Micro Trace Minerals Laboratory

environmental & clinical laboratory

Röhrenstrasse 20, 91217 Hersbruck, Germany
P.O.Box 4613; Boulder, CO 80306-4613, USA

MINERAL ANALYSIS — Hair

		Lab Number		1H225001	
Doctor/Clinic	Sample Doctor			Test Date	10.10.2019
Patient Name	Sample Patient	Sex	f	Age	40
Clinical Information	Sample Report big profile (P10)			Page	1/7

	Acceptable Range	Test Value		
Essential Trace Elements (ppm = mg/kg = mcg/g)				
Chromium (Cr)	0,020 --- 0,210	0,050		
Cobalt (Co)	0,010 --- 0,300	0,050		
Copper (Cu)	10,000 --- 41,000	37,220		
Iodine (I)	0,050 --- 5,000	494,090	↑	
Iron (Fe)	4,600 --- 17,700	4,080	↓	
Manganese (Mn)	0,050 --- 0,920	0,330		
Molybdenum (Mo)	0,030 --- 1,100	0,070		
Selenium (Se)	0,400 --- 1,700	0,910		
Vanadium (V)	0,010 --- 0,200	n.n.	↓	
Zinc (Zn)	150,000 --- 272,000	139,610	↓	
Essential Macroelements (ppm = mg/kg = mcg/g)				
Calcium (Ca)	220,000 --- 1.600,000	4.364,750	↑	
Magnesium (Mg)	20,000 --- 130,000	303,480	↑	
Nonessential Trace Elements (ppm = mg/kg = mcg/g)				
Boron (B)	< 0,840	0,910	↑	
Germanium (Ge)	< 1,650	n.n.		
Lithium (Li)	< 0,300	0,010		
Strontium (Sr)	0,650 --- 6,900	12,950	↑	
Tungsten (W)	< 0,010	n.n.		
Potentially Toxic Elements (ppm = mg/kg = mcg/g)				
Aluminum (Al)	< 8,000	2,270		
Antimony (Sb)	< 0,300	0,020		

n.n. = not detected, < x = below Detection Limit
Quality control: Dipl. Ing. Friedle, Accreditation: DIN EN ISO 17025; Validation: Dr. E. Blaurock-Busch PhD

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	Acceptable Range	Test Value		
Potentially Toxic Elements (ppm = mg/kg = mcg/g)				
Arsenic-total (As)	< 0,200	0,030		
Barium (Ba)	< 4,640	4,110		
Beryllium (Be)	< 0,100	n.n.		
Bismuth (Bi)	< 0,200	0,010		
Cadmium (Cd)	< 0,200	0,010		
Cerium (Ce)	< 0,100	n.n.		
Cesium (Cs)	< 0,010	n.n.		
Dysprosium (Dy)	< 0,006	n.n.		
Erbium (Er)	< 0,005	n.n.		
Europium (Eu)	< 0,005	n.n.		
Gadolinium (Gd)	< 0,100	0,810	↑	
Gallium (Ga)	< 0,200	n.n.		
Iridium (Ir)	< 0,006	n.n.		
Lanthanum (La)	< 0,032	n.n.		
Lead (Pb)	< 3,000	1,180		
Lutetium (Lu)	< 0,010	n.n.		
Mercury (Hg)	< 0,600	0,460		
Nickel (Ni)	< 1,000	0,430		
Palladium (Pd)	< 0,100	< 0,050		
Platinum (Pt)	< 0,010	n.n.		
Praseodymium (Pr)	< 0,013	n.n.		
Rhenium (Re)	< 0,005	n.n.		
Rhodium (Rh)	< 0,007	n.n.		

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	Acceptable Range	Test Value	
Potentially Toxic Elements (ppm = mg/kg = mcg/g)			
Ruthenium (Ru)	< 0,100	n.n.	
Samarium (Sm)	< 0,011	n.n.	
Silver (Ag)	< 1,000	0,030	
Tantalum (Ta)	< 0,011	n.n.	
Tellurium (Te)	< 0,010	n.n.	
Thallium (Tl)	< 0,010	n.n.	
Thorium (Th)	< 0,010	n.n.	
Thulium (Tm)	< 0,002	n.n.	
Tin (Sn)	< 0,700	0,060	
Titanium (Ti)	< 1,500	0,170	
Uranium (U)	< 0,100	0,020	
Ytterbium (Yb)	< 0,010	n.n.	
Zirconium (Zr)	< 0,500	< 0,050	

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Your Analysis Determined The Following Mineral Deficiencies And Excesses. Since it is difficult to distinguish treated samples from untreated ones, it is assumed that the spectroanalytical analysis was performed on chemically untreated hair as requested in our laboratory brochure. Chemically treated hair does not provide reliable results and TMI does not assume responsibility for data obtained from treated hair. The information contained in this elemental analysis report is designed as an interpretive adjunct to normally conducted diagnostic procedures. The findings are best viewed in the context of a medical examination and history.

BORON (B):
Excess Boron may inhibit some enzyme function. This element has a low toxicity, but excessive intake of boron compounds can interfere with the calcium and magnesium metabolism, causing boron to be stored in bone. Dental enamel varies widely in content, and its concentration is similar to that of hair and soft tissue. Boron is rapidly absorbed and excreted via the urine. Toxicity symptoms include nausea, vomiting, diarrhea, dermatitis, and lethargy.
THERAPEUTIC CONSIDERATION: Check calcium, magnesium, phosphorus levels. Increase the intake of Vitamin B2 and B6 to reduce or abolish toxic effects of boron.

CALCIUM (Ca):
High tissue levels of chemically untreated hair reflect malabsorption problems and a masked deficiency, which is caused by calcium being drawn from bones and redistributed into other tissues such as hair. Thus, high hair levels reflect bone withdrawal and osteoporotic tendency. Calcium deficiency symptoms such as unhealthy hair, nail and teeth, muscle cramping at night, insomnia, menstrual problems, nervousness and irritability may be present. When such deficiency symptoms are present, moderate calcium supplementation is recommended in combination with a low fat diet and increased activity level. To further support the calcium absorption and to normalize tissue levels, digestive aids and an increased intake of lecithin are recommended.

IRON (Fe):
Iron is essential for the oxygen transport and utilization. Iron is regulated in the body primarily by absorption rather than by excretion. Gastrointestinal function is important in controlling total body iron. Transferrin is the transport protein for iron in blood. The most common sign of deficiency is anemia. Symptoms include pallor and extreme fatigue, dizziness, decreased immune function, shortness of breath and poor appetite. Predisposing factors to iron deficiency may be excessive intake of copper, manganese, zinc, carbonates, oxalates, phosphates, phytates, antibiotics, coffee, or heavy metal exposure. Excessive blood loss or pregnancy can cause iron deficiency. Daily requirements vary depending on sex, age, and physio-logical status. The RDA is 10-18 mg/day.
SOURCES: Liver, other meats and green leafy vegetables.
THERAPEUTIC CONSIDERATION: Check lead, copper and manganese levels. Check transferrin levels. Prior to iron supplementation, increase intake of vitamin C, B-complex and amino acid to aid absorption.

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GADOLINIUM (Gd):
Gadolinium is not radioactive. This contrasting agent GdDTPA has been FDA approved in 1988. It is used in the US, Europe and Japan for magnetic resonance imaging (MRI) in adults and children. Gadolinium-based contrasting agents are thought to rapidly clear from the body via the kidneys but can accumulate in tissues. Darrah et al (2009) confirmed that Gadolinium, introduced in chelated form, incorporates into bone and is retained for longer than 8-years post-exposure. Vassallo et al (2011) found that mercury, lead and gadolinium, even at low doses or concentrations, affect vascular reactivity. During July 2015, the FDA warned that Gd traces were detected in the brain of some patients after receiving four or more MRIs (involving Gd). However, no medical information clearly indicates if side effects or negative health risks involved and the FDA is presently examining risks. In the meantime, German nuclear physicians advise that GD-contrasting agents are used only when unavoidable. Feng et al (2010) offered new insights into the mechanism of Gd-induced neurotoxicity. The results suggest that Gadolinium causes neuron cell apoptosis primarily by inhibiting mitochondrial function and inducing oxidative stress. Gd is also used industrially, in the iron and chromium manufacture and the production of electronic components, magnets and superconductors used for nuclear, microwave and radar technology.
Side Effects: Mild headaches, nausea and local burning or pain during injection can occur. Very rarely (less than one in a thousand), patients are allergic to Gadolinium, resulting in hives and itchy eyes, or shortness of breath. Since its initial discovery, nephrogenic systemic fibrosis (NSF) has been diagnosed in some patients who received a Gd-based contracting agent.

Literature:

www.fda.gov/cder/drug/infopage/gcca/default.htm. Darrah, T. H., Prutsman-Pfeiffer, J. J., Poreda, R. J., Ellen Campbell, M., Hauschka, P. V, & Hannigan, R. E. (2009). Incorporation of excess gadolinium into human bone from medical contrast agents. Metallomics: Integrated biometal science, 1(6), 479–88. Retrieved from http://pubs.rsc.org/en/content/articlehtml/2009/mt/b905145g Feng, X., Xia, Q., Yuan, L., Yang, X., & Wang, K. (2010). Impaired mitochondrial function and oxidative stress in rat cortical neurons: implications for gadolinium-induced neurotoxicity. Neurotoxicology, 31(4), 391–8. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/20398695 Fischer U, Kopka L, Brinck U, Korabiowska M, Schauer A, Grabbe E. Prognostic value of contrast-enhanced MR mammography in patients with breast cancer. Eur Radiol 1997; 7:1002-5 Gilles R, Meunier M, Lucidarme O, et al. Clustered breast microcalcifications: evaluation by dynamic contrast-enhanced subtraction MRI. J Comput Assist Tomogr 1996; 20:9-14.
http://www.nephrogenicsystemicfibrosis.org/gadolinium Vassallo, D., & et al. (2011). Toxic effects of mercury, lead and gadolinium on vascular reactivity. Braz J Med Biol Res, 44, 939–946. Retrieved from http://www.scielo.br/pdf/bjmbr/v44n9/1088.pdf.

IODINE (I):
Iodine is a component of thyroid hormone, and ultimately the regulation of cellular oxidation. Of the 20 to 50mg of iodine present in the body, 50 percent is found in muscles, 20 percent in the thyroid gland, 10 percent in the skin and 7 percent in the skeletal structure. The remaining 13 percent is found in other endocrine glands such as the ovaries and the central nervous system. One quarter of the iodine in the thyroid gland is found in the thyroid hormone thyroxine (T4) and triiodothyronine (T3). The remaining three-quarters is in the precursor of thyroxine, and in small amounts as the inorganic form. Iodine can be absorbed from the skin surface or from the intestinal tract. In the intestinal tract dietary iodine is converted to iodide and absorption is quick and complete. The excretion is through the kidneys, with minor amounts lost in sweat, tears, saliva, and bile. High hair levels suggest an abundance of iodine in tissues, and a reduction of dietary intake of fish, kelp and other iodine sources is the recommended treatment option.

MAGNESIUM (Mg):
Magnesium is an essential element with both electrolyte and enzyme-activator functions. High hair tissue levels reflect early bone withdrawal and maldistribution into tissue such as hair. In most cases, high hair levels are signs of a masked deficiency and can be confirmed with deficiency symptoms such as weakness, confusion, personality changes, muscle tremor and spastic tendencies during mild exercise, bizarre muscle movements, especially in the face, swollen gums, skin lesions, lack of coordination and digestive disorders.
GOOD FOOD SOURCES: All fruit and dark green vegetables, nuts, legumes, wholegrain cereals and breads.
THERAPEUTIC CONSIDERATION: B-Vitamins aid magnesium absorption.

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STRONTIUM (Sr):
Strontium possesses physiological and chemical properties similar to calcium. Strontium is poorly absorbed by humans, and the intestinal uptake lies between 5-25%. Of that, about 99% is found in bone and teeth. People living in areas where high levels are found in the water supply, show higher tissue levels. The daily intake varies considerably from 1 mg/day to 4.7 mg/day, according to geography. Strontium can interfere with the calcium metabolism, leading to bone disorders, incl. rickets.
THERAPEUTIC CONSIDERATION: Strontium may compete with the calcium absorption and storage in bone and teeth and when high hair strontium levels are followed by high hair calcium level, the need for an increased calcium supply is indicated. Algae and fibrous cellulose reduce strontium and calcium utilization.

VANADIUM (V):
The biological function of this trace element has not been substantiated and deficiency symptoms have not been established; however there is evidence that this trace element influences the glucose metabolism, the sodium/potassium transport and the adrenal catecholamine metabolism. Vanadium appears to catalyze the oxidation of catecholamine's and inhibit cholesterol synthesis and lower phospholipid levels. It may have anti-diabetic, weight-reducing function and anti-caries effects.
SOURCE: Fiber-rich foods, dill seeds, parsley and black pepper. Vanadium is highly concentrated in vegetable oils.
THERAPEUTIC CONSIDERATION: High fiber diet, use of vegetable oil instead of animal fats.

ZINC (Zn):
Zinc is a cofactor for many metalloenzymes, incl. those involving RNA and DNA synthesis. It is necessary for growth, healthy cell division and insulin production. Pregnant women, cancer and burn patients are at high risk for zinc deficiency, causing fatigue, poor growth, menstrual problem and sexual maturity problems. Deficiency causes are malnutrition and malabsorption. Skin problems, diarrhea, anorexia, hair loss, growth retardation, extreme irritability and increased susceptibility to infection are known deficiency symptoms. The zinc absorption occurs mainly in the small intestine, and Vitamin B6 is needed for utilization. The minimum daily requirement is 3-10 mg/day, depending on age and sex. In severe zinc deficiency states, a much higher intake is warranted with proper supervision.
SOURCE: Yeast, meat, fish, legumes, and eggs. The zinc in whole grains has a low bio-availability. Phytates block zinc absorption and a high intake of uncooked grains or unleavened bread can cause zinc deficiency.
THERAPEUTIC CONSIDERATION: Zinc supplementation and increased vitamin B6 intake. High exposure to toxic metals reduces the zinc absorption and increases the need for zinc and vitamin B6 supplementation.

The following nutritional program is aimed at providing optimum health. The program is suitable for patients 12 years and older. It is recommeded for 3-4 months, after which a repeat analysis is recommended. A follow-up test would evaluate and determine your body's ability to digest and absorb nutrients. If any questions or problems arise, consult your medical doctor or health care provider.

Boron (B)

Check water or soil as source of exposure. Avoid boric acid and boron-containing supplements. The Tolerable Upper Intake Level (UL), which is the maximum dose at which no harmful effects are expected, is 20mg per day for adults and pregnant or breast-feeding women over 19 years of age. For adolescents 14 to 18 years of age and pregnant or breast-feeding women 14 to 18 years of age, the UL is 17mg per day.

Calcium (Ca)

To improve calcium utilization, reduce consumption of dairy products. Avoid fatty foods and increase intake of fiber foods. Add digestive enzymes to improve digestive function and check your vitamin D level in blood. Physical activity greatly supports the utilization of calcium.

Gadolinium (Gd)

To check extend of exposure, check blood and/or urine levels. Consider renal support. Detoxification therapy may be useful.

Iodine (I)

To reduce iodine exposure, limit intake of fish and kelp. Avoid iodine-rich salt. Supplementation suggestion: Co-Enzyme Q10 & L-Tyrosine, 1-2xdaily.

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The following nutritional program is aimed at providing optimum health. The program is suitable for patients 12 years and older. It is recommeded for 3-4 months, after which a repeat analysis is recommended. A follow-up test would evaluate and determine your body's ability to digest and absorb nutrients. If any questions or problems arise, consult your medical doctor or health care provider.

Iron (Fe)

Ask your doctor to check serum iron and serum ferritin levels before supplementing iron. Wholegrain cereals, meats, fish and poultry are the major contributors to iron intake and to improve the bioavailability of iron, increase the intake of B-vitamins and vitamin C. In contrast, a high intake of calcium, zinc or phytates (found in legumes, rice and other grains), polyphenols and vegetable protein can inhibit the absorption of iron. The daily recommended intake for young adults 14-18y is 11mg for males and 15mg for females; female adults older than 18 require 18mg/day, males only 8mg/day. For older adults of both sexes, 8mg/day is sufficient. Pregnant and lactating women require between 9 and 27mg/day.

Magnesium (Mg)

To evaluate extend of exposure, check blood and/or urine levels, and kidney function.
High magnesium levels of hair rarely correlate with blood levels, but may indicate a masked deficiency and an increased need for magnesium. Chemical hair treatment causes falsely elevated hair magnesium values.

Strontium (Sr)

To check extend of exposure, check blood and/or urine levels. Water and soil can be a source of strontium, depending on the area’s geology. Strontium and calcium are handled similarly by the human body and when strontium exposure is high, calcium will be replaced in developing bone. Hence calcium deficiency increases strontium absorption. Check calcium status and Vitamin D level. An increased intake of vitamin D3 and calcium, vegetable fiber, and seaweed can normalize strontium levels.

Vanadium (V)

A daily intake of 0.5 to 1.0mg is recommended for adults, and is achieved through a normal diet. Good vanadium sources are black pepper, dill seed, peanut butter, cod fish, scallops, egg yolk, chicken breast, mushrooms, olives and vegetable oils.

Zinc (Zn)

The recommended daily requirement for zinc is 9-11mg for young people 14-18y; and 8-11mg for adults 19years and older. Males require more zinc than females. Pregnant or lactating females also show higher requirements (12-13mg/day). Vitamin B6 improves zinc absorption. Foods rich in zinc are seafood, meat and wheat germ.

Note: If the intake of zinc-rich food is high and hair levels are still low, zinc absorption needs to be improved. A blood test to confirm deficiency is recommended. Ask your physician.