

# Micro Trace Minerals Laboratory

environmental & clinical laboratory

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

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<https://microtrace.de>  
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## MINERAL ANALYSIS

## Hair

		Lab Number		1H298162	
Doctor/Clinic	Kathryn Moloney - Fertility and Beyond			Test Date	10/17/2025
Patient Name	Christopher John Malcolm Clement	Sex	m	D.O.B.	6/25/1986
Clinical Information				Page	1/5

	Acceptable Range	Test Value		
<b>Essential Trace Elements (ppm = mg/kg = mcg/g)</b>				
Chromium (Cr)	< 0.210	< 0.020		
Cobalt (Co)	0.010 --- 0.300	< 0.005	↓	
Copper (Cu)	10.000 --- 41.000	17.964		
Iodine (I)	0.050 --- 5.000	0.113		
Iron (Fe)	4.600 --- 17.700	4.536	↓	
Manganese (Mn)	0.050 --- 0.920	< 0.050	↓	
Molybdenum (Mo)	0.030 --- 1.100	0.037		
Selenium (Se)	0.400 --- 1.700	1.399		
Vanadium (V)	0.010 --- 0.200	0.002	↓	
Zinc (Zn)	150.000 --- 272.000	187.497		
<b>Essential Macroelements (ppm = mg/kg = mcg/g)</b>				
Calcium (Ca)	220.000 --- 1,600.000	299.924		
Magnesium (Mg)	20.000 --- 130.000	28.497		
<b>Nonessential Trace Elements (ppm = mg/kg = mcg/g)</b>				
Boron (B)	< 0.840	< 0.250		
Germanium (Ge)	< 1.650	< 0.003		
Lithium (Li)	< 0.300	0.009		
Strontium (Sr)	0.650 --- 6.900	0.297	↓	
Tungsten (W)	< 0.010	n.n.		
<b>Potentially Toxic Elements (ppm = mg/kg = mcg/g)</b>				
Aluminum (Al)	< 8.000	2.335		
Antimony (Sb)	< 0.300	0.010		

n.n. = not detected, < x = below Detection Limit

Quality control: Dipl. Ing. Friedle, Accreditation: DIN EN ISO 17025; Validation: Dr. E. Blaurock-Busch PhD;

Analytical method: ICP-MS with collision cell technique / Fluoride determined by ion chromatography

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Potentially Toxic Elements (ppm = mg/kg = mcg/g)						
Arsenic-total (As)	< 0.200	0.034			<div><div></div><div></div></div>	
Barium (Ba)	< 4.640	0.548			<div><div></div><div></div></div>	
Beryllium (Be)	< 0.100	< 0.010			<div><div></div><div></div></div>	
Bismuth (Bi)	< 0.200	< 0.010			<div><div></div><div></div></div>	
Cadmium (Cd)	< 0.200	0.002			<div><div></div><div></div></div>	
Lead (Pb)	< 3.000	0.242			<div><div></div><div></div></div>	
Mercury (Hg)	< 0.600	0.974	<div><div></div></div>		<div><div></div><div></div></div>	
Nickel (Ni)	< 1.000	0.139			<div><div></div><div></div></div>	
Palladium (Pd)	< 0.100	n.n.			<div><div></div><div></div></div>	
Platinum (Pt)	< 0.010	n.n.			<div><div></div><div></div></div>	
Silver (Ag)	< 1.000	< 0.010			<div><div></div><div></div></div>	
Thallium (Tl)	< 0.010	n.n.			<div><div></div><div></div></div>	
Tin (Sn)	< 0.700	0.068			<div><div></div><div></div></div>	
Titanium (Ti)	< 0.414	0.029			<div><div></div><div></div></div>	
Uranium (U)	< 0.100	0.014			<div><div></div><div></div></div>	
Zirconium (Zr)	< 0.500	< 0.050			<div><div></div><div></div></div>	

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**NOTES AND EVALUATION:** This multi-element examination was carried out utilizing mass spectrometry, specifically ICP-MS with cell technique.

Research indicates that chemical treatment of samples falsely alters test results. Hence, we do not accept responsibility for test results from unsuitable sample material. Strict quality controls and regular proficiency tests are enforced to validate results. This analysis has been conducted under the assumption that the sample is chemically untreated.

The specified reference values were statistically created according to the concept of human biomonitoring and are guidelines. They should not be considered as absolute limits for determining deficiency, toxicity or acceptance.

To assess deficiency or toxicity, additional values of diagnostic tests should be defined.

The information in this report is meant as a support for attending qualified health care professionals. It is based on research material and does not replace medical services and advice.

### COBALT (Co):

Cobalt is part of the Vitamin B12 molecule and is necessary for Vitamin B12 activity and function. Cobalt, which is mainly stored in the liver, activates numerous enzymes, and is excreted in bile. A low dietary intake inhibits fetal development and may reflect a low intake of Vitamin B12.

**SOURCES:** All animal products, including all meats, fish, cheese, brewer's yeast and yeast extracts. Strict vegetarians (vegans) and those who lack intrinsic factor risk vitamin B12 and cobalt deficiency.

**SYMPTOMS:** Include pernicious anemia.

**THERAPEUTIC CONSIDERATION:** Increase vitamin B12 intake and/or consumption of cobalt-rich foods.

### 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.

### MERCURY (Hg):

Circulating metals in blood 'feed' hair and nail roots. If exposure happened over time, hair and nails reflect long-term or chronic exposure.

Early symptoms of mercury overexposure include insomnia, dizziness, fatigue, drowsiness, weakness, depression, tremors, loss of appetite, loss of memory, nervousness, headache, dermatitis, numbness, and tingling of lips and feet, emotional instability and kidney damage.

Symptoms of acute toxicity: loss of teeth, extreme tremor, mental and emotional disorders, kidney failure.

**SOURCES:** Overexposure may stem from paints, explosives, electrical apparatus, batteries, mercurial diuretics, fungicides, fluorescent lamps, cosmetics, hair dyes, amalgams in dentistry, contaminated seafood, and petroleum products. Improper disposal of broken mercury thermometers and other apparatuses that use mercury including button cells and result in mercury exposure.

**RECOMMENDATION:** Increased oral intake of cysteine and antioxidant intake, especially selenium and vitamin E support mercury detoxification. Chelating agents such as DMPS or DMSA effectively bind mercury, resulting in an increased urinary excretion and detoxification. Consult your physician.

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### MANGANESE (Mn):

Manganese is a co-factor for many enzymes including mitochondrial superoxide dismutase, and several phosphatases, peptidases and glucosyltransferases. Mn functions with Vitamin K in the formation of prothrombin and is needed for the acetylcholine synthesis. Manganese is mostly stored in liver and kidneys. Acute deficiency has never been reported in humans, but an inadequate intake or digestive disorders may cause symptoms such as fatigue, lack of physical endurance, slow growth of fingernails and hair, impaired bone metabolism, impaired glucose metabolism, reduced fertility, and increased allergic sensitivities. Manganese is absorbed in the small intestine and largely excreted in bile and pancreatic secretion.

SOURCES: Liver, kidney, wheat germ, legumes, black tea and nuts.

NOTE: Manganese supplements should be used cautiously in young children, pregnant and lactating females. Do not supplement manganese in these populations without medical supervision.

### STRONTIUM (Sr):

Strontium has similar physiological and chemical properties as calcium, but essentiality has not been established. In humans, strontium is poorly absorbed in the intestinal tract, but younger people have a higher rate of absorption. Clinically, strontium has long been associated with strong teeth and bones. Studies suggest that strontium improves resistance to dental decay, claiming that in areas where the water contains more natural strontium and molybdenum, the rate of tooth decay is lower than in areas where the drinking water is fluoride-enriched. Strontium may improve cell structures and its function reflects that of calcium.

SOURCE: Drinking water, depending on geography, Brazil nuts, bran, root vegetables and milk. Vitamin D (and exposure to sunshine), lysine and arginine improve absorption. When magnesium deficiency is present, the strontium absorption is decreased.

### 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.

## NUTRITIONAL RECOMMENDATIONS

**The following nutritional program is aimed at providing optimum health. The program is suitable for patients 12 years and older.**

**To optimize health, it is recommended for 3-4 months. To repeat the test, either before or after dental work, check with your doctor. A follow-up test would evaluate the stability of your dental materials. Other tests, such as a blood or hair mineral analysis test may be needed to determine your body's ability to digest and absorb nutrients.**

**The following nutritional and medical recommendations are based on present clinical knowledge, and do not replace medical treatment. The nutrients listed below have been selected based on their quality, and because they are easily digested and absorbed.**

### Cobalt (Co)

There is no recommended intake of cobalt, however vitamin B12 contains cobalt and increasing the Vitamin B12 intake can improve the cobalt status. Check with your physician. Vitamin B12-rich foods are meat, liver and cheese.

### 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.

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The following nutritional and medical recommendations are based on present clinical knowledge, and do not replace medical treatment. The nutrients listed below have been selected based on their quality, and because they are easily digested and absorbed.

### Manganese (Mn)

No recommended dietary allowances (RDA) for manganese have been established, however, the daily adequate Intake (AI) levels for manganese are for men age 19 and older: 2.3mg; women 19 and older: 1.8mg; pregnant women age 14 to 50: 2mg; breastfeeding women: 2.6mg. Taking more than 11mg per day by mouth is possibly unsafe for most adults. Good sources of manganese are herbal teas, green or black tea. Excessive calcium or copper intake can block manganese absorption.

### Mercury (Hg)

Check blood levels, or ask your doctor for a provocation test. Cysteine, Selenium and vitamin E supplementation may be needed. Check for sources of longtime exposure.

### Strontium (Sr)

There is no known daily requirement for strontium. Depending on the geology, water can be a good source of strontium. Foods high in strontium include spinach, lettuce, carrots, peas, beans, potatoes and celery, if grown in strontium-rich soil. When soil is rich in calcium, strontium may be low. An increased intake of vegetable fiber, seaweed and calcium can help to 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.

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