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Practitioner
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Project# 6570
Client# 625

Patient: *Phineas Quinn, (SID: 13921)* **Report Date:** November 19, 2015 **Login Date:** November 18, 2015

TOXIC AND NON-NUTRITIONAL

	Result (ug/g)	High Limit	--- Acceptable--- / ---------- Above Acceptable Limits ----------	
Mercury (Hg)	0.57	1.00		Hg
Lead (Pb)	0.97	1.00		Pb
Cadmium (Cd)	0.00	0.10		Cd
Arsenic (As)	0.09	1.00		As
Aluminium (Al)	2.40	10.00		Al
Antimony (Sb)	0.01	1.00		Sb
Barium (Ba)	0.26	1.50		Ba
Beryllium (Be)	0.007	0.050		Be

Weighted Total Toxicity Assessment (23)

NUTRITIONAL ELEMENTS

Mainly Structural	Result (ug/g)	Expected (ug/g)	Below Normal / Normal / Above Normal	
Calcium (Ca)	1017	200-630		Ca
Magnesium (Mg)	20	18-78		Mg
Sulphur (S)	35808	35000-50000		S
Silicon (Si)	90	15-80		Si
Boron (B)	0.32	0.5-3.5		B
Phosphorus (P)	166.8	125-250		P
Strontium (Sr)	1.5	0.8-6.0		Sr
Mainly Electrolyte				
Potassium (K)	67.8	10-80		K
Sodium (Na)	108.9	25-180		Na
Mainly CoFactor				
Zinc (Zn)	164.5	140-200		Zn
Copper (Cu)	12.0	10-35		Cu
Iron (Fe)	9.4	6-15		Fe
Selenium (Se)	0.50	0.8-2.0		Se
Chromium (Cr)	0.24	0.2-1.2		Cr
Manganese (Mn	0.080	0.2-0.8		Mn
Nickel (Ni)	0.193	0.15-1.0		Ni
Vanadium (V)	0.011	0.01-0.15		V
Molybdenum (Mo)	0.023	0.03-0.15		Mo
Cobalt (Co)	0.014	0.02-0.20		Co

SIGNIFICANT RATIOS

	Result	Expected
Ca:Mg	50.4	4-20
Ca:P	6.1	1.5-7.0
Ca:K	15.0	9.4-135
Ca:Na	9.3	3.8-44
Ca:Fe	108.0	21-109
Na:K	1.6	2.0-4
Na:Mg	5.4	0.2-2.2
Zn:Cu	13.7	4-17
Fe:Cu	0.8	0.20-1.5

	Result	Expected
Ca:Pb	1051	>84
Fe:Pb	9.7	>4.4
Fe:Hg	16.4	>22
Se:Hg	0.87	>1.0
Zn:Hg	287	>200
Zn:Cd	>1000	>800

OTHER ELEMENTS

The significance of these elements in hair has not been established. Higher than normal values may indicate exogenous sources.

Potentially Toxic

	Result	Expected
Bismuth (Bi)	0.008	<1.0
Palladium (Pd)	0.033	<1.0
Platinum (Pt)	0.003	<1.0
Silver (Ag)	0.094	<1.0
Thallium (Tl)	0.000	<1.0
Uranium (U)	0.013	<1.5
Tungsten (W)	0.002	<2.0

Generally Non-Toxic

	Result	Expected
Germanium (Ge)	0.062	<DL - 0.8
Lithium (Li)	0.003	<DL - 0.1
Tin (Sn)	0.074	<DL - 2.0
Zirconium (Zr)	0.115	<DL - 0.4
Lanthanum (La)	0.001	<DL - 0.05
Cerium (Ce)	0.001	<DL - 0.05

Normal Type: (2) Male >14

Analysis Date: November 19, 2015

<dl: Below Method Detection Limit NA: No Analytical Data (Suspected Contamination) For use by practitioners only. Not for diagnosis.

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INTRODUCTION TO HMA INTERPRETATION

The interpretation of the results in this report is to be used as a guide. Hair mineral analysis is a valuable adjunct to other diagnostic techniques but should not be used in the absence of other information. Each person is biochemically unique and experiences a different environment, thus it is important to employ a range of information;eg patient history, metabolic type, occupation, symptoms, diet analysis, digestion and absorption status, current supplementation regimen, drug use, etc. It is important to consider each individual element that is outside the normal range, establish the possibility of exogenous sources (eg workplace, hobby), and assess the result in relation to other test results and information. Finally, the patterns and ratios can be used to confirm your conclusions. This report does not (and could not) provide patient specific recommendations for nutritional or detoxification protocols because such recommendations require information from numerous sources, as outlined above. Diet and supplementation is a complex issue and must be carried out with consideration of input from and assimilation of dietary nutrients. Many vitamins and minerals interact and an excess of one can cause a deficiency of another. Indeed, this is one of the values of hair analysis: it indicates these balances.

Hair analysis is widely recognized as a valuable tool for the detection of toxic heavy metals (mercury, cadmium, lead, arsenic, etc.). Research has shown that minerals in hair are reflective of the total nutritional environment, including the input of protein, carbohydrate, fat, vitamins and minerals, as well as the psychological state of the individual; Gershoff [Am. J. Clin. Nutr., 30, 868 (1977)]. Some elements are more reliable than others as indices of body burden and nutritional status. This report provides this information for each element based on current research.

Exogenous sources can contaminate the hair and cleaning is important during sampling as well as in the lab. Industrial and tobacco smoke, aerosol and other air particulate are particularly problematic. We recommend the use of Johnsons Baby or similar mild Shampoo prior to taking the hair sample.The strength of washing procedures and analytical methods may vary from one laboratory to another, thus concentration data and 'normal ranges' should not be compared directly [Assarian & Oberleas, Clin.Chem., 23, 1771(1977)]. Despite this difference, the interpretation of the concentration data (relative to 'normal') can be relied upon. The treatment of hair by bleaching or other treatments has an influence on trace element values. Some hair colouring and shampoo additives are rich in lead, selenium(Selsun), zinc, silicon, and other elements which could contaminate the sample, [McKenzie, Am.j.Clin.Nutr., 31, 470 (1978)].

DETAILED NUTRITIONAL INFORMATION REPORT

The following information is a summary of the known information relating to each individual element found to be outside normal ranges for this person. Extreme care must be taken when assessing this information with respect to a specific person because, in general, a relatively small subset of the information will be relevant. The assessment MUST be carried out in conjunction with other information.

Toxic Elements Introduction

The presence of high levels of toxic elements in the hair is a good indicator of poor nutritional status and can be a major factor in many disease processes. The concentrations of these elements can be determined very accurately. Their significance and effects have been well studied. This is particulalarly true of mercury, lead and cadmium.

Toxic Group 1 Summary

Toxic Group 1 Elements (Mercury, Lead, Cadmium, Arsenic) are within normal limits

Toxic Group 2 Summary

Toxic Group 2 Elements (Aluminium, Antimony, Barium, Berillium) are within normal limit

Individual Toxic Elements

MERCURY (Hg)

Mercury is in normal range.

LEAD (Pb)

Lead is in normal range.

CADMIUM (Cd)

Cadmium is in normal range.

Arsenic (AS)

Arsenic is in normal range.

ALUMINIUM (Al)

Aluminium is in normal range.

Antimony (Sb)

Antimony is in normal range.

BARIUM (Ba)

Barium is in normal range.

BERYLLIUM (Be)

Berillium is in normal range.

Mainly Structural

These elements play a major role in the formation and maintenance of the skeleton, teeth and connective tissue.

CALCIUM (Ca)

High Ca: Elevated calcium levelsin the hair indicate that the body is excreting calcium via the urine/ hair which may be due to an undesirable transfer of this element from bones and teeth to soft tissue ie maldistribution. This redistribution is often accompanied by elevated Strontium in the hair and can be associated with acidosis. It is rare for elevated calcium levels to be associated with too much calcium in the diet but supplementation levels should be closely monitored and included with food levels.

Relevance of Hair Levels: Calcium levels in hair correlate with nutritional intake and metabolic status in a complex manner, thus interpretation of high Calcium levels in hair should be done along with an assessment of dietary intake, absorption factors, drug intake and other information like bone density measurement, dietary analysis, parathyroid / calcitonin hormone status and symptom analysis. Grey hair has generally lower levels. Calcium levels can be elevated from exogenous sources (eg hard water, bleaching, dyes and other treatments). These treatments should not be used for at least 4 weeks prior to sampling hair.

Biochemical Roles: Calcium is the most abundant mineral in the body (~1200 gm). The parathyroid regulates blood levels which must be tightly controlled to maintain vital functions like heartbeat. It is concentrated in the bones and teeth (with phosphorus as hydroxyapatite crystallized on the protein collagen). Other locations are pancreas and cartilage. It is found in low concentrations in the brain and liver. Bone is not 'permanent' and is in a constant flux of deposition and loss. Even a very slight drop in Calcium levels in the blood result in an immediate loss from bones which act as a 'bank'. If the balance is disturbed towards chronic Calcium loss from bones then periodontal disease, osteoporosis or osteomalacia (bending) can result, particularly if 'peak bone mass' occurred very early in life or was very low. In addition to its structural roles, it is necessary for muscle contraction (Magnesium is a muscle relaxant) and therefore for heartbeat, immune and hormone function. It regulates the transport of ions across cell membranes and is particularly important in nerve transmission. It helps maintain normal blood pressure. It is essential for secretion of many hormones, digestive enzymes and neurotransmitters. It plays an important role in the clotting of blood. The parathyroid regulates blood levels which must be tightly controlled to maintain vital functions like heartbeat. Calcium is absorbed mainly in the duodenum/small intestine and requires acid conditions. Vitamin D is essential for Calcium absorption.

Possible Causes: The cause of high Calcium in the hair can be high intake of Calcium, excess vitamin D or A, but maldistribution is more common. Sub clinical hyperparathyroidism can be a cause. Ingestion of too much phosphate (soft drinks & processed food) can carry Calcium out of the blood forcing mobilization from bone (and deposition in soft tissue). If Calcium alone is high then the cause may be related to allergies or food intolerance. If both Calcium and Magnesium are elevated then metabolic acidosis may be the cause. This is particularly likely if the person consumes large amounts of phosphate containing foods (eg preserved foods, soft drinks). Other factors causing high hair Calcium values are stress, lack of exercise, small or large intestine malfunction and high levels of toxic elements. Absorption decreases with age, lack of exercise, excess fat or protein consumption, excess fibre (if eaten with Calcium), oxalates (spinach, rhubarb), phytates (whole grain, seeds, nuts, legumes), caffeine, and alcohol. Thyroid hormones can cause excessive excretion of Calcium.

Signs & Symptoms: Elevated levels in the hair are associated with hypoglycemia, arteriosclerosis, osteoarthritis and/or periodontal disease. Periodontal disease is often one of the first signs of osteoporosis because the alveolar (jaw) bones are robbed of Calcium early on in the process. Tooth sockets widen allowing bacterial inflammation. Other symptoms include confusion, high blood pressure, increased sensitivity of eyes and skin to light, thirst, muscle pain, and dermatitis. A severe deficiency of vitamin D, with the resulting loss of Calcium, causes rickets. Signs of overdose include constipation, muscle spasms, gas, bloating, and calcium kidney stones.

Supplementation: Levels of Phosphorus and Magnesium as well as vitamin D intake should be considered when making recommendations for supplementation. The nerve-muscle role of Calcium is partnered with Magnesium so Magnesium is usually supplemented along with Calcium. Up to 1500. mg per day can usually be tolerated. People with hyperparathyroidism, kidney disease, irregular heartbeat, or cancer should not take Calcium by itself. Calcium is also not recommended for people with chronic constipation, colitis, inflammatory bowel conditions, or diarrhoea. If taken with high levels of Calcium supplements, Vitamin A can stimulate bone loss. Potassium supplements should not be taken at the same time as Calcium as irregular heartbeat can occur. Calcium interferes with the absorption of antibiotics (eg tetracycline). Vitamin E supplementation is often combined with Calcium, particularly if muscle cramps are observed. Regular exercise (particularly compression) assists in the deposition of Calcium. Supplementation should be balanced with the following nutrients: Vitamins A, D, E, B12, C, Folic Acid, Magnesium, Phosphorus,

Copper, Sodium, Potassium, and Manganese. Lactobacillus and digestive enzymes assist absorption. Protein deficiency lowers absorption but excess protein (>95 gm) inhibits absorption (perhaps due to the increase of Phosphorus). People not getting at least 800 milligrams of calcium a day--ideally, 1,500 milligrams for women in a multimineral pill--may want to consider taking extra calcium in the form of calcium lactate. This form consists of calcium bound to lactic acid, thus creating an organic form of calcium from an inorganic mineral. Calcium from natural sources, such as oyster shell and dolomite, is not likely to be as potent. Several studies indicate some calcium supplements may contain substantial amounts of lead. Lead is a toxic metal that primarily affects the brain, kidney, and red blood cell manufacture. In 1981, the FDA cautioned the public to limit its intake of calcium supplements derived from dolomite or bone meal because of the potentially high lead levels in these calcium supplements. However, recent studies show that other calcium sources, such as bone meal, carbonate and various chelates, may also contain high amounts of lead. Avoid natural oyster shell calcium, dolomite, and bone meal products unless the manufacturer provides reasonable assurance that lead levels are negligible. Although refined calcium carbonate has the lower lead content, the body absorbs calcium chelates more efficiently. The absorption of calcium depends somewhat on the calcium becoming ionized in the intestines. Calcium ionization is a major problem with calcium carbonate, the most widely used calcium supplement. In order for calcium carbonate to be absorbed it must first be solubilized and ionized by stomach acid.
Some researchers express concern that increased calcium supplementation may result in increased calcium oxalate kidney stones. Calcium citrate appears to bypass this justifiable concern. Although urinary calcium rises in patients consuming calcium citrate, some of citrate's effects inhibit the formation of kidney stones. Specifically, citrate can reduce urinary saturation of calcium oxalate and calcium phosphate and retard the nucleation and crystal growth of calcium salts. Taken with vitamin C, calcium is said to help cure colds by increasing the absorption of the vitamin C. Calcium interferes with the absorption of antibiotics such as tetracycline and ciprofloxacin as well as iron and zinc. Antibiotics may decrease calcium absorption. Calcium may enhance digitalis toxicity.

RDA's Foods and Other Info: RDA's vary (800 - 1500 mg) depending on sex and age. Milk, yogurt, eggs, bread, wheat germ, soy, potatoes, apples, dates, sardines, halibut, beans, broccoli, cheese, cashews and almonds are good dietary sources. The highest levels among diary sources of calcium is dairy products. Most fruits and vegetables are poor sources but tofu, kale, spinach, turnip greens, and other green leafy vegetables contain Calcium. Calcium from spinach is poorly absorbed, but kale is an excellent source of absorbable calcium. In fact, the rate of calcium absorption from kale is superior to that of milk. Since ounce for ounce kale is higher in calcium that milk, it is a good alternative. Other members of the cabbage family (turnip, collard, and mustard) are as beneficial as kale. A compound called oxalic acid, present in high concentration in spinach, beet greens and rhubarb, combines with the calcium present and makes it unavailable for absorption from the food. The outer husks of cereal seeds and some vegetables contain a substance called phytic acid, which also inhibits calcium absorption by rendering it insoluble. However, recent research indicates that neither oxalic acid nor phytic acid has great importance in preventing calcium absorption assuming that calcium intake is high enough. Constant use of laxatives speeds the movement of food through the gut with consequent lower absorption of calcium.

MAGNESIUM (Mg)

Magnesium is in normal range.

SULPHUR (S)

Sulphur is in normal range.

SILICON (Si)

Si High: Silicon is generally regarded as nontoxic. High levels are rarely due to dietary intake but may result from excessive supplementation. Action should not be taken unless levels are very much higher than normal. High concentrations of silicon may cause impaired kidney function. Too much silicon--above 50 milligrams a day--may contribute to Alzheimer's disease. In fact, along with aluminium and iron, traces of it have been found in the brains of those afflicted with this disease.

Relevance of Hair Levels: There is inadequate data to establish the relationship between hair levels of Silicon and nutritional status. Despite this lack of published scientific data there is a common opinion among clinicians who measure hair silicon that those patients with higher hair silicon are more resistant to injury and generally exhibit better health for their age than patients with lower hair silicon. The evidence is anecdotal and of unproven scientific significance. High levels in hair may reflect elemination from the body which manifests itself as dry skin and hair.

Biochemical Roles: Silicon is an essential trace mineral (1972). It plays a role in bone and teeth calcification as

well as formation of elastin and collagen (it strengthens bones, arteries tendons, stomach lining, hair and skin). It is also found in cornea and sclera (white of the eye) but this role has not been adequately researched. Other tissues, such as liver, kidney and blood, contain very little. Silicon may help heal arteriosclerosis--the narrowing of veins and capillaries due to plaque--and aid in lessening the damage from osteoporosis. Silicon can form long complex molecules in the same manner as carbon. However, chemical bonds involving silicon atoms are stronger than bonds involving carbon atoms. As a result, silicon-containing molecules are relatively stable and structurally strong. There is evidence that some complex molecules in plants and animals are either linked together by silicon or have silicon substituting for one of the carbon atoms at regular intervals or at least inserted periodically in the complex molecules. It may be that silicon is used to provide strength or "architectural" rigidity wherever certain structural molecules are used extensively, such as in bone and organ tissue. Until recently, biologists believed that silicon was not essential to any other animals. Since several components of collagen (structural polysaccharides such as chondroitin sulfate and hyaluronic acid) contain 300 to 550 parts per million of bound silicon, this silicon may be cross-linking these molecules, increasing their size and stability.
The silicon content of arteries declines by more than half over the first forty years of age or in arteriosclerosis, even though the chondroitin sulfate content does not. Several studies have shown that wherever arteriosclerotic plaque is found in human arteries, there is a considerable decrease in silicon in that artery in comparison to arteries without plaque. One study of persons over sixty years of age determined the difference. There was fourteen times as much silicon in disease-free arteries as in arteriosclerotic arteries. There was also significant difference in the amount of silicon in the blood. Heart disease deaths are lowest in the regions of England and Finland where silicon concentrations in drinking water are highest.

Possible Causes: Most often high silicon levels are due to exogenous sources (dust, sand, shampoo, etc) ie contamination of the hair. In rare cases excessive supplementation may cause high Silicon levels. It is extremely rare for excessive levels to be associated with dietary intake.

Signs & Symptoms: Two major types of renal toxicity are observed: obstructive (urolithiasis) and toxic (nephropathy). The formation of silica urolithiasis is augmented by increased urinary protein, electrolytes, pH, possible elevated urinary phosphate and lowered electrolytes. Increased levels of Silicon have been found in the brains of people with Alzheimer's disease.

Supplementation: High levels of Molybdenum, and Magnesium inhibit Silicon absorption.

RDA's Foods and Other Info: There is no RDA but optimal intake has been suggested to be 20. - 50. mg. Dietary sources include cabbage, milk, whole grains (oatmeal, brown rice), beets, alfalfa, the herb horsetail (Equisetaceae), peppers, soybeans, turnips, raisins, green beans, brown rice, soy meal, pectin (from citrus fruit), kelp, onion, lettuce, curry powder and hard water. The silicon content of plant fibres is not related to their cellulose content, and in fact, cellulose contains very little silicon. Starch and glycogen also contain practically no silicon, and refined flour and soybean products are also low in this element. Bran is not a reliable source of silicon and "high fibre" bread made with cellulose contains practically none Meat, fish and dairy products are poor sources. Boron, calcium, magnesium, manganese, and potassium aid in the efficient utilization of silicon. The estimated average human daily intake of silicon from food is approximately 21 to 46 milligrams

BORON (B)

B Low: Boron is relatively non-toxic. It's biochemical roles are still largely unknown. Most people are not deficient in boron. However, middle aged and older people usually benefit from taking a supplement because they have greater problems with calcium absorption. Boron deficiency accentuates vitamin D deficiency. Boron helps to prevent postmenopausal osteoporosis and build muscle. A study conducted by the U.S. Department of Agriculture indicated that within eight days of supplementing their daily diet with 3 milligrams of boron, a test group of postmenopausal women lost 40 percent less calcium, one-third less magnesium, and slightly less phosphorus through their urine than they had before beginning boron supplementation. Action is not warranted based on the observation of low Boron levels alone.

Relevance of Hair Levels: Boron is commonly found in hair. However, correlation with nutritional status has not been established.

Biochemical Roles: Boron is found in bones and other structural components and may play a major role in maintaining bone density and preventing osteoporosis. It has been shown to affect bone and teeth density and equilibrium. It may activate vitamin D which increases Calcium (and probably Magnesium) absorption from intestines and reduces excretion via kidneys. It may also help to maintain testosterone and estrogen levels and enhance the development of muscle mass during progressive resistance exercise. It was established as essential in 1990. Boron appears to reduce body calcium loss by increasing the beneficial effects of estrogen on bone health thus

is useful in the prevention and treatment of osteoporosis and arthritis. It may also play a role in joint health. Boron supplementation has been used in the he treatment of osteoarthritis in Germany since the mid 1970s. Boron also seems to play a role in the body's ability to generate energy, especially during exercise and may activate certain hormones. In postmenopausal women, adequate boron raised blood levels of both estrogen and testosterone. It also might help in converting vitamin D to its active form. Bodybuilders who have used boron to increase testosterone levels have been disappointed. Large amounts of this mineral does not seem to affect hormone levels in people who are already getting adequate levels. It has been reported to enhance brain function, promote alertness, and play a role in how the body utilizes energy from fats and sugars. It was established as essential in 1990.

Possible Causes: Insufficient dietary intake or malabsorption.

Signs & Symptoms: Boron deficiency may be associated with an increased risk for postmenopausal bone loss. Boron deprivation in postmenopausal women lead to increased urinary excretion of calcium and magnesium and depressed serum concentrations of estrogen and testosterone.

Supplementation: The B vitamins, particularly riboflavin, may regulate Boron levels. Supplementation has been observed to reduce excretion of Calcium and Magnesium in postmenopausal women (Environ. Hlth. Persp. 102, Sup. 7: pp 59-63, 1994). There are several forms of boron on the marketplace. For general health and osteoporosis, sodium borate or boron chelates are suitable. For the treatment of arthritis, look for boron as sodium tetraborate decahydrate. In order to guarantee adequate boron levels, supplementing the diet with a daily dose of 3 to 9 milligrams of boron is indicated, especially in individuals at risk for osteoporosis.

RDA's Foods and Other Info: RDA's range between 1.5 and 3. mg / day depending on age and sex. Some diets contain as much as 20 mg per day. Dietary sources include apples, carrots, grapes, pears, avocado, banana, carrot, soy meal, wine, seafood, dark green leafy vegetables, nuts whole grains and legumes. However, the level of boron in these foods depends on adequate levels of boron in the soil. It is estimated that the average boron intake is somewhere between 1.7 and 7 milligrams per day. Because the minimum amount required by humans to maintain health has not been determined, no one knows whether these amounts are optimal. Research suggests that they are not. Interestingly, a diet rich in fruits and vegetables offers significant protection against osteoporosis and osteoarthritis--two conditions in which boron appears to offer benefit. Typically, the standard diet is severely deficient in these boron-rich food.

PHOSPHORUS (P)

Phosphorus is in normal range.

STRONTIUM (Sr)

Strontium is in normal range.

Mainly Electrolyte

These elements participate in many hormone actions and assist in maintaining equilibrium and homeostatis.

POTASSIUM (K)

Potassium is in normal range.

SODIUM (Na)

Sodium is in normal range.

ENDOCRINE EVALUATION

Electrolyte levels suggest hypo adrenal and normal thyroid function. Symptom analysis and other tests should be used to confirm this finding.

Electrolyte imbalance suggests stress (inflammatory/exhaustion) and/or kidney difficulties. Symptom analysis and other tests should be used to confirn

Mainly CoFactor

These elements participate in thousands of biochemical / metabolic reactions.

ZINC (Zn)

Zinc is in normal range.

COPPER (Cu)

Copper is in normal range.

IRON (Fe)

Iron is in normal range.

SELENIUM (Se)

Se Low: Selenium Dietary deficiency is quite common. Large areas of north America are deficient in soil selenium levels. This is true especially for the east and west coasts including large parts of Ontario. Soil deficiency usually translates into human deficiency as the water and crops grown in these regions have low concentrations in selenium.

Relevance of Hair Levels: Hair levels of Selenium are indicative of nutritional status. Selenium is an essential element that is normally found at very low concentrations in hair. Anti-dandruff shampoos (Selsun) contain high concentrations of selenium which becomes tightly bound to hair causing an erroneously high reading.

Biochemical Roles: The total-body content of selenium in an average adult is less than a milligram with major portions of that concentrated in the liver, kidney, testicles, spleen and pancreas but selenium is found in all body tissues. The normal blood level of selenium is 21. to 23. micrograms per 100. millilitres, mostly transported via the alpha- and beta-globulins.
The absorption of selenium seems to be efficient (44. - 70. percent), but the mechanism is unknown. Excretion is principally in urine although a small fraction is excreted in the feces, and a trace is lost in the breath. Homeostasis is achieved by the regulation of urinary selenium excretion. Selenium absorption and fecal excretion are not regulated. Selenium is found as selenocysteine (it replaces sulphur) which is found in high concentrations in erythrocytes, platelets, cytoplasm and liver mitochondria. Its main nutritional role is 'protection' and immune system enhancement.

Selenium is an essential component of glutathione peroxidase which protects the body from a vast array of toxins including free radicals and heavy metals, particularly Mercury. Selenium and glutathione peroxidase levels are low in patients with rheumatoid arthritis, eczema, and psoriasis and may be low in most inflammatory conditions. Because free radicals, oxidants, prostaglandin, and leukotrienes cause much of the damage to tissues seen in rheumatoid arthritis, a deficiency of selenium results in even more significant damage because of low levels of glutathione peroxidase. Glutathione peroxidase is especially important in reducing the production of inflammatory prostaglandin and leukotrienes.

Selenium activates Vitamin E in its protection against oxidation-induced cellular damage, including cardiac toxicity of drugs, aging pigment, peroxidation of fats and blood haemolytic problems. It is essential as a cofactor in thyroid hormone action and hypothyroidism may be associated with low Selenium (Nature: 349: pp438-440, 1991) and high Mercury. Many studies have indicated that Selenium plays an important role in protecting against heart disease, cancer, and asthma. There is evidence that a deficiency of Selenium can cause heart disease. Low selenium concentrations have been associated with pancreatic (exocrine) insufficiency and resulting protein malabsorption.

Many studies have shown that the lower the intake of selenium, the higher the incidence of cancer of the colon, breast, pancreas, ovary, bladder, prostate, rectum, skin, and lungs. In a recent study (Environ Health Prev Med, 14,261,2009) Selenium has an inverse correlation with cancer (higher levels of selenium - lower levels of cancer). Other conditions that have been reported to respond to supplementation with selenium include AIDS, allergies, arteriosclerosis, cataracts, macular degeneration, multiple sclerosis, and rheumatoid arthritis.

Selenium also helps maintain normal liver function and protein synthesis; it plays a role in male reproductive capacity (sperm count), and helps maintain healthy eyes, hair, and skin. It is used in solutions or shampoos as selenium sulfide for the treatment of common fungal infections demonstrates it's effectiveness for this application.

Selenium is necessary for the health of the heart and other muscle. It has been reported to improve the function of mitochondria (the energy-producing units of cells) by protecting them from lack of oxygen. This may account for the fact that selenium supplementation has been found to be effective in the treatment of chest pains associated with heart disease (angina pectoris). Selenium is also required for the production of a specific type of hormone-like substance called prostaglandin, which, among other things, helps regulate blood pressure.

Selenium may play a pivotal role in whether some viruses live harmlessly in the body or turn into pathogens that kill. Laboratory studies at the University of North Carolina at Chapel Hill first suggested that selenium is the switch that triggers a Jekyll-and-Hyde personality in viruses. Subsequent studies at the University of Georgia in Athens indicated that selenium depletion in a cell may be what throws a switch on HIV, the virus that causes AIDS. Studies in Africa show that when the diet of HIV positive patients is suplemented full blown AIDS does not develop.

Selenium's ability to enhance immune function was demonstrated in a study where individuals with normal selenium concentrations in their blood received selenium supplementation of 200. micrograms per day. This resulted in a 118. percent increase in the ability of lymphocytes to kill tumour cells and an 82.3 percent increase in the activity of a white blood cells (T-cells). These effects were speculated to have resulted from the ability of selenium to enhance the expression of the immune-enhancing compound interleukin-2. This in turn increased the rate of white blood cell proliferation and differentiation into forms capable of killing tumour cells and microorganisms. The supplementation regimen did not produced significant changes in the blood selenium levels of the participants.
It increases the ratio of HDL to LDL cholesterol and inhibits platelet aggregation, particularly in smokers.
Selenium protects cells against damage from free radicals. Selenium and vitamin E have been shown to work well together to reduce free radical damage.

Possible Causes: Low concentration of selenium is usually due to low intake caused by the regular food chain being low in selenium. Malabsorption and the presence of high levels of toxic metals, particularly Mercury, Lead and Cadmium, can be major factors.
Over-supplementation with vitamin E can also be a factor.

Signs & Symptoms: Deficiency of Selenium has been associated with alpaca (hair loss), muscle weakness, high cholesterol, liver impairment, certain cancers, cardiovascular disease and impaired immune function. Some of the therapeutic uses are: arthritis, hypothyroidism, chronic fatigue, arteriosclerosis prevention, cancer prevention, immunodeficiency, cataract prevention, MS, and heavy metal toxicity. Deficiency symptoms are sometimes hard to detect because vitamin E can substitute for selenium in some of its functions, thus masking some of the classic deficiency symptoms may suggest an increased risk of degenerative diseases and increased risk of toxic element accumulation (particularly Arsenic, Mercury, Cadmium, and PCBs).
Severe selenium deficiency is associated with Keshan disease, a severe heart disorder that affects primarily children and women of childbearing age. Keshan disease appears in some areas of China where selenium levels are very low. Kashin-Beck disease is an arthritic condition that is also linked to low selenium levels in China. In extreme cases, Selenium deficiency can cause other heart disturbances and muscle weakness.

Supplementation: The window of safe levels of selenium is narrow, and therefore supplementation should be approached cautiously. The

daily intake should not exceed 150 micrograms and high levels of supplementation should not be sustained for long periods: 50. ug (micrograms) per day is generally accepted as safe. NB! supplementing at higher levels than 200. ugs may be TOXIC. Supplementation should be balanced with the following nutrients: Vitamins A, B1, B3, B6, B12, D, E, C, Copper, Iron, Manganese, Calcium, Sodium and Potassium. Vitamin E levels should be correlated with Selenium levels. Vitamin C increases uptake.

Selenium is available in several different forms. Studies show inorganic salts like sodium selenite are less effectively absorbed and not as biologically active as organic forms of selenium, such as selenomethionine and selenium-rich yeast. Therefore, the preferred form of selenium supplement is either selenomethionine or high-selenium-content yeast. L-selenomethionine is the major form in food.

Selenium supplementation should be considered as part of any post-heart attack or stroke plan. In one double-blind study, 81 heart attack patients were randomly assigned to receive 100 micrograms of selenium (from selenium-rich yeast) or a placebo. After 6 months, there were 4 fatal and 2 nonfatal heart attacks in the placebo group compared to no deaths and 1 nonfatal heart attack in the selenium group.Clinical studies have not yet clearly demonstrated that selenium supplementation alone improves the signs and symptoms of rheumatoid arthritis; however, one clinical study indicates that selenium combined with Vitamin E does provide significant benefit.

Some nutritionists say that a natural form of selenium, called L-selenomethionine or selenium-rich yeast, is superior to synthetic form. This has not been proven.
Typical dosage is 50. ug (micrograms) daily. Higher doses are not recommended except for special cases and while under the direct case of a health care professional.

CAUTION: At high-intake levels selenium can produce toxicity. Although Selenium is an essential element at low concentrations, it is 10 times more toxic than arsenic at high levels.

RDA's Foods and Other Info: RDA is 40. - 70. ug (micrograms) but suggested optimal levels are in the 60. - 200. ug range (food plus supplementation). Requirements increase with age. Dietary sources include foods grown in selenium-rich soil brazil nuts(the highest concentration by far), whole grains, brewers yeast, garlic, sunflower seeds, meat and marine fish. The amount found in grains depends upon the level of the mineral found in the soil in which they were grown. In addition, the selenium content of animal products varies with the selenium content of the diet fed the animals. Thus the foods vary markedly from region to region in their selenium content, and food tables are unreliable. The best approach is a varied diet. Most fruits and vegetables are low in Selenium.

CHROMIUM (Cr)

Chromium is in normal range.

MANGANESE (Mn)

Mn Low: Low levels are usually due to insufficient intake or malabsorption. Many people consume insufficient quantities of Manganese.

Relevance of Hair Levels: Hair is a good indicator for Manganese status. Clinicians who have used hair analysis over a period of many years have noticed that manganese concentrations in hair increases slowly as patients correct their diets to eliminate processed foods and as manganese-containing supplements are employed.

Biochemical Roles: Adults normally contain an average 10 to 20 mg (most of which is in the bone, liver, and kidney) of manganese in their bodies. It is an essential element and is involved with energy production (cofactor for mitochondrial superoxide dismutase (SOD) and pyruvate carboxylase), and is required for proper formation of bone, skin, nerves, cartilage and connective tissue.

The manganese containing superoxide dismutase is an enzyme that protects the fragile mitochondrial membrane from undesirable attack by a very reactive form of oxygen called the superoxide radical (Zinc and copper are the trace elements present in another type of superoxide dismutase). It plays an important role in lipid metabolism and the production of cholesterol, assists in blood clotting and in the synthesis of protein. Manganese is known to help heal inflammatory diseases, osteoporosis, sprains, and strains. It promotes fertility and lessens chances of sterility.

Manganese is a co-factor necessary for the activation of many different enzyme systems including glycosyltransferase enzymes which play an important role in the production of cartilage and bone. A manganese deficiency results in abnormal bone and cartilage and disc degeneration due to inadequate cartilage formation in the disc.Manganese is also involved in the building and degrading of proteins and nucleic acid, biogenic amine metabolism and is necessary for RNA chain initiation.

Manganese is required (as is Chromium) for proper glucose tolerance (energy production from blood sugar). The role of manganese in glucose tolerance is not well defined, but it is believed to be due to its involvement with enzymes such as glycosyltransferase and pyruvate coroxylase. Another possible mechanism is that manganese deficiency produces defective cells in the pancreas and a smaller number of pancreas islet cells which contain fewer beta cells that manufacture insulin. The abnormalities in the pancreatic secretion of insulin caused by manganese deficiency could contribute to at least one type of diabetes.

Manganese is absorbed slowly and poorly throughout the length of the small intestine. Most absorbed manganese is rapidly removed from circulation by the liver although a small amount becomes bound to a transporter thought to be transferrin or "transmanganin" and passed into systemic circulation. The amount of manganese absorbed may not increase appreciably with dietary increases above that needed for normal nourishment, and the circulating manganese concentration varies little with changes in dietary manganese concentration.
Most of the manganese removed by the liver is excreted into the bile. Significant amounts are reabsorbed. If bile flow is overloaded or blocked, then the body regulates tissue manganese levels by excretion via pancreatic juice or the intestinal walls. Thus the tissue levels of manganese are regulated at the excretory level rather than at the site of absorption. This system minimizes the possibility of manganese toxicity from dietary sources but allows for deficiency, because excretion can continue even when Manganese body stores are inadequate.
Manganese deficiency has also been noted in rheumatoid arthritis and cancer. Most cancer cells are very low in or devoid of manganese-containing superoxide dismutase.

Manganese is a very specific calcium antagonist at an intracellular level, by its action on smooth muscle and elsewhere. Dietary manganese deficiencies or manganese malabsorption can enhance the toxic effects of soft tissue calcium.

Manganese makes up a part of molecules known as mucopolysaccharides. These molecules are used to form collagen, the strong, fibrous connective material that builds tissues throughout the body, including bone and cartilage, the rubbery cushioning (synovial /lubricating) fluid of the joints. Manganese is essential for people with iron-deficiency anaemia and is needed for the utilization of vitamin B1 (thiamine) and vitamin E. Manganese works well with the B-complex vitamins to give an overall feeling of well-being. It aids in the formation of mother's milk and is a key element in the production of enzymes needed to oxidize fats and to metabolize purines.

Possible Causes: The most likely cause is insufficient dietary Manganese. In addition, phosphates interfere with uptake and intestinal malabsorption is common.
Lack of sufficient stomach HCl can be a cause of low assimilation, particularly in middle aged or older people.

Signs & Symptoms: Deficiency is associated with fatigue, decreased endurance, dermatitis, heightened allergic reactions and inflammation. Other signs of manganese deficiency include impaired glucose intolerance, birth defects, growth retardation, reduced fertility, reduced brain function and inner-ear imbalance. Severe manganese deficiency produces convulsions, skipped heartbeats, weight loss, dermatitis and hair colour loss. Other conditions which have been associated with severe deficiencies are arteriosclerosis, confusion, convulsions, eye problems, hearing problems, heart disorders, high cholesterol levels, hypertension, irritability and memory loss, muscle contractions, pancreatic damage, profuse perspiration, rapid pulse, tooth-grinding, tremors, and a tendency toward breast ailments.

Manganese deficiency may cause skeletal abnormalities, slow bone healing, backaches due to disc problems, and sore knees due to cartilage damage. A deficiency (along with Copper) has been implicated in schizophrenia and other brain disorders.

Manganese deficiency lowers the threshold that causes seizures, and some epileptic patients are found to have low manganese levels. Membrane instability due to manganese deficiency could account for the lowered seizure threshold, but this has not been adequately tested. Manganese deficiency produces reduced levels of the neurotransmitter dopamine, and it is possible that manganese is related to other mental processes. Phenothiazine tranquilizers deplete body stores of manganese. Manganese appears to be of value in treating tardive dyskinesia.
In several human studies where subjects were fed a manganese-deficient diet, numerous metabolic abnormalities developed, including the appearance of a skin rash, loss of hair colour, bone remodelling, reduced growth of hair and nails, and reduced HDL cholesterol. People with osteoporosis usually have low blood levels of manganese and can benefit from supplementation, as can people with backache, diabetes, rheumatoid arthritis, or those who have damaged their ligaments or tendons. Low levels of manganese have also been linked with ear infections.

Supplementation: Supplementation should be balanced with the following nutrients: Vitamins A, B1, B3, B6, E, Magnesium, Zinc, Iron, Phosphorus and Potassium. Due to the poor absorption and rapid excretion of manganese, the relative absorption of a specific form of Manganese may be an important factor in low-manganese diets. People with cirrhosis should avoid manganese supplements because they may not be able to properly excrete this mineral. Manganese works with Copper and Zinc to activate SOD. Both Calcium and Iron reduce the amount of manganese the body can absorb. Some multivitamin/mineral supplements contain manganese. If you decide to take a supplement that includes this mineral, look for one that offers no more than two milligrams of manganese chloride, a very absorbable form. Single supplements of manganese are not available, nor are they desirable, since taking too much of this trace mineral can be toxic. Calcium supplements interfere with body's ability to absorb manganese. In one study, a dose of 800 milligrams of calcium inhibited the absorption of manganese. It is suggested that calcium be taken separately from food or multivitamin/mineral supplement containing manganese.

RDA's Foods and Other Info: RDA is 3. - 10. mg. Manganese absorption is dependent largely on the concentration of manganese already in the body. Manganese absorption is also decreased by dietary calcium, zinc, phosphorus, soy protein, iron and cobalt whereas lecithin, choline and alcohol increase intestinal and liver uptake of manganese. Therefore, diets that may appear to meet the needs for manganese may not in fact do so due to the influence of other nutrients. Most fruits and vegetables (except pineapple and raspberries) are poor sources. Around the turn of the century, North Americans were getting about 8. milligrams a day from a diet based on whole grains, nuts and seeds. Nowadays, people average 2. - 3. milligrams.
The best food sources of manganese are black tea, nuts, whole wheat flour, peas, and brown rice. Canned pineapple juice is one of the best sources, with about three milligrams of manganese per cup. Manganese can also be found in legumes, rice bran, whole grain cereals, and ginger. Meats, dairy products, poultry, and seafood are considered poor sources of manganese. The amount of manganese in each food varies with that amount of manganese available in the soil. Depleted soils and food processing rob manganese from our diet, just as is the case with many other minerals. Milling removes manganese from whole grains. White flour contains less than one-tenth the manganese of whole wheat. Cornflakes contain one-tenth the manganese of whole corn, and rice cereals one-half the manganese of whole rice.
Dietary surveys have found the Japanese receive 6. to 10. mg manganese daily, Indians 6. to 12. mg and New Zealanders 1. to 7. mg. One survey found North American diets containing 2. to 9. mg manganese per day, however others have shown adult men receiving only 3.3 to 5.5 mg daily and college students, hospital patients and youngsters receiving less than 2. mg daily.
Diets high in refined cereals, white bread, sugar and milk may easily contain less than 2. mg of manganese daily, if few green leafy vegetables are also eaten. If whole grain cereals and whole grain bread are included, the same diet could contain 9. mg manganese per day.

NICKEL (Ni)

Nickel is in normal range.

VANADIUM (V)

V Low: Vanadium was declared an essential nutrient in 1971 but its role in human nutrition has not been firmly established. It has been suggested that a deficiency may increase one's susceptibility to cancer and heart disease.

Relevance of Hair Levels: Hair is an approximate indicator. Vanadium is usually found at very low concentrations in hair. The significance of lower than normal hair values has not been established. The vanadium content in hair correlates with tissue vanadium content in toxic states. Vanadium disappears from the blood and is involved in skeletal tissue mineralization. Radioactive vanadium, used as a tracer, disappears from

blood after twenty days.

Biochemical Roles: The total amount of vanadium in the average adult's body may be in the range of 17. to 43. milligrams. Vanadium is essential for growth and is involved in fat metabolism. A vanadium deficiency results in increased blood cholesterol and triglycerides levels. A reduction of blood and tissue cholesterol may be possible in some people by establishing normal Vanadium and Chromium levels. The altered levels of blood and tissue cholesterol have been related to Vanadium inhibition of the microsomal enzyme system known as squalene synthetase, and to the vanadium stimulation of the enzyme, acetoacetyl-CoA deacylase in liver mitochondria. This enzyme is important to the conversion of fat into coenzyme A.
Vanadium may play a role in thyroid function and may affect glucose metabolism by exerting an insulin-like (lowers blood levels of glucose) effect. It facilitates glycogen formation and may inhibit the formation and deposition of cholesterol in blood vessels and the liver Vanadium may have anti-diabetic and weight-reducing functions. Vanadium deficiency may retard bone and tooth formation. There is abnormal bone growth in vanadium deficiency, and when radioactive Vanadium is used to race the travel of vanadium in the bodies of laboratory animals, the highest uptake of vanadium is found to be in tooth dentine and bone. The zones of mineralization show the greatest vanadium uptake. It may play a role in osteoblast / osteoclast chemistry.
It is also believed that vanadium functions as an oxidation-reduction catalyst.

Possible Causes: Low intake & malabsorption are both common. Tobacco and alcohol use decreases the uptake of vanadium.

Signs & Symptoms: The effects of chronic Vanadium deficiency has not yet been established. Although vanadium may function in hormone, cholesterol, and blood sugar metabolism, no specific deficiency signs or symptoms in humans have been reported. Some researchers speculate that a vanadium deficiency may contribute to elevated cholesterol levels and faulty blood sugar control manifesting as either diabetes, hypoglycemia, chronic fatigue or fibromyalgia. It has also been speculated that Vanadium deficiencies may be involved in some manner with bone pathologies.

Supplementation: Supplementation should not exceed 80 ug (micrograms) per day. Levels higher than 250. ugs (micrograms) may be toxic.

RDA's Foods and Other Info: RDA has not been established. The human requirement for vanadium is not known, and dietary intake data are meagre. Typical intakes range widely from less than 2. micrograms to over 1. milligram. Foods contain very low concentrations of Vanadium. Foods that contain some Vanadium are: black pepper, dill, parsley, mushrooms, whole grains, corn, oats, tomatoes, parsley, carrots, olive oil, sunflower seeds, apples, beets, shellfish, nuts, fibre rich foods and vegetable oils. Vanadium is not easily absorbed. Athletes and people who expend large amounts of energy may require more of this trace mineral than sedentary people.
Diets consisting exclusively of milk, meat and certain vegetables could contain less than one-tenth milligram. The Vanadium content of food varies over a very wide range depending on the vanadium content of the soil.

MOLYBDENUM (Mo)

Mo Low: The concentration of Molybdenum in the body is quite low and is sometimes at the limit of analytical delectability.

Relevance of Hair Levels: Hair is an approximate indicator of Molybdenum status. The clinical significance of low hair concentrations of molybdenum are unknown at this time.

Biochemical Roles: The complete role of Molybdenum in the body is not well documented and research is required. Molybdenum is an essential trace mineral for man and other mammals. The average adult has about 9. milligrams of molybdenum concentrated mostly in the liver, kidney, adrenal gland, bones and skin. It is a key component of three important enzymes in our bodies: xanthene oxidase, aldehyde oxidase and sulfite oxidase. These enzymes are involved with fat oxidation and purine metabolism. Other roles of Molybdenum are not well documented, but research has shown that it is present in a number of giant proteins that function as enzymes involved in carbohydrate, fat, and protein metabolism. It is thought to have a detoxifying effect in the body and it is possible that it can help mitigate the harmful effects of alcohol and environmental pollutants.

Molybdenum also shows promise in helping treat asthma and preventing the formation of carcinogenic nitrosamines. Molybdenum deficiencies have been associated with sexual impotency, tooth decay and cancer of oesophagus. Some crops can be low in molybdenum. Crops in the transeki region of South Africa have become molybdenum deficient, and cancer of the oesophagus there is increasing rapidly. In the United States, areas deficient in molybdenum have high rates of cancer of the oesophagus. However, it has been found recently in China that where there is low molybdenum in the soil, there is a high nitrogen content which leads to the formation of nitrosamines in the soil, which in turn affects the plants. This seems to be the factor influencing the cancer rate rather than the direct influence of the molybdenum itself.

There is a suggestion that a molybdenum deficiency may be a factor in some cases of gouty arthritis.

Molybdenum's unique functions appear to be related to its ability to catalyze chemical reactions that require the simultaneous exchange of two electrons and two protons. Enzymes containing molybdenum give up two electrons at one end of the molecule, changing the attraction for other atoms, and causing protons to be given up at the other end. Thus, molybdenum containing molecules act much like a battery with chemical reduction (gain of electrons) taking place at the "anode" end of the molecule, and oxidation at the "cathode" end.

Possible Causes: Low levels may be caused by low intake, or poor absorption / assimilation. High levels of Copper can cause low levels of Molybdenum because they compete for common enzyme systems.

Signs & Symptoms: Molybdenum activates a variety of enzymes and a deficiency can include sensitivity to sulphur rich proteins and it may play a role in the development of arthritic conditions. Increasing Molybdenum levels has been helpful in the treatment of asthma and environmental sensitivities. Molybdenum deficiency has appeared in subjects receiving total pretrial (intravenous) nutrition. It manifests as an inability to detoxify sulfites because the enzyme that detoxifies sulfites (sulfite oxidase) is molybdenum dependent. Molybdenum supplementation has been reported to eliminate symptoms of sulfite toxicity such as increased heart rate, shortness of breath, headache, disorientation, nausea,

and vomiting. A low intake of molybdenum is associated with mouth and gum disorders and cancer and may cause impotence in older men.

Supplementation: Molybdenum is available commercially as sodium molybdate. Another form, etrathiomolybdate, is used in the treatment of Wilson's disease. Molybdenum is almost completely absorbed from the intestinal tract and absorption studies show a high rate of absorption (88. to 93. percent) at dietary intakes between 22. and 1,5000. micrograms per day. Molybdenum is conserved at low intakes, and excess molybdenum is rapidly excreted in the urine. There is probably no advantage of one form of molybdenum over another. The most often recommended dosage range for molybdenum supplementation is 200. micrograms to 500. micrograms daily (usually for short periods). High doses over longer periods may lead to the development of gout. Higher dosages, under the advice of a health care professional, may be required in some cases (eg the adjunctive therapy of Wilson's disease). A high intake of sulphur may decrease molybdenum levels. Excess amounts of molybdenum (over 15 milligrams daily) may interfere with copper metabolism. High copper intakes increase molybdenum excretion and conversely high levels of Molybdenum can cause depletion of Copper. Caution is needed when supplementing people with gout or high blood levels of uric acid.

RDA's Foods and Other Info: The RDA range for molybdenum is 150. to 500. micrograms daily for adults. The average diet contains between 50. and 500. micrograms of molybdenum per day. Foods high in molybdenum include legumes, barley green, strawberries, peas, green beans, carrots, potatoes, spinach, sunflower seeds, squash, whole grains, beans, organ meats and certain nuts. Molybdenum can also be found in sunflower seeds, buckwheat and lima beans. Soil depletion often restricts plant growth and concentration of Molybdenum, especially crops depending on nitrogen fixing bacteria, such as peas and beans. Molybdenum deficiencies are becoming a concern to nutritionists because of modern diets that consist largely of refined foods. People whose diets are high in refined and processed foods are at risk for deficiency.

COBALT (Co)

Co Low: Cobalt is found in the body as part of Vitamin B12.

Relevance of Hair Levels: The significance of low Cobalt levels in hair has not yet been established.

Biochemical Roles: Vitamin B12 (cobalamin) is the only known biological role of Cobalt. Cobalamin (B12) is required for all cells and is particularly important in bone marrow, nervous system, and GI tract. It interacts with iodine to promote normal thyroid function. It is found mainly in the liver where it activates many enzymes. It is excreted in the bile.

Possible Causes: Insufficient intake and/or malabsorption.

Signs & Symptoms: Deficiency or inability to absorb B12 causes pernicious anaemia which exhibits as fatigue and permanent nerve damage.

Supplementation: The conversion of inorganic Cobalt to vitamin B12 does not occur and supplementation of Cobalt intake with other than this vitamin is not recommended as many forms of soluble Cobalt are toxic. Vegans are particularly prone to B12 deficiency.

RDA's Foods and Other Info: RDA is 1 ug (microgram) as B12. The main source of vitamin B12 is red meats, cheese, brewers yeast, and vitamin B12 supplementation (which is difficult to absorb and requires healthy levels of stomach acid).
No estimated Safe and Adequate Daily Intake has been set for cobalt. You must get the amount you need from preformed vitamin B12 (not elemental Cobalt).

Significant Ratios

These ratios and the patterns that they and the individual elements (above) form can be indicative of biochemical and metabolic imbalances.

Calcium/Magnesium (Ca/Mg)

Ca/Mg: A ratio seen as relating to carbohydrate intolerance(ideal ratio is about (6.5/1). Calcium is required to release insulin while magnesium inhibits it. High Calcium-to-Magnesium ratio could be due to excessive calcium intake along with vitamin D excess or magnesium deficiency. Could indicate Osterporosis, periodontal problems, or hyperparathyroid function. Excessive phosphorus in the diet is a contributing factor. Needs grains and vegetables, possible Magnesium supplements, and avoid soft drinks and processed food. High ratios (over 12) may indicate a tendency for calcium precipitation in tissue - bone spurs, arthritis, arterial calcification, kidney -gall stones.

Calcium/Phosphorus (Ca/P)

Calcium / Phosphorus (Ca/P) ratio is in normal range.

Calcium/Potassium (Ca/K)

Calcium / Potassium (Ca/K) ratio is in normal range.

Calcium/Sodium (Ca/Na)

Calcium / Sodium (Ca/Na) ratio is in normal range.

Calcium/Iron (Ca/Fe)

Calcium / Iron (Ca/Fe) ratio is in normal range.

Sodium/Potassium (Na/K)

Na/K Low: Very important ratio. refered to as the Life-Ratio. Low Sodium / Potassium ratio, the patient should be checked for 1) kidney dysfunction, 2) low salt diet, 3) high potassium diet, 4) diuretic use, 5) hypotension. Reduction of the ratio may indicate hypoadrenal function with increase susceptibility to infection, allergies, cold hands and feet, sensitivity to loud noises and potential glucose intolerance (Diabetic trend when below 1). This is a good indication of long term stress..exhausted adrenal. The Sodium / Potassium ratio is intimately linked to the adrenal gland function, and the balance between aldosterone and cortisone secretion. On the emotional side a low ratio often expresses frustration, resentment, reduced awareness. Low ratio may also be an indicator of unavailable copper that will affect the sodium levels. Ratios below 1 are serious with tendency towards heart attack, cancer, arthritis, diabetes, stroke and other serious health and emotional conditions.

Sodium/Magnesium (Na/Mg)

Na/Mg High : The ratio reflects adrenal function. An ideal ratio is about 4/1. A High Sodium / Magnesium ratio may indicate an overactive adrenal gland : high energy levels. It may also be caused by elevated Sodium levels. Sodium levels may be elevated by elevated cadmium, copper, mercury, iron or nickel. Individuals under acute stress have elevated Sodium levels in the hair. Reduced Magnesium levels in association with high Sodium generating an elevated ratio is often seen with A type personalities. Overactive adrenal function will produce the following symptoms - tendency to inflammatory reactions, increased stamina / drive, agressiveness, impulsiveness, hypertension, and diabeties.

Zinc/Copper (Zn/Cu)

Zinc / Copper (Zn/Cu) ratio is in normal range.

Iron/Copper (Fe/Cu)

Iron / Copper (Fe/Cu) ratio is in normal range.

Toxic Ratios

Calcium / Lead (Ca/Pb)

Calcium / Lead (Ca/Pb) ratio is in normal range.

Iron / Lead (Fe/Pb)

Iron / Lead (Fe/Pb) ratio is in normal range.

Iron / Mercury (Fe/Hg)

Selenium / Mercury (Se/Hg)

Zinc / Mercury (Zn/Hg)

Zinc / Mercury (Zn/Hg) ratio is in normal range.

Zinc / Cadmium (Zn/Cd)

Zinc / Cadmium (Zn/Cd) ratio is in normal range.

Other Potentially Toxic Elements

These elements can be toxic in certain circumstances. High levels in the hair can indicate industrial or environmental exposure. The biochemistry of these elemets is poorly understood and we are monitoring the literature.

Bismuth (Bi)

Bismuth (Bi) is in normal range.

Thallium (Tl)

Thallium (Tl) is in normal range.

Palladium (Pd)

Palladium (Pd) is in normal range.

Tungsten (W)

Tungsten (W) is in normal range.

Platinum (Pt)

Platinum (Pt) is in normal range.

Uranium (U)

Uranium (U) is in normal range.

Silver (Ag)

Silver (Ag) is in normal range.

Other NonToxic Elements

These elements are generally nontoxic. The role of these elemets is poorly understood and we are monitoring the literature. When significant findings are published we will include them in this report.

Lithium (Li)

Lithium (Li) is in normal range.

Tin (Sn)

Tin (Sn) is in normal range.

Germanium (Ge)

Germanium (Ge) is in normal range.

Zirconium (Zr)

Zirconium (Zr) is in normal range.

Analytical Methodology

Hair mineral analysis has been in use for more than 30 years Hair Tissue Mineral Analysis: An Emergent Diagnostic Technique: Jeffrey Bland, Publ Northwest Diagnostics 1980. Analytical technology and methodology has improved dramatically during this time and when analysis is carried out by a reputable laboratory using appropriate technology, along with effective quality control and assurance systems, the analysis of hair produces accurate and precise results. However, hair analysis methodology has not been internationally standardized. The International Atomic Energy Agency published a procedure for sample preparation IAEA Report, IAEA/RL/50, Vienna, 1978. The earliest attempt at method standardization was published by the Hair Analysis Standardization Board, Cranton, Bland et al,. J. Holistic Medicine, 4, 11 1982.

Our laboratory has carried out an exhaustive development of the hair analysis method. It is based on the well accepted technology of Inductively Coupled Plasma Source Mass Spectroscopy. Calibration of the method has been carried out using at least two internationally recognized standards N.I.S.T. for each element and is validated by analysis of Certified Reference Material CRM. Standardization of the instrumentation is carried out under rigorously controlled conditions. Sources of determinate error have been accounted for and quality control QC procedures are in place for each of these sources of error. Quality assurance QA procedures have been developed to document the quality of the method.

Please Note: This information is for the exclusive use of health care practitioners and is not intended for diagnosis ,prophylasix or treatment. It should be used in conjunction with other information including patient history, symptom assessment and diet / nutritional assessment.

Thank you for choosing our services. We value your business and welcome any suggestions you may have.

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