerebellum - congenital ataxia
high cholesterol
Iron storage disease - abnormal iron accumulation in liver
Reduced glucose tolerance - low blood sugar
Neutropenia

We have identified several on this list as contributing factors in afib.

You could be on to something here.

Michael Murray, ND says that Copper is an essential trace mineral involved in several key enzymatic reactions. It is the third most abundant essential trace mineral - after iron and zinc - and the highest concentration - amount/gram of tissue - of copper is in the brain and liver.

He says the estimated 70-80 milligrams of copper in the human body are distributed among all organs in the following percentages:

skeletal muscle, 24.7
Skeleton, 19
Skin, 15.3
Bone Marrow, 14.8
Liver, 8 to 15
Brain, 8.

Also, copper is widely distributed in foods. the richest sources are oysters, other shellfish and legumes, and in earlier times, from copper piping used for water in homes.

Copper deficiency results in anemia since it is required for proper iron absorption and utilization. It is required for collagen and elastin integrity. Poor integrity manifests in rupture of blood vessels, osteoporosis and bone and joint abnormalities.

Other symptoms of deficiency are brain disturbances, increased lipid peroxidation, elevated LDL and reduced HDL cholesterol levels and impaired immune function.

For the heart, Dr. Murray also indicates aortic aneurysms and atherosclerotic vascular disease along with the elevated cholesterol and heart muscle damage.

He suggests a safe and adequate intake of copper for adults is 1.5 to 3 milligrams. Since nutrients like zinc and Vitamin C interfere with copper absorption, a popular recommendation for copper is based on zinc intake with an optimal ratio of zinc to copper at 10:1 - ie, 30 mg. of zinc to 3 mg. of copper.

High intake of vitamin C, zinc, iron and other minerals may decrease the absorption of copper.

Source: Encyclopedia of Nutritional Supplements, Michael T. Murray, ND.
Rare Earths, Forbidden Cures, Joel D. Wallach, BS, DMV, ND & Ma Lan, MD, MS.

Jackie

Hans - forgive my questions in the recent post.... I wasn't operating the new site properly and didn't get all of the posts.... I now see that you have covered very efficiently the topic as it relates to afib.

Thanks. Sorry!

Jackie

Jackie,

No problem. I appreciate your research. Two independent sources of information only adds to the veracity.

Hans

Hans and All,

I thought this link was very important information that would be good to have in the archives for future reference. It's a bit lengthy, and if you want to remove and just leave the web address, pls. do, but I find sometimes that these links go away overtime.

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Once thought to be the seat of courage, love etc., the liver is central to our bodies' endless process of removing unwanted chemicals. Leading British nutritionist and Director of the Society for the Promotion of Nutritional Therapy LINDA LAZARIDES takes a closer look.

One of our body's most vital functions is to convert metabolic products and toxins into safe, soluble substances which can be eliminated via the urine or the gall bladder into the intestines. The liver plays an all-important role in this process – known as detoxification or biotransformation. Recent research has shown that many patients with chronic illnesses have a disordered liver biotransformation ability.

We simply don't know all the diseases and health disorders which may be promoted by a toxic overload resulting from such dysfunction, but progress is beginning to be made in looking at specific detoxification pathways and relating under functioning of these to the development of disease.

Pathways

A number of biochemical 'pathways' – sequences of chemical changes – are involved in liver biotransformation. These are normally grouped into oxidation, reduction or hydrolysis reactions (Phase I) and conjugation reactions (Phase II). Phase I reactions are catalysed by a group of liver enzymes scientifically known as cytochrome P450 oxidases (or P450 oxidases or cytochrome p450s). These enzymes introduce oxygen into the chemical structure of toxins or metabolites. Typically, by this process the toxins are converted into intermediate substances – alcohols and aldehydes – then into acids, which are water-soluble, and can be excreted via the urine.

Phase I detoxification

The intermediate substances created during Phase I detoxification, which include reactive oxygen species (free radicals), can be extremely toxic – far more so than the original toxins. Their harmful effects are primarily controlled by antioxidant nutrients/enzymes: a plentiful supply of these substances is essential. Apart from free radicals, intermediate

metabolites include chloral hydrate (which is identical to the knock-out drug often known as a 'Mickey Finn'), epoxides, and endogenous benzodiazepines – substances similar to Valium and other tranquillisers and sleeping pills. This makes it easier to understand how chronic fatigue, for instance, can develop when a toxic overload is present.

The more P450 enzymes are induced in the liver, the more of the toxic intermediates will be present in the body. P450 enzymes are induced by caffeine, alcohol, dioxin and other pollutants, exhaust fumes, high protein diets, oranges and tangerines, organophosphorus pesticides, paint fumes, steroid hormones, and a variety of drugs including paracetamol (acetaminophen), diazepam tranquillisers and sleeping pills, the contraceptive pill and cortisone.

Aldehydes

Substances which can inhibit the action of P450 enzymes include carbon tetrachloride, carbon monoxide, barbiturates, quercetin and naringenin (found in grapefruit). The oxidation reaction can also be blocked by an excess of toxic chemicals, a lack of enzymes, lack of nutrients and/or loss of oxygen.

Such blocking results in a build-up of more toxic substances such as formaldehyde and other aldehydes in tissue. This can in turn lead to a spreading phenomenon, with increasing sensitivity to more chemicals such as ketones and alcohols, and eventually even to natural chemicals occurring in foods, pollen and mould. A build-up of aldehydes can in severe cases lead to tissue cross-linking, causing vasculitis with possible seizures and brain damage.

Although most aldehydes in the body are thought to occur as intermediate metabolites, external sources include exposure to formaldehyde gas (which is given off by new carpets, curtains and other furnishings) and breakdown products of ethylene glycol and methanol.

Two known sources of aldehydes are intestinal overgrowth with *Candida albicans*, as well as the peroxidation of polyunsaturated fats. The fatigue, foggy thinking and 'brain fag' linked with candidiasis may be due to an overloading of the detoxification system with aldehydes, which can even lead to a reverse reaction of aldehyde to alcohol. Extreme intolerance to alcohol consumption may occur in these individuals, as it does in those diagnosed with ME or chronic fatigue syndrome.

Amines

Cytochrome P450 and other oxidizing enzymes also oxidize amines such as phenylethylamine found in chocolate, tyramine found in cheese, and adrenaline, noradrenaline and dopamine. These are oxidized into aldehydes by the enzyme mitochondrial monoamine oxidase (MAO) – if this enzyme is blocked, for instance by MAO inhibitor drugs used to treat depression, tyramine, for instance, cannot be metabolized and hypertension can develop as a chemical sensitivity reaction.

Phase II detoxification (conjugation)

There are five main conjugation categories, including acetylation, acylation (peptide conjugation with amino acids), sulphur conjugations, methylations and conjugation with glucuronic acid. Some substances enter Phase II detoxification directly, others come via Phase I pathways.

Conjugation involves the combining of a metabolite or toxin with another substance which adds a hydrophilic (or water-reactive) molecule to it, converting lipophilic (or fat-reactive) substances to water-soluble forms for excretion and elimination. Individual xenobiotics and metabolites usually follow a specific path, so whereas caffeine is metabolized by P450 enzymes, aspirin-based medications are conjugated with glycine, and paracetamol with sulphate.

Acetylation

Acetylation requires pantothenic acid to function. It is the chief degradation pathway for compounds containing aromatic amines such as histamine, serotonin, PABA, P-amino salicylic acid, aniline and procaine amide. It is also a pathway for sulphur amides, aliphatic amines and complex hydrazines.

A proportion of the general population – perhaps up to 50 per cent – are slow acetylators. This rises to as high a level as 80 per cent among the chemically sensitive population. Their N-acetyltransferase activity is thought to be reduced, and this prolongs the action of drugs and other toxic chemicals, thus enhancing their toxicity.

Acylation

Acylation uses acyl CO-A, with the amino acids glycine, glutamine and taurine. Conjugation of bile acids in the liver with glycine or taurine is essential for the efficient removal of these potentially toxic compounds. Disturbed acylation by pollutant overload decreases proper levels of bile in the gastrointestinal tract, resulting in poor assimilation of lipids and fat-soluble vitamins, and disturbed cholesterol metabolism.

Toluene, the most popular industrial organic solvent, is converted by the liver into benzoate, which like aspirin must then be detoxified by conjugation with the amino acid glycine (glycination): large doses of glycine and N-glycylglycine are used in treating aspirin overdose. Benzoate itself is present in many food substances and is widely used as a food preservative.

Glycine is a commonly available amino acid, but the capacity to synthesize taurine may be limited by low activity of the enzyme cysteine-sulfinic acid decarboxylase. Damage can occur to this enzyme directly by pollutants, or by overload/over-use resulting in depletion.

Both taurine- and glycine-dependent reactions require an alkaline pH: 7.8 to 8.0. Environmental medicine specialists may alkalinize over-acidic patients by administering sodium and potassium bicarbonate in order to facilitate these reactions.

Glutathione conjugation, using the amino acid glutathione in its reduced form, is used for the transformation of xenobiotics such as aromatic disulphides, naphthalene, anthracene, phenanthracin compounds, aliphatic disulphides – and the regeneration of endogenous thiols from disulphides. There is a cycle of replenishment for glutathione, allowing it to be reformed after conversion to glutathione reductase. Heavy metals can inhibit this cycle, thus preventing replenishment.

Sulphur conjugation (sulphation)

Neurotransmitters, steroid hormones, certain drugs and many xenobiotic and phenolic compounds such as oestrone (one of the forms of oestrogen), aliphatic alcohols, aryl amines and alicyclic hydroxy-steroids employ sulphation as their primary route of detoxification. Steventon at Birmingham University (UK) has found that many sufferers from Parkinsonism, motor neurone disease and Alzheimer's disease as well as environmental illness, tend to have a reduced ability to produce sulphate from the amino acid cysteine in their body, and instead accumulate cysteine.

Sulphate may be ingested from food, but is also produced by the action of the enzyme cysteine dioxygenase on cysteine. This process is known as sulphoxidation.

The body's ability to conjugate toxins with sulphate is 'rate limited' by the amount of sulphate present; if there is inadequate sulphate, toxins and metabolites can accumulate, perhaps building up to levels which cause degeneration of nervous tissue after several decades.

Steventon's findings are a matter for serious concern. How many individuals are given the opportunity to find out whether they are poor sulphoxidizers and to reduce their chances of developing the above mentioned diseases by improving their sulphoxidation ability?

Methylation

According to environmental medicine specialist William Rae, the process most often disturbed in chemically sensitive people involves methylation reactions catalysed by S-adenosyl-L-methionine-dependent enzymes. Methionine is the chief methyl donor to detoxify amines, phenols, thiols, noradrenaline, adrenaline, dopamine, melatonin, L-dopa, histamine, serotonin, pyridine, sulphites and hypochlorites into compounds excreted through the lungs. Methionine is needed to detoxify the hypochlorite reaction.

The activity of the methyltransferase enzyme is dependent on magnesium, and, due to the frequency of magnesium deficiency, supplementation with this nutrient will often stabilize chemically sensitive patients.

Glucuronidation

Glucuronic acid is a metabolite of glucose. It can conjugate with chemical and bacterial toxins such as alcohols, phenols, enols, carboxylic acid, amines, hydroxyamines, carbamides, sulphonamides and thiols, as well as some normal metabolites in a process known as glucuronidation.

For most individuals glucuronidation is a supplementary detoxification pathway. It is a secondary, slower process than sulphation or glycation, but is important if those pathways are diminished or saturated. Obese people seem to have an enhanced capacity to detoxify molecules that can use the glucuronidation pathway. However, damage to the capacity for oxidative phosphorylation which takes place in the mitochondria, is likely to diminish the capacity for glucuronide conjugation.

Overload

If the liver's detoxification pathways are excessively stimulated and overly utilized, they eventually become depleted or begin to respond poorly – being suppressed by toxic chemicals. Once breakdown of the main pathways occurs as a result of pollutant overload, toxins are shunted to lesser pathways, eventually overloading them, and disturbing orderly nutrient metabolism. Chemical sensitivity may then occur, followed by nutrient depletion and finally fixed-name disease. Depleted immunity is also a potential outcome of a toxic overload.

Interesting facts

- Dr William Rae of the Environmental Health Centre in Dallas says that the most severely ill chemically sensitive patients not only have abnormally low anti-pollutant enzymes, in addition to toxic suppression and nutrient depletion, but in some instances antibodies are produced against cytochrome P450 and these may inhibit or decrease its effectiveness.
- Environmental medicine specialists have found that almost 35 per cent of chemically sensitive patients are deficient in intracellular sulphur. Not only can this hinder the detoxification of some sulphur-containing and other toxic chemicals, it can enhance the harmful effects of exposure to cyanide from foods such as cassava and almonds as well as from tobacco products. The hereditary disease known as Leber's optic atrophy involves a defect in the ability to detoxify cyanide, and leads to sudden, permanent blindness on first exposure to cyanide in small amounts such as those ingested from smoking cigarettes.
- Many multimineral supplements in the UK omit iron and copper due to theories that individuals may already be overloaded with these nutrients. However if no overload is present, an unbalanced supplement may promote depletion of the minerals. The Environmental Health Centre in Dallas finds that intravenous infusions to replenish iron stores brings dramatic improvements for the chemically sensitive patient as part of their detoxification process. Copper is also found to help catalyse the cytochrome systems. (NB: self-supplementation with iron and copper should be cautious, to avoid iron and copper overload conditions).
- Although the liver is the primary site for oxidation of xenobiotics, the cytochrome P450 system is found in other tissues that are exposed to environmental compounds like the skin, lungs, gastrointestinal tract, kidneys, placenta, corpus luteum, lymphocytes, monocytes, pulmonary alveolar macrophages, adrenals, testes and brain, in both the mitochondria and in the nuclear membrane.
- Always rinse your washing-up carefully. Pollutants in the form of solvents and detergents can damage and penetrate cell membranes and damage the contents of the cell.
- Vitamin B3 has been shown to accelerate the clearance of aldehydes in some chemically sensitive patients.
- Molybdenum, although an essential element, competes with sulphate in its activation step to the important enzyme PAPS and can thus lower sulphate levels and impair sulphation ability. Environmental medicine experts warn that molybdenum supplementation may be contraindicated in individuals with poor sulphation ability.
- The substance naringenin, found in grapefruit, can significantly inhibit Phase I detoxification, as can grape-fruit itself. This may prove clinically useful in some situations where Phase I activity is too high, (as shown in liver function tests available from nutritional therapists).
- Persons who have been exposed to toxic chemicals, drugs and other xenobiotics, have increased requirements for some vitamins. Functional nutritional assays for vitamins B1, B2, B3, B6, B12 and folate, and serum levels of vitamins A, D, C and beta carotene were performed in a random sample of 333 environmentally-sensitive patients prior to

treatment. 57.8% were found to be deficient in B6, 37.7% in vitamin D, 34.9% in B2, 32.2% in folate, 27.7% in vitamin C, 21.4% in niacin, 14.9% in B12, 5.6% in vitamin A and 4.6% in beta-carotene. (Ross GH et al: Evidence for vitamin deficiencies in environmentally-sensitive patients. *Clinical Ecology* 6(2):60-6, 1989.)

Adapted from the *Nutritional Health Bible* by Linda Lazarides (Thorsons, £9.99). Published September 1997. Available from all good bookshops or by mail order from SPNT Books (see address below).

Foods to aid detoxification

Beetroot helps with liver drainage

Broccoli, cauliflower and other cruciferous vegetables these aid cytochrome P450 activity

Protein

Radish, watercress rich in sulphur.

Supplements to aid liver detoxification

B complex vitamins

Digestive enzymes may be necessary to ensure that protein is adequately digested and glycine is readily available

Essential fatty acids

N-acetyl cysteine (NAC)

Reduced glutathione

Selenium, zinc, magnesium and manganese possibly iron and copper if used with caution

Taurine (a useful combination product is magnesium taurate)

Vitamins C and E and beta carotene.

Liver herbs to aid detoxification

(traditionally known as 'blood cleansing' herbs)

Dandelion root cholagogue (stimulates liver secretions and bile flow)

Globe artichoke leaf promotes regeneration of the liver and promotes blood flow in that organ

Silymarin according to recent research, this herbal extract stabilizes the membranes of liver cells, preventing the entry of virus toxins and other toxic compounds including drugs. Promotes regeneration of the liver.

Turmeric a cholagogue like dandelion, but may irritate the gastric mucosa. Its advantages are its cheapness and ability to be used in cookery.

These herbs are best combined with wild yam, which helps to prevent liver spasms caused by gall bladder stimulating herbs.

For help with a liver detoxification programme, it is best to consult a nutritional therapist, who can arrange for (non-invasive) tests to determine which pathways need boosting.

For a list of nutritional therapists and other natural medicine practitioners in your area, send £1 plus sae to: Society for the Promotion of Nutritional Therapy (SPNT), PO Box 47, Heathfield,

Glossary

acetylation – combination with acetic acid

alveolar macrophages – rounded granular phagocyte cells in the alveoli of the lungs that ingest inhaled particulate matter

aldehydes – a class of organic compounds containing the atomic group C(Carbon)H(Hydrogen)O(Oxygen)

amines – organic compounds containing nitrogen

amino acids – the chief constituents of proteins; the "building blocks" of life

biochemical pathway – a series of chemical enzyme reactions, that converts one biological material into another

Candida albicans – a quite common fungus in humans, which when unchecked can cause illness

catalyse – speeding up of a chemical reaction by a substance which remains after the reaction

conjugation – the joining together of two compounds to form another

corpus luteum – a yellow glandular mass in the ovary

dioxins – a group of chemicals present as trace contaminants in herbicides

endogenous – arising from within the organism

epoxides – compounds containing one oxygen atom bound to two different carbon atoms

ethylene glycol – a solvent used as an antifreeze

gall bladder – the reservoir for bile, on the surface of the liver

hydrolysis – the splitting of a substance's molecules by adding water (H₂O): a hydrogen-oxygen molecule (HO-) being added to one fragment, and the hydrogen atom (H) to the other

hydrophilic – readily interacting with water

intracellular – within cells

ketones – a class of organic compounds containing the molecule C=O

lipids – fats and fat-like substances

lipophilic – readily reacting with fat

lymphocytes – an immune-system cell generated by lymph tissue

metabolic, -ism – all the processes which create and maintain, and use up, organised living matter

metabolites – any substance produced by metabolism

methanol – a solvent

methylation – the addition of a methyl, i.e. a molecule of C(Carbon) and three H(Hydrogen) atoms

mitochondria – small cell organelles, with their own nucleic acids, that through synthesis of adenosine triphosphate (ATP) produce most of the energy for cells

monocytes – cells formed in bone marrow that travel to tissues, e.g. lungs and liver, to develop into macrophages

oxidation – the removal of electrons from the atoms of a substance; often by combination with oxygen

pantothenic acid – a member of the vitamin B complex

peptide – a compound of more than two amino acids

peroxidation – a chemical reaction creating an oxide with more oxygen than any other

polyunsaturated – denoting a chemical compound, particularly a fatty acid, having two or more double or triple bonds in its hydro-carbon chain

reduction – the addition of electrons to the atoms of a substance; often by combination with hydrogen

thiol – the univalent – S(sulphur)H(hydrogen) group

vasculitis – inflammation of a (usually blood) vessel

xenobiotics – substances foreign to the body

<http://www.garynull.com/Documents/Continuum/LiverOfTheMatter.htm>

Richard

Richard,

Very interesting post. I agree that iron and copper supplementation should be used with caution and only if you have some indication that you may be deficient

Hans

Joe

I find the connection between low copper levels and grey hair fascinating. Given that I had really bad AF for a long time (?low copper) and that I had started to go grey - I now find my self in the position where I have been wondering where my grey hair went. I had understood there was a connection between stress and grey hair and had put it down to a more unstressful outlook on life. But considering the turn around in my diet and Zn and Cu ratio - I am beginning to think that copper is a lot more important than anyone - up until Hans research - has ever realised.

I wonder if this has anything to do with vitiligo? Come to think of it I cannot see the white pigment I had on the side of my face and on my stomach. I will check more thoroughly in daylight tomorrow.

Then of course there was the hypoglycemia....

Thanks for that

Fran

Fran,

I think that there is a distinct connection between vitiligo and the graying of hair, perhaps at the same time.... I had vitiligo form on some parts of my body, only after the hair there turned white first (I'm Italian, and have a lot of hair everywhere! ;)) I, like you, was told this was stress related..... I have so much research to do about all of this - the problem is my day job is getting in the way of this research! :)

Richard,

I have been taking a B,Paba regimen for about a year, I first thought that I had what has been coined the "20th century Stress Syndrome", a book, by James L. Wilson, MD. In it, he stresses the importance of nutrition as it is related to the adrenal glands- the master gland, the pancreas, hormone levels etc... and focused quite a bit about the importance of B5. Certainly a great book... if you have the extra money; you can order it at Amazon.com. I picked up quite a bit of useful information from it.

I never have supplemented with copper before and found that the multi-vitamin base I have been taking only has .07

mg of copper in it, roughly 4% of the RDA (Not ODA). I don't really eat many of the foods that are high in copper. I am now supplementing with 6 mg Copper Amino Chelate -divided into 2mg 3x per day..... I do have some hope about this.

Having been reading lots of copper deficiency studies done with mice as experiments inducing copper deficiency, usually though high zinc supplementations and how it causes arrhythmias, CHF, and heart hypertrophy in the mice.

I still have a lot to digest.

Goin' Gray in PA,
Joe

Correction; "21st Century Stress Syndrome"

Joe

It's all quite interesting, Joe, and there is so much to know. It sure sounds as if copper could be, at least part, if not most of your problem. Are you taking other supplements, such as Mg.?

Richard

Copper deficiency, collagen types, remodeling of the heart and covalent cross-linking:

Dietary copper deficiency induces alterations of connective tissue metabolism that are associated with lesions in cardiovascular and other organ systems. Copper deficiency has been shown to induce extensive remodeling of the heart, particularly in the left ventricle and bicuspid valves of pigs. 1 Proportions of type III collagen were increased in the left ventricle, can this cross-linking may provide the stimulus for the development of heart hypertrophy which is characterized by server copper deficiency, by increasing the compliance of the ventricular wall. The sift n the phenotypic profile of collagen that is associated with this cardiac hypertrophy indicates synthesis of new collagen... 1

In a study by Dennis M. Medeiros and Laura Shirley 2 the effects of copper deficiency on the extracellular matrix of hearts of rats some interesting things were discovered that may shed some light on our atrial fibrillation problems. One thing to note is that this study was done on newborn rats and that many of their findings only may relate to diets deficient from birth, although there is much to draw from this study anyway.

They were looking at studies that have shown that rats fed a copper-deficient diet for several weeks exhibited cardiovascular defects such as an increase in the fragility of the connective tissue, ventricular aneurysms, hem thorax, pleural effusion, cardiac hypertrophy, aberrant ekgs, impaired glucose tolerance and other symptoms.

In this they said this. "A hallmark appearance of hearts from copper-deficient animals includes a markedly increased area occupied by mitochondria" (The sites of aerobic production of ATP, where most of the energy from carbohydrate, protein, and fat is captured. Called the "power plants" of the cell, the mitochondria are where the citric acid cycle and electron transport chain are located. A human cell contains about 2,000 mitochondria, WEBSTERS)

They go on to say that the mitochondrial , however are vacuolated (Full of vacuoles, or small air cavities; as, vacuolated cells. WEBSTERS) One reason for this may be due to the reported decreased levels of the nuclear encoded subunits of the copper containing enzyme cytochronrne c oxidase.

The hearts in the copper deficient rats are significantly larger than those of the others. This heart hypertrophy in the copper-deficient animals in concentric where the free walls become markedly thickened, as does the interventricular septum. They state that the believe that since the hearts enlarge in the copper-deficient rats prior to anemia onset that the degree of anemia is not connected with the heart enlargement. Anemia related hart enlargement is largely associated with a eccentric type hypertrophy and not a concentric type hypertrophy which is exhibited in the copper-deficient rats.

The collagen connection:

Of the major defects in hearts from copper-deficient (CD) rats is the connective tissue, in particular the collagens, and to some extent the elastins. Most of the collagen affecting the heart are Types I, III and IV. Types I and III collagen are encoded by the nucleus within the fibroblasts, whereas Type IV is nuclear encoded by both myocytes and fibroblasts. These collagen type exert specific roles upon cardiac function.

Tensile strength and stiffness is associated with Type I collagen and Type III has a major role in maintain the elasticity and compliance of the rnyo-cycle?????. Type IV collagen in non-fibrillar in structure. In the heart is a component of basement membranes of both myocytes and capillaries.

Lysl oxidase is an enzyme that contains copper and is important in promoting the cross linking between the collagen molecules.

Echocardiography has confirmed the presence of valvular regurgitation in rats fed CD diets. All rats having CD also had murmurs.

Of interesting note, the Light micrograph of the tricuspid valve showed enlargement from the change in the collagen and a greater portion of Type III collagen to Type I. The basal lamina is also disrupted. However the enlarged tricuspid was noticeable packed less dense....perhaps this is part of the problem with the electrical signals being able to more easily pass through parts of the atrium from the pulmonary valves than they do in a "normal" heart allowing for a confusion of signals... Perhaps the scarring provides simply another barrier whereas the copper sufficient diets pack a different type of collagen more densely??? I don't know just a question....

Of interesting note as well is that a copper deficient heart incurs the presence of phagocytes in addition to the normal myocytes...these are not present in the hearts of the rats who have a sufficient copper intake. Some implications of this study suggest that the overall increased access to the laminin receptors likely implies other cell membrane components could be less protected and made more available to proteases and phagocytes....

There is no doubt much more in this study, than I can glean from it and thought I would present it to you for your own scrutiny..... See direct link below....

1. Vadlamudi RK, McCormick RJ, Medeiros DM, Vossoughi J, Failla ML, Copper deficiency alters collagen types and covalent cross-linkin in swine myocardium and cardia valves. AJP – Heart and Circulatory Physiology, Vol. 264, Issue 6, 1993.

2. Denis M. Medeiros and Laura Shiry. The Alterations in the Extracellular matrix of Heats from Copper-Deficient Rats <http://www.bio.unipd.it/~bam/PDF/8-2/Medeiros.pdf> ...Direct Link....

Joe P.

Just thought I would throw this out.

Based on the research about the effects of copper deficiency and collagen and it's effects on the makeup of the heart tissue, why does magnesium seem to help so many of us? What might be the connection?

A possible answer may be found in some research on Micro Valve Prolapse, magnesium deficiency and the effect that Magnesium has on collagen levels...

A Study by the following seems indicate some possibilities, it may not be too far a leap to connect them in some way.....

Magnesium Deficiency in the Pathogenesis of Mitral Valve Prolapse

Leo D. Galland, Sidney M. Baker, Robert K McLellan

Gesell Institute of Human Development, New Haven, Conn., USA

The Link:

<http://www.mdheal.org/magnesiuh.htm>

Joe P.

Hello all,

Just a wondering thought about zinc toxicity as it related to copper deficiency, I have stated in the past that as I would approach any form of a ketogenic state that I begin to feel, "not well". My research of this is now showing me that most meats, poultry dairy and things that would be on a strict Atkins diet is extremely high in zinc, and guess what....No copper!

On top of that Vitamin C has been shown to reduce the assimilation of copper, and I have been on 2 to 3 grams of C from the start....

Joe P.

As far as GERD, gastrointestinal problems, perhaps this is another missing part of the link. Acute zinc toxicity is characterized by gastric distress, dizziness and nausea.

My HDL has been low, I was called in to the doctor to be told that not only was my HDL low, but my LDL was almost as low. I had never heard a doctor tell anyone that the total cholesterol was too low. Mine was combined, 78. One characteristic of copper deficiency is LOW HDL levels.

Well, that's all for now....

Joe

Joe,

You are absolutely right. The Zn:Cu ratio in meats (beef, lamb, chicken) is very high (around 30:1) with ground beef clocking in at an astonishing 74:1.

Certainly a diet heavy in meats could lead to an imbalance. Nevertheless, it would be a good idea to have your copper and zinc levels measured so that you can tailor your supplementation to your present levels. A hair analysis would be a good way of determining your mineral status, but an analysis of packed red blood cells should show any major imbalances.

I had a hair analysis done in 1993 and again in 1998 and in both cases my copper level was below the normal lower limit of the reference range.

Hans

Hans, Fran,

I have a scheduled blood test to check a vitamin and mineral profile, is this ok or should I do the hair analysis. I have read some scepticism about the accuracy of the hair test.... Please advise.

Joe

Joe,

A blood analysis for Cu, Zn, and Se should show whether there are any gross imbalances at the time the sample is drawn. Hair analysis, on the other hand, would show long-term mineral status. Hair analysis is quite accurate if performed by a reputable laboratory. Careful sample handling and washing are extremely important as even minor contamination can throw off the results. Toenail clippings can also be used for heavy metal analysis and is quite accurate. All the major research projects on selenium and prostate cancer prevention use toenail clippings.

By the way, it is interesting that heavy alcohol consumption markedly increases Zn and Cu levels in hair samples.

Hans

Hans, or Anybody...

Could you recommend a reliable group that could perform this for me in the US, I am from PA....

Thanks,

Joe

Have you tried adding liver to your meat intake. Liver has a good source of Cu. I used to hate it, but now I actually feel like eating it. I was peeved the other day as I thought I had some in the freezer but I must have eaten it - so have to go for more.

This is the Zn:Cu ratio of 1 cup of liver.

Zinc mg 6.93
Copper mg 5.6

Fran

Fran,

Interesting that Cu seems to be relatively concentrated in the liver, the main detoxification site.

Hans

Richard,

I am including a list of my current supplementations:
Supplements Per Day:

Magnesium 1000mg
Vitamin C 1000-3000mg
Folic Acid 800 mcg
Coenzyme Q10 150 mg
B Complex
1 10mg

2 15mg
3 25mg
6 10mg
12 25mg
Pantho.+PABA 100mg
Fiber 5g
EPA Omega 3 1000mg
Garlic 1200mg
Standard Multi- 2x-3x RDA

Now I have added Copper. 6mg.

Joe

Thanks, Joe, for responding. Sounds as if you're going in the right direction. I hope the copper does the trick.

Richard

Richard,

I am not really familiar with the expected range of mineral content in packed red blood cells; however, assuming the ranges you list are correct then you would seem to be doing real well except for the molybdenum and your Zn:Cu ratio which would seem to be a bit high. Some blood tests are unfortunately not that accurate; zinc, magnesium and potassium come immediately to mind.

Have you had a hair analysis? That, or an analysis of nail clippings, may actually be a better indicator of long term mineral status.

Interesting that you had a high mercury level. Please check out my book (pages 144-149) for precautions re. amalgam removal. It is very important to do it correctly.

Hans

Hans,

Thank you for your response. Interesting that you asked about a hair analysis. I was just looking it over, before coming here, esp. in regards to molybdenum. Here's some of the main ones.

Mercury Ref range <1.1 Result 1.5 High
Copper Ref range 10-28 Result 190 Very high
Zinc Ref range 130-200 Result 280 High
Potassium Ref range 9-40 Result 3.0 Low
Sodium Ref range 12-90 Result 7.0 Low
Mg. Ref range 25-75 Result 51 Normal
Ca. Ref range 200-750 Result 267 Shy side of low
Molybdenum Ref range .025-.064 Result .02 Low
Lithium Ref range .007-.023 Result <.004 Very low
Rubidium Ref range .011-.012 Result <.003 Very low
Sulfur Ref range 44,500-52,000 Result 53,500 High

The sulfur is confusing me to no end. I'm low in methionine, taurine, and cysteine, low in homocysteine and CRP, but my hair sulfur is high. I was low in sulfur in urine and blood, so is it all going to skin and hair. I'm not a hairy person, either. I do have the average skin covering, however.

I'll re-read your book, on amalgams. Thank you for reminding me.

Richard

I may be being a bit simplistic here but from what I gleaned in the links I posted above - some of these antioxidants and minerals are involved in scavenging free radicals and help detox the body. It would seem to me that if all your dietary antioxidants and minerals are used for scavenging free radicals there will not be much left for storage. And as such are eliminated from the body as waste.

Fran

Fran,

Thank you for that thought. It has to be the only answer. Hair is made of cysteine, so hair would probably represent a higher sulfur content, even though my levels were above normal. I must be using up my stores faster than I can replenish them, or there isn't enough sulfur in my diet, or both, but molybdenum is crucial for this process, as well.

Richard

Richard,

Well from this analysis it certainly does not look like you are low in copper or zinc, for that matter. Do you actually have a lot of PVCs or are your ectopic beats mainly PACs?

Hans

Hans,

I was assuming that levels in my hair analysis weren't as representative as the packed erythrocytes, so I'm sure glad you clarified that. Luckily, my regimen from Dr. Gersten has very little copper in it.

I know I don't fit the typical scenario here, as my problem is more to do with flutter, and I'm taking flec. daily. Maybe too much copper causes flutter, and too little causes AF. As far as my heart beat is concerned, I, unfortunately, have never ask my EP to clarify what exactly my heart is doing. I have only seen my EP once, since finding this site, and wish to avoid her at all causes, so I never thought to ask her these questions. But, I do believe that I occasionally have PAC's, but rarely. However, after my second ablation, causing me to go into AF, I found I had pauses between beats, then a strong beat, and I assume that these are PVC's, and I had them frequently in the evening. Those completely went away after stopping beta blockers. Because betas block adrenalin, I believe that adrenalin had something to do with my problem, as well. I need more of it, not less. Dr. Gersten found that I did need tyrosine and tryptophan, and so I will be taking those, among many other supplements, and will see what happens. I hope this helped answer your question, as I'm so uneducated about exactly what my heart is and was doing. I just didn't know the right questions to ask at the time. I've also tried to figure out my freeze frame gadget, and could never understand the readings.

Richard

Joe,

I know that Great Smokies is an excellent lab for blood work and stool analysis. I'm not sure about hair. You might check out www.gsdl.com and another is www.metametrix.com, which I believe that they do, do hair. You could

contact either of them, and see what doctors use their services in your area.

Richard

I had a mineral analysis done on a hair sample at the end of January 2003 (my last episode of LAF was on January 1). I had started taking mineral supplements in earnest in January but I did not include copper.

My copper level was at the lower limit of the normal range.

I started adding 6 mg of chelated copper to my supplement regime about a week ago. My impression is that my PACs are reduced (I normally experience a few a day).

Michael in SF

Richard,

I have been trying to find some information as to the time frame to recovery from a deficiency.... specifically a vitamin or mineral deficiency.... perhaps copper or something similar...I have not turned up anything as of yet...any thoughts? Wondering if it is weeks, months or years...

Joe

Richard

What a great article. It serves to remind me that indeed I was low in copper by the symptoms alone.

Fran

I found this to be very, very interesting, as well, especially in relation to the sympathetic nervous system, and Fran's cigarette smoking. I could relate to a lot of the info here, with regards to myself. I really must have a high level of copper. Read on:

COPPER TOXICITY SYNDROME

Do you know anyone who suffers from headaches, fatigue, insomnia, depression, skin rashes, spaciness, learning disorders or premenstrual syndrome? These can be symptoms of a copper imbalance.

Copper, an essential trace mineral, is vitally important for both physical and mental health. It has been studied for years, including at government laboratories. However, its importance for health is still largely unappreciated. The following is but an introduction. The author is deeply indebted to Dr. Paul C. Eck, an avid copper researcher.

COPPER'S ROLE IN THE BODY

Copper is critical for energy production in the cells. It is also involved in nerve conduction, connective tissue, the cardiovascular system and the immune system. Copper is closely related to estrogen metabolism, and is required for women's fertility and to maintain pregnancy. Copper stimulates production of the neurotransmitters epinephrine, norepinephrine and dopamine. It is also required for monoamine oxidase, an enzyme related to serotonin production. It is possible to become copper-toxic or copper-deficient, and there is a condition called biounavailable copper. In the latter, copper is present, but cannot be utilized. Toxicity and biounavailability are seen most often. This article uses the words copper imbalance when more than one situation is possible.

Physical conditions associated with copper imbalance include arthritis, fatigue, adrenal burnout, insomnia, scoliosis, osteoporosis, heart disease, cancer, migraine headaches, seizures, fungal and bacterial infections including yeast

infection, gum disease, tooth decay, skin and hair problems and female organ conditions including uterine fibroids, endometriosis and others. Mental and emotional disorders related to copper imbalance include spaciness, depression, mood swings, fears, anxiety, phobias, panic attacks, violence, autism, schizophrenia, and attention deficit disorder. Copper deficiency is associated with aneurysms, gout, anemia and osteoporosis. Interestingly, the symptoms of premenstrual tension are identical to the symptoms of copper imbalance.

SOURCES OF COPPER

Today, many children are born with excessive tissue copper. It is passed from high-copper mothers to their children through the placenta.

Stress from any cause contributes to copper imbalance. Stress depletes the adrenal glands and lowers the zinc level in the body. Whenever zinc becomes deficient, copper tends to accumulate. Our soil is low in zinc. Refined sugar, white rice and white flour have been stripped of their zinc. The trend toward vegetarianism reduces zinc in the diet, since red meat is the best dietary source of zinc.

Copper is found in many foods, particularly vegetarian proteins such as nuts, beans, seeds and grains. Meats contain copper, but it is balanced by zinc which competes for its absorption. Chocolate is high in copper. A desire for copper may help explain chocolate cravings.

Another source of copper is drinking water that remained in copper water pipes, or copper added to your water supply. During a recent dry summer, several Oregon cities added copper sulfate to their reservoirs to reduce algae growth. Accident and disease rates increased.

Other sources of copper are copper cookware, dental materials, vitamin pills, fungicides and pesticides residues on food, copper intra-uterine devices and birth control pills. Mrs. Robinson and her 6-month-old, breast-fed baby both began to experience hair loss. The cause was a daily prenatal vitamin containing 4 milligrams of copper, far too much for this high-copper mother. Deficiencies of manganese, iron, B-vitamins and vitamin C can cause copper to accumulate. Adrenal hormones cause the liver to produce ceruloplasmin, the main copper binding protein in the body. Therefore, a sluggish liver or weak adrenal glands may cause copper to build up in the tissues.

THE COPPER PERSONALITY

There is a high copper personality. Positive traits include a warm, caring, sensitive, emotional nature, often with artistic orientation and a child-like quality. Often high-copper people are young-looking. Many traditional feminine traits are associated with copper such as softness, gentleness and intuitiveness.

When the personality is not fully integrated or the copper becomes too high, negative traits show up. These include spaciness, racing thoughts, living in a dream world, naivete, childishness, excessive emotions, sentimentality, a tendency to depression, fearfulness, hidden anger and resentments, phobias, psychosis and violence. Artists, inventors and other high-copper types often "live on the edge", in part due to their high copper level.

The copper personality tends to accumulate copper easily. Copper functions as a psychological defense mechanism. It causes one to detach slightly from reality. This provides relief from stress for the sensitive individual. It works well as long as the copper does not become too high. Very high copper can cause a psychotic break from reality, a type of schizophrenia.

An 18-year old schizophrenic patient had a hair copper level of 40 mg% (normal is 2.5 mg%). She hallucinated and attempted suicide twice while in the Scottsdale Camelback Mental Hospital. When her copper decreased to normal through a diet and supplement program, her symptoms disappeared and she has remained well.

COPPER AND SOCIETY

Is it possible that our mineral balance affects our attitudes? Copper is called the 'psychic' mineral, the 'intuitive' mineral, and a 'feminine' mineral because it is so important for the female reproductive system. Its level generally parallels that of estrogen. While many factors influence our attitudes and values, the rise in tissue copper levels in both men and women in the past twenty years parallels renewed interest in feminism, in psychic and intuitive knowledge, and 'nurturing' movements such as environmentalism.

COPPER AND SEXUALITY

Women tend to have higher levels of copper than men. Women also have more symptoms related to copper imbalance. These include yeast infections, migraine headaches, adult acne, various menstrual symptoms and

depression.

Copper-toxic women are often estrogen dominant. They may benefit from progesterone therapy to help balance their hormones. Women with bioavailable copper are often low in estrogen. Their bodies are often more linear in shape. Of course, copper is not the only factor affecting hormones. Some pesticides, for example, mimic the effects of estrogen and can affect the hormone balance.

Men, by contrast, should be zinc-dominant. Zinc, a 'masculine' element, balances copper in the body, and is essential for male reproductive activity. Today, however, many men have symptoms of copper toxicity including depression, anxiety and other symptoms. Homosexuality may be related to copper levels. This is because secondary sex characteristics are greatly influenced by hormones which are in turn influenced by copper and zinc levels.

COPPER AND CHILDREN

Children are often born with high copper levels. Young children are very sensitive and intuitive. They often lose some of their sensitivity and 'psychic abilities' as their copper levels diminish around age four.

Persistent elevated copper levels in children are common today. The problem often begins during gestation, when high-copper mothers pass on excessive copper (and often low zinc) to the fetus through the placenta. This is called congenital, rather than genetic high copper. It can be prevented by correcting one's copper metabolism before becoming pregnant. After birth, poor nutrition, stress in the home, and overuse of prescription drugs can aggravate a child's copper imbalance.

Copper imbalance in children is associated with delayed development, attention deficit disorder, anti-social and hyperactive behavior, autism, learning difficulties and infections such as ear infections.

VEGETARIAN DIETS

Excess copper interferes with zinc, a mineral needed to make digestive enzymes. Too much copper also impairs thyroid activity and the functioning of the liver. If severe enough, a person will become an obligatory vegetarian. This means they are no longer able to digest meat very well. Conversely, if one becomes a vegetarian for other reasons, most likely one's copper level will increase. Vegetarian proteins are higher in copper, and lower in zinc.

At times, the vegetarian orientation is health-producing. In many people, however, restricted diets do not work well. Fatigue, spaciness and other symptoms begin to appear. Many people, including the author, felt they were becoming more spiritual on a vegetarian diet, when in fact it was just copper poisoning! The taste for meat often returns when copper is brought into better balance.

Some people with high copper dislike all protein. They crave high-carbohydrate diets. Protein feels heavy or causes other symptoms. Eating protein stimulates glandular activity. This releases stored copper which causes the symptoms. However, these individuals usually need to eat protein. The symptoms will eventually disappear.

Copper-toxic individuals may also be drawn to sweets or salty foods due to adrenal insufficiency. Some sea salt is often beneficial. Sweets, including fruit juices, provide a temporary lift but may worsen the condition.

ADRENAL BURNOUT

Adrenal burnout, characterized by chronic fatigue and other symptoms, is often related to copper imbalance. Although correcting emotional and other factors are necessary, improving the copper imbalance, supporting the adrenals and releasing fearful thoughts go hand in hand to restore optimum health. [Click here for more information about adrenal burnout syndrome.](#)

COPPER AND ADDICTION

Compulsive behavior may be related to copper and the adrenals. Exercise, for example, stimulates the adrenals. This helps keep copper available and makes one feel better. If one stops exercising, unbound copper builds up and one may feel fatigue, mood swings and depression. In some people, this can create a compulsive need to exercise. Other ways to temporarily control copper toxicity include the use of caffeine or other stimulants.

Part of the appeal of cocaine, Ritalin and amphetamines may be their ability to help lower copper temporarily by stimulating the adrenals. Cadmium found in marijuana and cigarettes drives copper back into storage. These drugs may make one feel better by affecting the copper balance.

COPPER AND YEAST INFECTIONS

Our bodies use copper to help control the growth of yeast. This may be because copper favors aerobic metabolism. Copper is required for the electron transport system, where most of our cellular energy is produced. Yeast organisms use anerobic metabolism.

Copper sulfate is often sprayed on crops to kill yeast and fungus. Copper is also used in some swimming pools and hot tubs to control yeast and bacterial growth.

When copper is out of balance, our bodies cannot control yeast overgrowth. This often lead to chronic candida albicans infections that are resistant to treatment.

COPPER AND MALIGNANCY

Copper imbalance impairs the immune system. Research is underway investigating the role of excess copper in tumor angiogenesis. Copper imbalance is often related to a tendency for infections and cancer.

COPPER AND CONNECTIVE TISSUE

Copper is required for collagen formation. Copper deficiency is association with atherosclerosis and other cardiovascular conditions. Excess copper or biounavailable copper often cause connective tissue problems, interfering with the disulfide bonds in connective tissue. Symptoms may include stretch marks, tendon and ligament weakness, mitral valve prolapse, skin and hair problems and other conditions affecting connective tissue.

DETECTING COPPER IMBALANCE

Blood, urine and hair analysis are used to detect copper toxicity. Challenge tests with a chelating agent such as EDTA may also be used to detect excess copper. However, they may not reveal copper toxicity directly. Copper is stored mainly in the brain, liver and other organs, not in the blood or urine. A liver biopsy can be performed for copper, but this is invasive and unnecessary.

Several indirect indicators on a hair mineral test are excellent to detect copper imbalance. These include a hair calcium level greater than about 100 mg%, a potassium level less than about 3 mg%, a sodium/potassium ratio less than 2.5:1, a zinc/copper ratio less than 6:1, an elevated mercury level or a copper level less than 1.0 mg%.

BALANCING COPPER

The author dealt with severe copper imbalance in himself and with many others for the past 18 years. Seven methods are used to reduce copper in the tissues:

- 1) Inhibit the sympathetic nervous system. This is easier said than done. Copper toxic individuals often complain of their mind racing. Turning off the sympathetic or fight-or-flight nervous system can be a challenge. Methods that are helpful include electric light sauna therapy, meditation, relaxation techniques, deep breathing, supplemental calcium, magnesium, ox bile, pancreatin, kidney glandular and coffee enemas.
- 2) Reduce exposure to sources of copper like copper intra-uterine devices, swimming in pools and high-copper vegetarian diets.
- 3) Antagonists such as zinc, manganese and iron compete with copper for absorption and utilization. Other antagonists include vitamins B6, folic acid and selenium. Research indicates copper may be excreted by binding with glutathione and metallothioneine which require these nutrients.
- 4) Chelators of copper include vitamin C, molybdenum and sulfur-containing amino acids. These bind and remove copper. More powerful chelators may be used, but can have harmful side effects.
- 5) Enhance the eliminative organs, such as the liver, skin and colon. Digestive enzymes, especially pancreatin, are very important. Also excellent is sauna therapy, especially with an infrared electric light sauna. Other methods of enhancing the eliminative organs are coffee enemas, colonic irrigation and skin brushing.
- 6) Balance body chemistry, enhance energy production and improve adrenal gland activity. To support the adrenal glands, avoid sweets, eat protein with each meal. Supplements that assist the adrenals include vitamins A,C and E, manganese, zinc, adrenal glandular and B-complex vitamins. Animal protein is very helpful due to its higher content of zinc, B-vitamins and sulfur amino acids including cysteine and taurine. Adrenal glandular substance is also frequently helpful.
- 7) Reduce fear and stress. Methods range from a change in location or work to meditation, therapy, more rest and

other changes.

Note that just taking a lot of copper antagonists and chelators may not work very well. This is because it does not balance body chemistry. For example, zinc and vitamin C lower sodium while molybdenum raises sodium. Each vitamin and mineral affects overall body chemistry. For best results, I strongly recommend an integrated nutrition, lifestyle and detoxification program based on a properly performed and interpreted hair mineral analysis. It is worth the extra cost and you will save more in not buying unneeded supplements.

COPPER DETOXIFICATION SYMPTOMS

One of the difficulties in reducing excess copper are symptoms that arise during the process of elimination. As the body begins to mobilize excess copper from tissue storage sites, it enters the bloodstream on its way to the liver and kidneys for elimination. While in the bloodstream, the copper can cause headaches, skin rashes, racing thoughts, strange odors, digestive upset, mood swings and energy fluctuations. In men, testicular pain is not uncommon. Women's periods may be affected.

Certain methods of lowering copper cause these symptoms more than others. Zinc, vitamin C and manganese tend to cause more symptoms, perhaps because zinc and manganese replace copper in the liver. Molybdenum and sulfur compounds such as Russian black radish tend not to produce copper elimination effects.

If one knows what is occurring, it is possible to take measures to minimize these temporary elimination symptoms. Enemas, sweating, and drinking more water can help promote copper elimination. Reducing the nutrition program for a few days may also help slow the reactions and reduce symptoms if they are severe. Supplements of molybdenum, bile acids, laxative herbs and vitamin B6 may also mitigate elimination symptoms.

ATTITUDES TO HELP BALANCE COPPER

Adequate rest and sleep are important. Any technique to help handle stress is also helpful. A simple but powerful technique for handling all negative emotions is given in an excellent book, *Emissary of Light*, by James Twyman. He suggests to feel our negative emotions purely, dissociating them from thoughts. Feel them in the body. Then move the feeling to the heart area, visualize a small door just in front of you, open the door and release the emotion. Realize that all feelings are just energies. They can be transmuted, sent forth and used for good.

High copper people are often sensitive, must acknowledge this and 'live their own truth'. At the same time, a careful look at one's attitudes, especially hidden fears, angers and resentments, is very important. Overcoming copper imbalance often involves overcoming deep fears.

Life is not always easy for the copper-toxic person. One can become resentful or depressed at times. With understanding, a complete nutritional balancing program based on hair mineral analysis and lots of compassion for oneself, these obstacles can be overcome. Then the creative, intuitive and loving qualities of the high-copper individual can shine through to the world.

http://www.drlwilson.com/articles/copper_toxicity_syndrome.htm

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I'm going to Dr. Wilson and Dr. Eck you all to death, uh?!

Richard

Hans and All,

Dr. Gersten told me that Dr. Paul Eck is the guru of minerals, so I did a search on him. In searching, I came upon this article that I found of interest. Here it is in its entirety, but take note of the high potassium and sodium in the hair, and that it is indicative of oxidative stress. Also, take note of overdoing a good thing, such as Vit. C, and what it can do to copper.

IS VITAMIN C ALWAYS INNOCUOUS?...SOME FOOD FOR THOUGHT

By Dr. William Risley Sr.

Mae West has been quoted for years and probably wishes we would forget her remark that "Too much of a good thing is wonderful." Most of us are aware that certain vitamins and minerals when used in excess or inappropriately can cause problems. We know in fact, that any vitamin or mineral has a toxic level that should be considered. But can Vitamin C be overused? Is there a contraindication to massive dosages of Vitamin C. Occasionally, in my clinical practice, one of my patients would tell me that "Vitamin C makes me feel badly." What heresy! Denigrating vitamin C is akin to finding fault with baseball and apple pie. I would often subtly categorize this patient as one to fall into the questionably sane column.

To be sure, vitamin C has a track record of literal miracles. Klenner's work embraces in excess of 10 grams IV push as an emergency room routine for immediate detoxification in virtually every patient admission. Ten grams of vitamin C per day and dietary correction, in Klenner's words, will control the typical diabetic in 60% of known cases, and markedly enhance glucose tolerance in the remaining 40%. Klenner boldly states that diabetics should be considered victims of sub-clinical scurvy and that is likely why they heal wounds so poorly. From the prodigious work of Paul Eck, we know that vitamin C increases the metabolic or oxidation rate of the body through adrenal gland impetus. This increased "oxidation rate" is manifested on a tissue mineral analysis (hair) as increased levels of sodium and potassium. An increase in metabolic or oxidative efficiency is a major impetus in enhanced glucose tolerance, not to mention overcoming the stress of acute infection.

Cathcart suggests titrating the need for vitamin C in patients by determining their bowel tolerance to increasing amounts. He states that if a patient takes 10 grams of C in one day and does not get diarrhea, "something is wrong, and you better find out what it is." In other words, a pathology existing that may be asymptomatic will quickly use the massive dose of C, preventing loss through the intestines. In recognition of the patient's biochemical individuality, he suggests with a cold, the patient may need to increase the dosage to 50 grams per day; with the flu, 150 grams; and he suggests AIDS patients take as much as 200 Grams per day in an IV drip. Most of the medical approaches entail an ascorbic acid recommendation of course, versus a whole vitamin C complex. That fact alone may play a major role in the possible negatives that I will address.

Long ago, one of my patients wrestled with the heroin addiction of her son and provided money for his habit so that he would not have to steal for the next fix. His habit threatened to destroy her financial stability not to mention her sanity. She brought in two studies that I have lost, that suggested 700 Grams of vitamin C per day to prevent withdrawal symptoms from heroin. Her son was "afraid to take that much vitamin C," but of course was not afraid to take the frequent dose of heroin. It has been stated that removal of all vitamin C from the body is the equivalent of removal of the adrenal glands. Massive dosages of this seeming "miracle worker" likely has significant positive effects on the heroin user's adrenal glands, and certainly on the immune-compromised sufferer of viral or bacterial infection.

From personal experience I have been able to take 50 grams orally, sometimes 3 times per day, and have a dramatic recovery from influenza and colds symptoms. Coincident with the relief of viral symptoms, the ongoing back pain of herniated discs also is relieved with those dosages of vitamin C. Studies that suggest 200 mg usage per day has no effects on cold symptoms are laughable at best. The vitamin does in fact enhance recovery from a multitude of bacterial and viral infections, but 200 mg per day is next to worthless.

But is there a downside to the use of this vitamin? My experience suggests that there may be significant risks to routine use of the substance.

Being a staunch advocate of using the vitamin, and wanting to prevent or forestall being subject to the flu, I purchased

a commercially available vitamin C product with bioflavonoids, coming as close as possible to a totally natural product. Specifically, the product was TWINLAB® "C-PLUS CITRUS BIOFLAVONOID CAPS, (1000 MG CAPSULES) It also was described as "HIGHEST IN PURITY" The "Highest in Purity" statement was comforting. I took 10 grams per day, in two 5 gram dosages.

For several weeks, I enjoyed a significant period of well being, easily attributed to the increase of vitamin C. I did in fact feel generally better without side effects. But I then began to develop a well-delineated set of symptoms directly paralleling those common with copper toxicity. I began awakening at 4:00 AM ready to virtually jump out of bed and begin my day. I felt energized with no fatigue, just on an average of 5-6 hours of sleep. I often relate in my seminars, that children get up in the morning and say "good morning, God," while most of us awaken and say " Good God, it's morning." I was remarkably refreshed after just a relative few hours of sleep.

I then began to be aware of the symptom of "pencil rolling" drumming of my fingers. Not a major complaint, but certainly more than I had prior to the regimen of vitamin C. Next in line was some occasional right shoulder and sub-sternal distress paralleling symptoms of gall bladder upset. Having passed some gallstones in my health history, I can easily recognize those symptoms.

Subsequently appearing symptoms then got my attention even further. I began to experience a gradually building level of mental depression along with a drop off of sexual desire and some erectile dysfunction. I then promptly experienced an audible tear in the right gastrocnemius muscle and went into an immediate shock reaction. I was unable to support weight on the injured leg for some days, and one month later still suffer residual disability.

Here is what I propose may have occurred. From the work in the laboratory wherein I am a consultant, we have found a significant number of patients with what we term copper toxicity, or a situation where the patient displays an excess of biologically unavailable copper in their hair assay. There are certain symptom profiles that are common and remarkably consistent with all of these patients. The degree of expression of these symptoms remains dependent upon their own biochemical individuality.

They include:

Insomnia - Bio-unavailable copper stimulates the biogenic amines. The patient often states that their mind is "running" constantly. Emotional disturbances - irritability, mood swings, depression and even suicidal tendencies. Sexual hormone disruption - male or female, especially estrogen difficulties in the female. Gall bladder disease - 85% of copper is eliminated through the gall bladder and an excess may inflame the organ. Collagen tissue impairment - steers that are copper deficient develop "sway back" postures. Scoliosis and aneurysms have been related to copper deficiencies.

For a patient plagued with the symptoms of a toxic (bio-unavailable) copper overload, removal of that burden gives them new reasons for living. Depression, mood swings and emotional volatility constantly interfere with this patient's enjoyment of life. Inadequate levels of usable (bio-available) copper can result in heart disease, serious other pathologies and death. Too much copper, and the patient often wishes they were dead. The correct amount of usable copper is the ultimate best scenario.

Some time ago in the Original Internist, I described the negative effects of using the copper bracelet for treatment of arthritis. The symptoms of inappropriate use of the bracelet are identical to the symptoms of copper toxicity. Vitamin C chelates out copper-whether toxic or usable. I would presume that the high levels of vitamin C ingestion caused a massive loss of copper from the tissues into the blood stream for elimination and resulted in symptom expression as described. When patients discharge large amounts of copper as a result of successful supplement therapy, ceruloplasmin levels rise in the blood stream. Ceruloplasmin carries copper as an amino acid-copper chelate. It has been described as transporting a volatile substance through the bloodstream in the same manner as carrying money to the bank in an armored car. It is dangerous not to be transported in a protective vehicle. Adequate protein intake and adrenal gland function are two required elements for this procedure.

Zinc is used to buffer copper in the system, and since zinc deficiency is rampant in this country, my reserves were depleted as a result. The normal zinc to copper ratio was disturbed, impairing sexual hormone production and release, and thus manifesting reduction of sexual function. Zinc is calmativ and copper is excitatory when bio-unavailable.

Nervous tics, tremors, Parkinson's syndrome and other neurological difficulties are major syndromes likely connected with copper toxicity.

All of my symptoms disappeared 48 hours after discontinuance of the mega- doses of vitamin C.

Copper toxicity or deficiency is classically related to collagen afflictions, calcium imbalance, strains, sprains and as aforementioned, scoliosis in steers. Could my sudden and severe tear in the gastrocnemius muscle be a result of the temporary over-dose of copper? As an aside, we virtually always find copper toxicity when the patient demonstrates mercury poisoning. I am reminded of the dentist who came to me complaining of unremitting shin splints with jogging. His mercury exposure likely contributed to the copper toxic situation, and bone/collagen problems, resulting in shin splints.

Vitamin C can and does do miraculous things for patients afflicted with toxic levels of copper. So why should it be a problem? The problem arises when the intake of vitamin C continues past the stage of effective detoxification of the patient. A high level of copper has been implicated in schizophrenia, and massive doses of C can cure many of these patients. Continued usage of the vitamin after the system has been detoxified, results in continued discharge of copper that is usable and critically needed for normal health. The cure in this scenario becomes the poison and all of the symptoms of toxicity will commonly manifest as a result of the artificially created deficiency.

A classic patient in the annals of our laboratory work, involved a patient with prostatic disease. He took zinc as recommended for six months, and recovered completely. Not wanting the return of the disease symptoms, he vowed to continue the intake of zinc. Six months later, the condition returned. Excessive and prolonged use of zinc supplementation depleted his copper levels, once again disturbing the critical zinc:copper ratio necessary for normal sexual hormone production. The environment necessary for prostate disease was created, and that is of course the condition which returned.

The work of Paul Eck does provide a monitoring assessment to prevent this occurrence, utilizing hair mineral assays. It is breakthrough work. It is also material for future discussion.

(Dr. Risley Sr. can be reached on the Internet for comments or nutritional consultations, at: mediserv@futureone.com)

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Richard

I think I may have reached an end to the information I can find, in relation to Dr. Eck, but it's been eye-opening, to say the least. This is a bit that I found quite interesting, as well. It would seem that the sympathetic dominant is better off than the parasympathetic dominant, in that they have not reached the same level of adrenal exhaustion, yet.

Assessing metabolic type is most helpful in clinical practice to recommend diet and supplementary nutrients. Balancing the oxidation rate is most useful to increase energy, reduce stress on the body and assist toxic metal elimination. Methods of assessment include blood, hair and urine tests, heart rate variability, questionnaires, oriental diagnosis (pulse, tongue, color) and others. Many times the assessments do not correlate with each other. This article sorts out basic concepts and presents a simplified approach I have found very adequate and reliable.

CONCEPTS

More ancient metabolic typing methods include yin and yang assessment of acupuncture and macrobiotics. Ayurvedic typing is another. Morphological types were used by Hippocrates and other ancient physicians. This article concerns the use of biochemical markers for metabolic assessment. Concepts include:

1) Oxidation types were first proposed by Dr. George Watson, author of *Nutrition and Your Mind*. He divided people into fast and slow oxidizers based on their response to odor testing. He later correlated this with blood pH and CO₂ levels. The blood of fast oxidizers tended to be slightly more acidic. Dr. Watson theorized that the types were based on one's relative ability to handle carbohydrates in the glycolysis cycle and fats in the krebs cycle. He also identified another metabolic type he called sub-oxidizers.

2) Sympathetic and parasympathetic were researched extensively by Melvin Page, DDS, author of *Degeneration-Regeneration*. He used the calcium/phosphorus ratio in the blood along with body measurements for his assessment.

3) Autonomic dominance is different from the autonomic state. For example, one's body can be in a parasympathetic state (very weak adrenal and thyroid activity) due to exhaustion of the sympathetic nervous system. However, one's response tendency can be sympathetic. That is, one may still approach problems with an exaggerated fight-or-flight attitude and response.

Autonomic dominance is related to personality type, although toxic metals and other imbalances can influence the tendency for a particular dominance.

4) Autonomic Versus Oxidation Dominance. Some authorities assess whether an autonomic imbalance is most important or whether an oxidation imbalance is most important. Dr. Bill Wolcott and others use this approach, making use of questionnaires for assessment.

5) Alarm, resistance and exhaustion are the stages of stress according to Dr. Hans Selye, MD. His revolutionary stress theory of disease has yet to be appreciated by most of medical science. Dr. Selye carefully identified the characteristics of each of his stages of stress.

6) Anabolic and catabolic metabolic types were proposed by Dr. Emmanuel Revicci, MD, a prominent physician who did excellent cancer research.

7) Blood types. According to Dr. James D'Adamo, ND, author of *Eat right For Your Type*, one's blood type will dictate the best diet and other lifestyle choices. I have found this concept of limited usefulness, although those with blood type O have the most difficulty maintaining their health on a vegetarian diet.

SYNTHESIS

Dr. Paul C. Eck, a mineral researcher, studied all these systems and attempted to synthesize them. For example, he asserted that an alarm stage of stress (the fight-or-flight response) is a sympathetic state. It also tends to correspond to a fast oxidizer. This is not too hard to understand. All are characterized by excessive activity of the thyroid and adrenal glands and a hyper-alert state of the nervous system.

As stress continues, the thyroid and adrenal glands begin to "burn out" and one goes into the resistance stage of stress. The oxidation rate begins to slow and the body begins to move from a sympathetic to an unhealthy parasympathetic state. The latter occurs not because one chooses it, but because the sympathetic system becomes depleted of nutrients and can no longer function correctly.

Continued stress results in an exhaustion stage of stress. This corresponds to a very slow oxidizer and an unhealthy parasympathetic state. Thyroid and adrenal activity are low. Symptoms may include fatigue, allergies, low blood sugar, weight gain and many others.

This is the basic correlation of these concepts. Dr. Eck used hair mineral analysis for his assessment of metabolic type.

After much experimentation, he found mineral ratios were more reliable as indicators than mineral levels.

HAIR ANALYSIS

To assess oxidation rate, one uses the ratios of calcium to potassium and sodium to magnesium. For accurate mineral readings, hair must not be washed at the laboratory. Only two commercial laboratories in the United States do not wash the hair, Analytical Research Labs and Trace Elements, Inc.

Dr. Eck found that a high calcium in relation to potassium is associated with a slower oxidation rate. Thyroid activity lowers calcium. Potassium also sensitizes the tissues to thyroid hormone. Also, calcium stabilizes cell membranes and decreases cell permeability.

A high calcium is associated with sluggish thyroid activity and reduced cell permeability which also decreases oxidation and cellular respiration. Note that diagnoses of hyperthyroidism are possible in this instance and occur quite commonly. They occur because the body may respond to reduced cell permeability and low cellular thyroid activity by secreting more thyroid hormones. Thus blood tests and some symptoms will indicate hyperthyroidism. However, it is not the same as a primary hyperthyroidism which may have different causes. Mercury toxicity in the pituitary can also cause a secondary hyperthyroidism in slow oxidizers.

The sodium/magnesium ratio is more indicative of adrenal glandular activity. The adrenal hormone aldosterone causes sodium retention in the kidneys. An elevated hair sodium in relation to magnesium is associated with excessive adrenal activity. Here too, however, secondary causes for elevated sodium may occur. These include toxic metals in the kidneys and zinc deficiency.

Dr. Eck used as his ideal ratios 4:1 for the calcium/potassium ratio and 4.17:1 for the sodium/magnesium ratio. To summarize the calculation:

* Slow oxidation is defined as a calcium/potassium ratio greater than 4 and a sodium/magnesium ratio less than 4.17.

* Fast oxidation is defined as a calcium/potassium ratio less than 4 and a sodium/magnesium ratio greater than 4.17.

* If one ratio indicates fast and the other slow, the pattern is called mixed oxidation. This is an unstable and temporary state that will resolve to either fast or slow in a number of months.

* Dr. Watson's sub-oxidizer corresponds to another hair mineral pattern, four low electrolytes. Discussion of this pattern is beyond the scope of this article.

AUTONOMIC STATE AND THE CA/P RATIO

Phosphorus is fiery and explosive. Phosphorus must be stored under water. Exposed to the air, it spontaneously catches fire. TNT contains phosphorus. Phosphors make televisions and computer monitors light up. Phosphorus is the key element in ATP, adenosine triphosphate, the high energy molecule that provides energy for our bodies.

Dr. Paul Eck found that either high or low phosphorus on a hair analysis indicates impaired protein synthesis. All proteins contain phosphorus. Elevated hair phosphorus, especially in relation to calcium, is an indicator of a sympathetic state. This is catabolic, associated with excessive protein breakdown.

In an exhaustion stage of stress, the body becomes parasympathetic because the sympathetic system is depleted. Digestion, absorption and utilization of protein are impaired due to zinc deficiency, copper toxicity, improper gut flora and other problems. This produces a low hair phosphorus, especially in relation to calcium. This is more serious than an elevated hair phosphorus. The ideal phosphorus level is 14-17 mg%.

CALCIUM

Calcium is cold, hard and static. It is the key ingredient in concrete. Calcium gives rigidity to our bones and teeth. Where phosphorus is energy in motion, calcium is structure.

Dr. Hans Selye, founder of the stress theory of disease, discovered that sympathetic nervous activation lowers tissue calcium and magnesium levels. This puts the body in a hyper-alert state, increases blood pressure by constricting the arteries and enhances nervous system reactivity. This prepares the body for fighting or running.

The opposite occurs in the exhaustion stage of stress. The sympathetic system is depleted. Thyroid and adrenal activity diminish and tissue calcium begins to rise. It can become very elevated in a hair sample, indicating an unhealthy parasympathetic state. The ideal hair calcium level is about 40 mg%. The ideal ratio of hair calcium to phosphorus is therefore 2.5:1. From Dr. Eck's research,

- * A sympathetic state is indicated by a calcium/phosphorus ratio less than 2.5.
- * A parasympathetic state is indicated by a calcium/phosphorus ratio greater than 2.5.
- * A sympathetic state will usually correlate with fast oxidation.
- * A parasympathetic state will usually correlate with slow oxidation.
- * A sympathetic state generally correlates with Dr. Selye's alarm stage of stress.
- * A parasympathetic state generally correlates with an exhaustion stage of stress.
- * Resistance stage of stress is an in between stage. It is associated with mild slow oxidation and a balanced calcium/phosphorus ratio on a hair mineral analysis.

This may seem complex, but is actually quite intuitive. Calcium is hard and static. More of it in the tissues is associated with sluggish glandular activity, a parasympathetic state and an exhaustion stage of stress. (Elevated tissue calcium does not mean the body has too much calcium. Rather it means calcium is depositing in the soft tissues).

AUTONOMIC DOMINANCE

Autonomic dominance refers to which branch of the autonomic system one uses most of the time. This is often a personality issue. Most people are sympathetic dominant. When it is mild, one is forward-looking, optimistic, active and energetic. Symptoms of excessive sympathetic dominance include compulsiveness, running around excessively, overworking, excessive thinking, fearfulness, anxiety, worry or anger. One may talk, think and work fast.

Sympathetic dominant individuals do not spend enough time in a parasympathetic state to rebuild the body, so it eventually becomes depleted of nutrients or "burns out". A hair sodium/potassium ratio greater than about 4 indicates sympathetic dominance. Greater than 8 is extreme. Today even young children are burned out due to stress and poor diets.

Healthy parasympathetic dominant individuals are rare. They love to relax, do not react to stress and may rest all day, not because they are tired but because they are content. They live in the present moment and are at peace within. A healthy parasympathetic dominant loves eating, has a great appetite and great digestion because the parasympathetic system activates digestion. They are rare due to the stress of modern living. Also, toxic metals and chemicals in the food, air and water disturb the proper functioning of the autonomic nervous system.

Much more common is emotionally or chemically-caused unhealthy parasympathetic dominance. These people have given up on life and will not fight for anything. They may advocate peace, but they are not at peace. They may sit around or they may be active, but are in a give-up mode. Their hair analyses reveal a high calcium/phosphorus ratio, slow oxidation, a sodium/potassium ratio less than about 1.5 or perhaps a four-low-electrolyte pattern (calcium less than 40, magnesium less than 6, sodium less than 25 and potassium less than 10).

One's autonomic dominance and autonomic state may be different. Many patients are sympathetic dominant, but the body is in a parasympathetic state. This is called a burned out sympathetic dominant. It is indicated on a hair analysis by a calcium/phosphorus ratio greater than 2.5 (parasympathetic state) and a sodium/potassium ratio greater than 4

(sympathetic dominance).

HEART RATE VARIABILITY AND ACUPUNCTURE

Some physicians use heart rate variability to assess autonomic activity. The most common pattern it reveals is deficient parasympathetic. This corresponds to the slow oxidizer (parasympathetic) and the deficient parasympathetic indicates this person is not in a healthy parasympathetic state. It is really just a state of sympathetic nervous system exhaustion. Above we discussed that healthy parasympathetic dominant individuals are rare.

Acupuncture diagnosis also corresponds to these types. The author conducted experiments comparing hair analysis and acupuncture pulse and tongue diagnosis. Fast oxidizers or those in a sympathetic state are yang in acupuncture terminology. Slow oxidizers, those in a parasympathetic state, are yin. There are many other correlations between traditional Chinese acupuncture assessment and hair mineral analysis.

CAUSES OF THE METABOLIC TYPES

The autonomic state and oxidation rate are dependent mainly on biochemical factors. All children start out in a sympathetic state. As one ages and the body wears out, the ability of the body to mount a fight-or-flight response diminishes and the adrenals and thyroid gland slow down. This eventually results in an unhealthy parasympathetic state or slow oxidation.

The degree of deviance from the ideal depends to some degree on genetic factors, congenital nutritional imbalances, diet, lifestyle, accumulation of toxic metals and traumas. One's emotional reactivity, sensitivity and other subtle factors play an important role in some people.

CAUSES OF AUTONOMIC IMBALANCE

The metabolic type is also heavily influenced by autonomic dominance. This is the tendency of the person to either overuse the sympathetic nervous system or to conserve their energy. In many cases, this is a personality trait. However, it may be influenced by genetic and congenital imbalances, toxic metals and early life traumas. Daily diet and life style usually play a lesser role and are more a result than a cause of one's autonomic dominant type.

For this reason, I do not distinguish which is more important for a patient, the metabolic state or one's autonomic dominance. Both can be important and both may be related to biochemical or emotional imbalances. Both need to be addressed for best results.

IMPROVING THE METABOLIC BALANCE

Healing requires a healthy parasympathetic state. This is a state of regeneration, nurturing and nourishing the body. It is a relaxed state that allows the immune system, digestion and the eliminative organs to function optimally.

Inhibiting an overactive sympathetic nervous system by whatever means necessary is a primary concern for healing. I begin the process by supporting two parasympathetic activities, digestion and sleep. If these are not attended to, most people will not get well. There are many natural products and strategies to help correct digestive difficulties and insomnia.

Improving digestion involves the diet, eating habits, and often supplying digestive enzymes for a while. It may also involve restoring normal flora, ending constipation or diarrhea, cleaning and restoring the colon and eliminating reactive foods.

Strategies for improving sleep include the use of sedative nutrients such as calcium, magnesium and zinc, improving sleep habits, lowering excessive copper and other toxic metals that interfere with sleep, improving the sleep environment and other remedies if needed.

Another method to inhibit the sympathetic nervous system is the coffee enema or colonic irrigation. These activate parasympathetic organs. Another very powerful method is sauna therapy. Heating the body shuts down normal heat

production, an important sympathetic activity. Meditation, relaxation, yoga and tai chi are other methods that inhibit the sympathetic nervous system. Changing one's attitudes away from fear, guilt, worry and anger toward love and peace in all situations also powerfully inhibits sympathetic nervous system responses. Deciding at a deep level that the world is basically friendly, not threatening, helps immensely to calm down an overactive sympathetic nervous system.

In some patients, biochemical imbalances are primary, while in others emotional and even spiritual issues must be addressed and can be primary factors. However, for best results biochemical, structural, energetic and emotional/spiritual issues all need to be addressed.

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Richard

Richard,

This is very interesting. I am going to print it out to read it more thoroughly. It seems to contradict some of the things I read by Linus Pauling....

Joe

Richard,

Very, very interesting information. As I recall it your hair analysis showed high copper levels. Were you supplementing with high doses of vitamin C when the sample was taken?

Anyway, this sure shows that copper is critical and that the proper level is essential. The problem is, how to determine the proper level and how to determine whether it is bioavailable or not. Presumably it would be bioavailable if it shows up in a blood test - otherwise how did it get into the blood stream? So is the conclusion that the blood test shows amount of bioavailable copper while the hair analysis shows amount of non-bioavailable (toxic) copper or perhaps total copper?

A brain twister for PC perhaps?

Hans

Hans,

Yes, at the time of my hair analysis, I was taking Vit. C, but only between 2-3,000 mg per day, which could be considered a high level. I didn't stop supplements, until I went to Dr. Gersten, the latter part of May, because of testing requirements. My books don't give me much more to go on, other than hair and serum.

On my spreadsheet breakdown, my supplements, that Dr. Gersten prescribed, will include the following dosages:

Vit C as Ascorbic Acid/Ascorbyl Palmitate - 3300mg per day (3000 time release)
Copper - 1.0009mcg per day
Zinc - 52mg per day, which seems a bit high
Niacin/Niacinamide - 1600mg per day - ditto on high
P5P (coenzyme B6) - 270mg per day
B6 - 4mg per day

Vit E - diff forms - 1425iu (high??) various forms in diff supps
Beta Carotene - 21,000iu
Vit A - 3,000iu
Plus all the other vitamins/minerals in normal doses

All the aminos, by way of Biological Pure Protein (Metagenics), Gluca Balance (Montiff), Neuro Balance (Montiff-Tyrosine/N-acetyl tyrosine w/P5P), L-glutamine (I'm taking Jomar, but he suggested Montiff), Pure N-acetyl cysteine (same, but I'm doing Jomarlabs.com), Tryptophan (prescription), Ultra Carnitine (Montiff), Pure Taurine (Montiff), Super Anti Oxidant (Montiff), Cir Cu Care (Montiff, extracts of diff herbs), Ultra Flora Plus (Metagenics), GLA Forte (Metagenics Gamma-Linolenic I was low here), VitaMinz Plus (Montiff), Garlic, Molybdenum, Intrinsic B12/Folate (Metagenics), Lipotain (Metagenics Niacin as inositol w/Guggul Resin extract), Mg. Glycinate (Metagenics), Super C Plus (Montiff time release), TriPhos B (Montiff).

I can feel you cringing Fran. Just so you know, I'll be very in tune with my body, and if I have any indication of problems, I'll cease the supps. I've tried Paleo now for 10mths, so I'm going to try this route and see what happens. Better than an ablation. If anyone has any questions, pls. ask.

Richard

Richard,

It will be fascinating to see how you get on with your new protocol - I've got my fingers crossed for you my friend. You really have put a LOT of effort into researching and testing, and a nice guy like you deserves a positive result!

As for me, having read all of the info proffered here on Cu, I'm left somewhat reeling and bewildered as to whether or not to actually take my copper chelate tabs which I rushed out and bought! I'm SURE I must qualify for adrenal burnout given my traumatic childhood and anxious adulthood. I have always had problems - albeit mild - with candida. I am definitely parasympathetic dominant. I guess I will have to look into some further testing - hair testing more specifically..... for minerals and mineral ratios.

Mike F.

Mike,

It is a confusing dilemma as to whether to take copper or not. What I find most interesting is that Hans found reduced PVCs by taking copper. I'm going to retake my hair analysis one more time through the link given on the BB. I'm also going to have the rest of my family do the same. Another point I found interesting, in one of the post above, was that molybdenum is one of the nutrients that helps restore adrenal function, and that was the most profound finding that Dr. Gersten found, being that I was very low. Also, that Fran is a smoker and this causes copper to go back into storage, was very interesting. I have to believe that a big part of all our problems are adrenal insufficiencies, due to our lifestyles and am amazed at how many things effects the adrenals, including hydrating and aldosterone. It bears repeating, if I already did post above, that my packed erythrocytes showed that my levels of copper, Mg., manganese, K, and zinc, were all normal, with K and Mg. being a bit high, and molybdenum being very low. Does that tell me that aldosterone is not my problem, because I wasn't drinking that much water, at the time of testing, and my K should have been excreting. Is that part of my adrenal insufficiencies, as well. I think if we're going to get to the bottom of this, that we should all try to get the hair analysis done, so we can compare the results given by the same lab. For a mere \$175.00, it would be well worth the findings. Here's the link for the hair analysis:

<http://www.drlwilson.com/do%20hair%20analysis.htm>

Too many questions and not enough time,

Richard

That's an interesting article. I read some time back that MVP can cause problems when sleeping on certain sides, but I didn't correlate it at the time, as I thought that wouldn't be anyone's problem, because that would have been caught through all our testings. However, it did say that it is hard to detect. Makes one wonder.

Richard

Good posts Richard. And I'm not cringing at your list of supplements. You know your own body as I think I know mine. I asked a question on the main BB about high oxidation. This excerpt below seems to answer it.

"One's autonomic dominance and autonomic state may be different. Many patients are sympathetic dominant, but the body is in a parasympathetic state. This is called a burned out sympathetic dominant. It is indicated on a hair analysis by a calcium/phosphorus ratio greater than 2.5 (parasympathetic state) and a sodium/potassium ratio greater than 4 (sympathetic dominance)."

I wonder if my smoking is really to do with normalising copper. The more I read about minerals etc the more similar in symptoms all the deficiencies and excesses become. In some cases it seems you could substitute copper for Mg or K, or low for high. Although I am sure there are subtle differences. I do want to know WHY exactly but sometimes it feels like I am chasing the wind and it keeps changing direction. I am one of the very lucky ones it would seem.

All the best

Fran - who's smoking has gone up again due to the stress of doing up two houses and trying to move.

Fran

Richard,

A lot of my reading has showed that an increased level of copper coupled with a decreased level of zinc has led to tinnitus (Latin for ringing of the bell) in the ears of many people. Have you experienced this.... I have just started to pick up a sensation of ringing of the ears since starting this copper regimen....I have sent my hair analysis out and am eagerly waiting the results.... I think that this zinc to copper ratio is a very critical part of this equation.... I am going to change my copper intake to 3 mg and couple that with a better ratio of zinc as per Hans and Fran's research has led them.....

Joe

Joe,

Interesting, that you started getting ear bells. That should look nice for Christmas. Just kidding. Maybe your levels of Cu are fine, and it's zinc that you need. Metagenics carries a product called Zinc Tally (www.aminoacidpower.com). It's a solution of zinc sulfate that you hold in your mouth to determine a zinc deficiency. If there's no taste you need zinc, and you can swallow it for the supplemental use. I'm just as excited about your hair analysis results as you are. As soon as you get them, pls. post. Did you send them to Dr. Wilson? Is that the same Dr. Wilson that wrote the book about stress?

Richard

Richard,

I was talking to my internist who referred me to a local pharmacy that has a health, nutrition and wellness center. They send the tests through the Great Smokies place. I hope to have them back by this time next week.

Joe

This little lot may be of some peripheral pertinence to the discussion here (and will, I'm fairly sure, be of interest to Richard in particular).

Copper(II) protects yeast against the toxicity of cisplatin independently of the induction of metallothionein and the inhibition of platinum uptake.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=14511662&dopt=Abstract

and:

Protection against cisplatin-induced nephrotoxicity by Cu(II)2(3,5-diisopropylsalicylate)4.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12631444&dopt=Abstract

In vitro release of metal ions from a gold-platinum alloy in saliva-simulated conditions.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12971176&dopt=Abstract

and:

Comparison of copper heptonate with copper oxide wire particles as copper supplements for sheep on pasture of high molybdenum content.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12465816&dopt=Abstract

and:

Myocardial cytochrome c oxidase activity in Swedish moose (*Alces alces* L.) affected by molybdenosis.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12083703&dopt=Abstract

and:

Experimental copper deficiency, chromium deficiency and additional molybdenum supplementation in goats-- pathological findings. (Includes mention of fibrosis (of liver) as a result of copper deficiency and candida as a result of Chromium deficiency.....)

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11887391&dopt=Abstract

and:

[Dietary intake of trace elements in the general population, estimated from a regional nutritional survey, and comparison with recommended dietary allowances and tolerable upper intake levels]

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11070600&dopt=Abstract

and:

Cytochrome c oxidase, Cu,Zn-superoxide dismutase, and ceruloplasmin activities in copper-deficient bovines.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11049217&dopt=Abstract

and my last braincrammer for today:

Experimental copper and chromium deficiency and additional molybdenum supplementation in goats. II.
Concentrations of trace and minor elements in liver, kidneys and ribs: haematology and clinical chemistry.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10813454&dopt=Abstract

ENJOY!!

(Seriously though, I hope that perusal of all or at least some of the above abstracts by eyes more expert and analytical than my own will add a little spicy something to the pot that is the current discussion on copper and molybdenum - particularly interesting about the Swedish moose problem..... there: that'll get y'all at it!)

Later,

Mike F.

I started supplementing with copper and zinc on October 11, 2003 (copper: 2-5 mg/day and zinc 10-25 mg/day). I had a 16 hour afib episode on October 23, 2003 and a 14 hour episode on November 2, 2003. I conclude from this that Cu and Zn supplementation is unlikely to have any significant effect on my episode frequency or duration.

I would be curious to know if anyone else have tried Cu/Zn supplementation and what their results were. I believe that when we have eliminated all possible causes of LAF we'll be left with the real cause - no matter how improbable (Sherlock Holmes), but boy, it sure is a lot of work to eliminate all the possible causes :~)

Hans

I was hoping for better results for you. I hope you continue to be patient and see what happens. I have to get a hold of my friend that knows more about this story, but her friend was admitted into the hospital about a month ago for complete exhaustion. The cause: extremely low molybdenum. It struck me strange that they even found that to be the cause. After administering an IV, she was fine. I had never heard much about this mineral, except in college, until my test results came back. I assume you don't have sulfite sensitivities, as you were trying wine to convert, but I don't recollect ever having sulfite problems either. I hope we can find the missing skeleton key, because this is driving me crazy.

Richard

Hans,

In reading these slides to get a better understanding, I came across this slide which states that digitalis increases vagal (acetylcholine) tone. I know you probably already know this info, but FWIW, I have a friend, who was a runner in marathons and was hit with serious AF that took him down in a race. Digoxin has worked wonders for him ever since. No more arrhythmias. If digoxin increases vagal (acetylcholine) tone, then maybe choline and it's cofactors would serve you well. Just thoughts.

http://www.cvm.umn.edu/academics/course_web/current/cvm6141/Cardio/sld030.htm

Richard

Richard,

Thank you so much for your suggestion to attempt to increase my acetylcholine level through supplementation in order to make sure that I have plenty of the vagal neurotransmitter in my system. I imagine supplementation with phosphatidylcholine (lecithin) may do the trick with a little pantothenic acid (vitamin B5) to help things along.

I have also learned that thiamin (vitamin B1) mimics acetylcholine in the brain so that may be worth trying as well. I'll add the acetylcholine idea to the top of my list of things to try. Thanks again.

Hans
