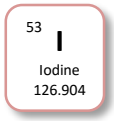
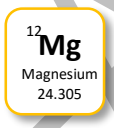
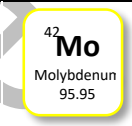
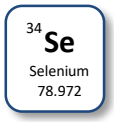
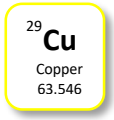
Metals & Traces®

HEAVY METALS & TRACE MINERALS EXTENDED PROFILE, WHOLE BLOOD

Name:	Gender:	Age:
Sample Taken Day:	Date of Analysis:	
Specimen: **Whole Blood**	Patient Code Number:	

Essential Trace Elements

Code	TEST	RESULT		REFERENCE VALUES
344	Vanadium (**V**), Whole Blood 	0.125 µg/L	●	< 0.800 µg/L
1118	Iodine (**I**), Whole Blood 	48.486 µg/L	●	15.000 – 132.000 µg/L
1203	Cobalt (**Co**), Whole Blood 	0.187 µg/L	●	< 1.500 µg/L
1309	Manganese (**Mn**), Whole Blood 	**3.647 µg/L**	↓	7.100 – 20.000 µg/L
1936	Magnesium (**Mg**), Whole Blood 	**21.902 mg/L**	↓	Adults 30.000 – 55.000 mg/L Children 25.000 – 48.500 mg/L
1348	Molybdenum (**Mo**), Whole Blood 	**0.250 µg/L**	↓	Adults 0.300 – 1.800 µg/L Children 0.500 – 1.800 µg/L
1937	Selenium (**Se**), Whole Blood 	**142.655 µg/L**	↑	Adults 79.00 – 130.00 µg/L Children 60.00 – 120.00 µg/L **New reference range from 1/6/2024**
1938	Copper (**Cu**), Whole Blood 	**0.597 mg/L**	↓	Adults 0.756 – 1.500 mg/L Children 0.600 – 1.360 mg/L **New reference range from 1/6/2024**

Reference Values & Methods adapted from:
1. Analytical Biochemistry, Holme & Peck, 3rd ed., 1998, Prentice Hall
2. Laboratory Tests and Diagnostic Procedures, Chernecky & Berger, 5th ed., 2008, Saunders Elsevier
3. Interpretation of Diagnostic Tests, Wallach, 8th ed., 2007, Lippincott

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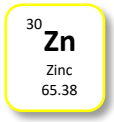
Code	TEST	RESULT		REFERENCE VALUES
1845	Chromium (**Cr**), Whole Blood 	0.808 µg/L	●	Adults < 2.000 µg/L Children < 1.000 µg/L
1939	Zinc (**Zn**), Whole Blood 	**3.908 mg/L**	↓	4.000 – 7.500 mg/L

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Potentially Toxic Elements

Code	TEST		RESULT		REFERENCE VALUES
146	Aluminum (**Al**), Whole Blood	^{13}Al Aluminum 26.982	0.216 µg/L	●	< 30.000 µg/L
224	Antimony (**Sb**), Whole Blood	^{51}Sb Antimony 121.760	**8.441 µg/L**	↑	< 3.500 µg/L
311	Silver (**Ag**), Whole Blood	^{47}Ag Silver 107.868	0.200 µg/L	●	Adults < 2.000 µg/L Children < 0.600 µg/L
319	Arsenic (**As**)-Toal, Whole Blood	^{33}As Arsenic 74.922	1.960 µg/L	●	< 10.000 µg/L
376	Beryllium (**Be**), Whole Blood	^{4}Be Beryllium 9.012	0.103 µg/L	●	< 0.400 µg/L
387	Bismuth (**Bi**), Whole Blood	^{83}Bi Bismuth 208.980	0.146 µg/L	●	< 1.000 µg/L
990	Zirconium (**Zr**), Whole Blood	^{40}Zr Zirconium 91.224	0.149 µg/L	●	< 3.000 µg/L
1027	Thallium (**Tl**), Whole Blood	^{81}Tl Thallium 204.383	0.125 µg/L	●	< 0.600 µg/L
1125	Cadmium (**Cd**), Whole Blood	^{48}Cd Cadmium 112.411	0.500 µg/L	●	Adults < 1.100 µg/L Children < 0.500 µg/L

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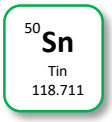
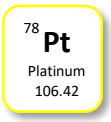
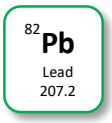
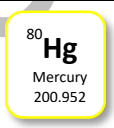
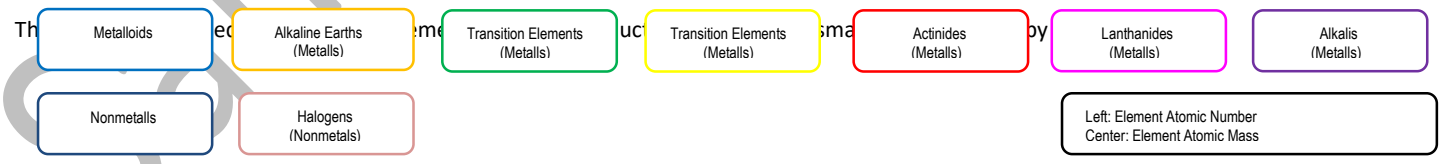
Specimen: **Whole Blood**	Patient Code Number:	

Potentially Toxic Elements

Code	TEST	RESULT		REFERENCE VALUES
1181	Tin (**Sn**), Whole Blood 	0.500 µg/L	●	< 1.300 µg/L
1278	Platinum (**Pt**), Whole Blood 	0.250 µg/L	●	Adults < 0.400 µg/L Children < 0.500 µg/L
1355	Lead (**Pb**), Whole Blood 	5.411 µg/L	●	Adults < 30.000 µg/L Children < 35.000 µg/L
1412	Nickel (**Ni**), Whole Blood 	0.204 µg/L	●	< 2.000 µg/L
1473	Uranium (**U**), Whole Blood 	0.075 µg/L	●	< 0.100 µg/L
1748	Mercury (**Hg**), Whole Blood 	1.431 µg/L	●	Adults < 2.000 µg/L Children < 1.000 µg/L

* **ND** = Not Detected



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General Notes and Comments

The information contained in this report is an interpretive aid to diagnostic procedures. The findings should be related to clinical examination, individual medical history, and possibly other diagnostic tests. Reference values have been obtained from the CDC (Center for Disease Control and Prevention, USA), WHO (World Health Organization), and other international agencies.

Blood is a transport medium, and the concentrations of metals and trace elements found in the blood reflect the immediate nutritional status of the body as well as the factors affecting their uptake and distribution. The presence of toxic metals in the blood is often associated with direct exposure and indicates the need for medical attention. Reduced concentrations of micronutrients and trace elements reflect insufficient intake and may indicate nutritional deficiency. The minerals circulate in the blood for about 72 hours and are either excreted or deposited in various body tissues.

Determining heavy metals in the blood **is the most reliable test** for diagnosing toxicity or poisoning from metals such as lead, mercury, etc. The Heavy Metals and Trace Minerals in Whole Blood reflect the levels of elements regardless of their form (organic or inorganic), both intracellular (within blood cells) and extracellular (in serum or plasma) in total (without differentiation).

Heavy metals become toxic to organisms because they can replace other elements in the macromolecules of cells (e.g., enzymes, proteins, etc.). For example, Cadmium (Cd) toxicity occurs because it can replace Zinc (Zn) in many essential enzymes that contain Zinc in their structure, thus rendering them inactive.

All the above are general notes and comments.
Consult your Physician to interpret the results and administer the most appropriate treatment regimen for your case.

IMPORTANT NOTE: Special laboratory tests are performed for research purposes and as ancillary or supplementary tests in the context of a conventional laboratory test. Special laboratory tests should only be used with other established medical data (e.g., medical history, symptoms, clinical examination, results of different lab tests, etc.).

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Special Comments

COPPER (Cu)
Copper is an essential metalloenzyme needed for hemoglobin synthesis. It readily complexes with L-amino acids, which facilitate its absorption from the stomach and duodenum. There are three distinct syndromes of deficiency: The first is characterized by anemia and hypoproteinemia and is easily corrected with combined copper and iron supplementation. The second occurs in malnourished infants, receiving high-calorie, low copper diets. Neutropenia, anemia, diarrhea, bone changes and hypocupremia respond to copper therapy. The third is the genetic defect, Menke's syndrome, in which copper is not absorbed from the intestinal mucosa. Results are low blood, liver, and hair copper levels.
Deficiency Symptoms: Reduced hemoglobin synthesis, impaired iron metabolism, hypochromia, microcytic anemia, Kwashiorkor, heart and liver disease, poor growth and development, infertility, pancreatic dysfunction, progressive mental deterioration and defective keratinization of hair.
Recommended Daily Allowance: Adults (18 years and older): 900 mcg for adults; 1000 mcg for pregnant women; 1300 mcg for nursing women; 890 mcg for adolescents 14-18 years old. Vegan diets appear to provide adequate amounts of copper.
Sources: Liver, shellfish, kidneys, egg yolk, legumes, and nuts.
Therapeutic Consideration: Deficiency may be due to a lack of metalloenzymes in the liver. Tyramine (tyrosine + amine) increases copper absorption. Citrus fruits increase the absorption in the small intestine, and glutamine increases copper transport into blood and tissues.

MANGANESE (Mn)
Manganese is a co-factor for many enzymes including arginase, cholinesterase, phosphoglucomutase, pyruvate carboxylase, mitochondrial superoxide dismutase, and several phosphatases, peptidases and glucosyltransferases. It functions with Vitamin
K in the formation of prothrombin and is needed for the acetylcholine synthesis. Manganese is mostly stored in the liver and the kidneys. Acute deficiency has never been reported in humans, but symptoms of decreased intake include fatigue, lack of physical endurance, hearing loss, slow growth of fingernails and hair, impaired bone metabolism, impaired glucose metabolism
incl. diabetes, reduced fertility, and increased allergic sensitivities. Deficiency symptoms may be caused by dietary insufficiency, intestinal malabsorption, or excess dietary intake of phosphorus, cobalt or magnesium. Manganese is absorbed in the small intestine and excreted in bile and pancreatic secretion.
Sources : Liver, kidney, wheat germ, legumes, black tea and nuts.
Uses/Documentation: Manganese is known to be an important nutrient, but manganese deficiency has not been documented
in humans, as dietary intakes often exceed dietary requirements. The element may be added to TPN solutions in patients who
receive chronic parenteral nutrition.
Contraindications/Precautions:
Note: Manganese supplements should be used cautiously in young children, pregnant and lactating females. Do not supplement manganese in these populations without medical supervision.

MOLYBDENUM (Mo)
Re
1. Molybdenum serves as a co-factor for xanthine and aldehyde oxidases. Dietary molybdenum is readily absorbed by the
2. intestine and is excreted in the urine and bile.08. Saunders Elsevier
3. SOURCES: Whole grains, legumes, leafy vegetables and organ meats. The RDA is 0.15 - 0.5 mg/day, depending on age and

status. Acute deficiency symptoms are unknown in humans. Excess intake of copper, zinc, and sulfates can depress Mo-update, causing disturbances in the uric acid cycle. Low molybdenum levels have been associated with impotency, increased cancer susceptibility, gout, dental caries, defects in the metabolism of sulfur-containing amino acids and asthma tendency.
THERAPEUTIC CONSIDERATION: Increase molybdenum intake and support intestinal function.

SELENIUM (Se)
Selenium is an essential constituent of the enzyme glutathione peroxidase and is known for its antioxidant properties. It is linked to cysteine as selenocysteine, an enzyme found in blood, liver and other tissues. In humans, toxicity is rare, but excessive intake results in alkali disease, characterized by liver and neuromuscular disorders. Long-term exposure or excess supplementation can cause toxicity symptoms including alopecia, arthritis, atrophic, brittle nails, prevailing garlic breath and body odor, GI disorders, irritability, kidney impairment, metallic taste, and yellowish skin.
Therapeutic Consideration: Sulfates and sulfur-containing amino acids reduce selenium absorption and toxicity. Methionine detoxifies excess selenium.

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 problems, and delayed sexual maturity. Deficiency causes are malnutrition and malabsorption. Enteropathic acrodermatitis, skin lesions, 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. Excreted zinc occurs in urine and sweat. The RDA is 3-10 mg/day, depending on age and physiology. A much higher intake is warranted with proper supervision in severe zinc deficiency states.
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 with increased vitamin B6 intake. High exposure to toxic metals reduces zinc absorption and increases the need for zinc and vitamin B6 supplementation.

MAGNESIUM (Mg)
Magnesium is an essential element with both electrolyte and enzyme-activator functions. It is a predominately intracellular cation, needed for cell function. 1% of body magnesium is found in blood, 60% is stored in bone, and the remainder is equally divided between muscle and other soft tissue. The absorption and excretion of magnesium is regulated by the renal system and parathyroid hormones.
HYPOMAGNESIA and MAGNESIUM DEFICIENCY are rare and generally caused by decreased uptake of magnesium caused by gastrointestinal disorders (steatorrhea, malabsorption syndrome, gut resections, or protein-calorie malnutrition, or increased
urinary losses due to renal disease or high rates of production of aldosterone, hyperparathyroidism and diabetes mellitus.
DEFICIENCY SYMPTOMS: Nervous disorders (tixs, tremors, muscle spasms during mild activity), disorientation, cardiac arrhythmia, fast pulse, gastrointestinal problems, pancreatitis, nausea, vomiting, convulsions, seizures (especially in combination with vitamin B6 deficiency)
SOURCE: All plant foods, fish and seafood.
THERAPEUTIC CONSIDERATION: Hypomagnesia is often a symptom of alcoholism, liver cirrhosis, diabetic acidosis, atherosclerosis. Adequate magnesium reduces blood pressure, prevents circulatory problems, headaches, insomnia, excessive perspiration and has an age-retarding effect. Studies indicate that 500-1000 mg/day reduced overall illness in tested
individuals.

ANTIMONY (Sb)
Antimony has no known function in living organisms and is not highly toxic. It is found in hair tissue and other organs, with the highest concentration in lymph nodes, lungs, skin and adrenals. Environmental exposure and illness affect the antimony concentration of some tissue. Hair and lung tissue of smelter workers contained high amounts of this trace element and uremic patients have also shown high Sb-levels. Food stored in enamel vessels and cans may contain appreciable antimony concentration. New research indicates that PET (Polyethylenterephthalate) bottles contain appreciable amounts of Sb, and the antimony concentration of mineral water stored in such bottles has been found to increase over time i.e., mineral water

Re
1. [illegible]
2. Laboratory Tests and Diagnostic Procedures, Chernecky & Berger, 5th ed., 2008, Saunders Elsevier
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takes up Sb from PET. Trivalent antimony is more toxic than the pentavalent form; however, there is no evidence that this element is carcinogenic.
Therapeutic Consideration: Increase vitamin C and B-complex intake.

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