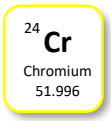
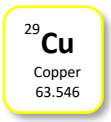
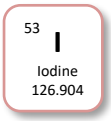
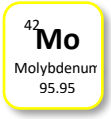
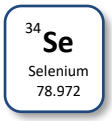
Metals & Traces®

HEAVY METALS & TRACE MINERALS EXTENDED PROFILE, HAIR

Name:	Gender: **MALE**	Age: **40 YEARS**
Date of Sampling: **12 SEPTEMBER 2022**	Date of Analysis: **12 SEPTEMBER 2022**	
Specimen: **Hair**	Patient Code Number:	

Essential Trace Elements

Code	TEST	RESULT		REFERENCE VALUES
1851	Chromium (**Cr**), Hair 	0,050 µg/g	●	Adults 0.020 – 0.210 µg/g Children 0.020 – 0.150 µg/g
1918	Copper (**Cu**), Hair 	16,150 µg/g	●	Adults 10.000 – 41.000 µg/g Children 6.700 – 37.000 µg/g
1209	Cobalt (**Co**), Hair 	**0,005 µg/g**	↓	Adults 0.010 – 0.300 µg/g Children 0.010 – 0.150 µg/g
1124	Iodine (**I**), Hair 	0,213 µg/g	●	Adults 0.050 – 5.000 µg/g Children 0.015 – 3.500 µg/g
1970	Iron (**Fe**), Hair 	6,405 µg/g	●	Adults 4.600 – 17.700 µg/g Children 7.700 – 15.000 µg/g
1315	Manganese (**Mn**), Hair 	0,188 µg/g	●	Adults 0.050 – 0.920 µg/g Children 0.070 – 0.500 µg/g
1354	Molybdenum (**Mo**), Hair 	0,031 µg/g	●	Adults 0.030 – 1.100 µg/g Children 0.020 – 1.000 µg/g
1917	Selenium (**Se**), Hair 	0,789 µg/g	●	Adults 0.400 – 1.700 µg/g Children 0.400 – 1.400 µg/g

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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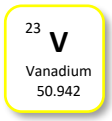
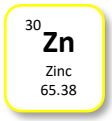
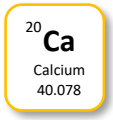
Essential Trace Elements & Microelements

Code	TEST	RESULT		REFERENCE VALUES
350	Vanadium (**V**), Hair 	0,015 µg/g	●	Adults 0.010 – 0.200 µg/g Children 0.010 – 0.150 µg/g
1916	Zinc (**Zn**), Hair 	**116,742 µg/g**	↓	150.000 – 272.000 µg/g

Essential Microelements

Code	TEST	RESULT		REFERENCE VALUES
1912	Calcium (**Ca**), Hair 	**207,795 µg/g**	↓	Adults 220.00 – 1600.00 µg/g Children 200.00 – 850.00 µg/g
1913	Magnesium (**Mg**), Hair 	20,784 µg/g	●	Adults 20.00 – 130.00 µg/g Children 20.00 – 115.00 µg/g

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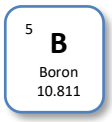
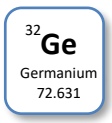
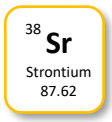
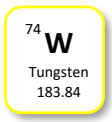
Specimen: **Hair**	Patient Code Number:	

Non-Essential Trace Elements

Code	TEST	RESULT		REFERENCE VALUES
437	Boron (**B**), Hair 	0,374 µg/g	●	Adults < 0.840 µg/g Children < 2.000 µg/g
483	Germanium (**Ge**), Hair 	0,004 µg/g	●	Adults < 1.650 µg/g Children < 0.500 µg/g
1911	Lithium (**Li**), Hair 	0,001 µg/g	●	Adults < 0.300 µg/g Children < 0.200 µg/g
1661	Strontium (**Sr**), Hair 	**0,554 µg/g**	↓	Adults 0.650 – 6.900 µg/g Children 0.110 – 4.280 µg/g
430	Tungsten (**W**), Hair 	0,001 µg/g	●	Adults < 0.010 µg/g Children < 0.020 µg/g

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Potentially Toxic Elements

Code	TEST		RESULT		REFERENCE VALUES
152	Aluminum (**Al**), Hair	^{13}Al Aluminum 26.982	5,229 µg/g	●	< 8.000 µg/g
230	Antimony (**Sb**), Hair	^{51}Sb Antimony 121.760	0,023 µg/g	●	Adults < 0.300 µg/g Children < 0.200 µg/g
317	Silver (**Ag**), Hair	^{47}Ag Silver 107.868	0,060 µg/g	●	< 1.000 µg/g
325	Arsenic (**As**)-Whole, Hair	^{33}As Arsenic 74.922	0,032 µg/g	●	< 0.200 µg/g
361	Barium (**Ba**), Hair	^{56}Ba Barium 137.328	0,376 µg/g	●	Adults < 4.640 µg/g Children < 2.650 µg/g
383	Beryllium (**Be**), Hair	^{4}Be Beryllium 9.012	0,002 µg/g	●	Adults < 0.100 µg/g Children < 0.030 µg/g
395	Bismuth (**Bi**), Hair	^{83}Bi Bismuth 208.980	0,002 µg/g	●	Adults < 0.200 µg/g Children < 0.180 µg/g
458	Gadolimium(**Gd**), Hair	^{64}Gd Gadolinium 157.25	0,005 µg/g	●	< 0.010 µg/g

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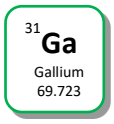
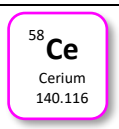
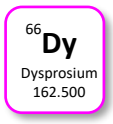
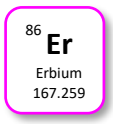
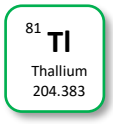
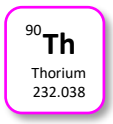
Potentially Toxic Elements

Code	TEST	RESULT		REFERENCE VALUES
468	Gallium (**Ga**), Hair 	0,016 µg/g	●	< 0.070 µg/g
532	Cerium (**Ce**), Hair 	0,078 µg/g	●	< 0.100 µg/g
552	Dysprosium (**Dy**), Hair 	0,000 µg/g	●	< 0.010 µg/g
958	Erbium (**Er**), Hair 	0,000 µg/g	●	< 0.010 µg/g
981	Europium (**Eu**), Hair 	0,000 µg/g	●	< 0.010 µg/g
996	Zircomium (**Zr**), Hair 	0,021 µg/g	●	Adults < 0.500 µg/g Children < 0.470 µg/g
1033	Thallium (**Tl**), Hair 	0,001 µg/g	●	Adults < 0.010 µg/g Children < 0.010 µg/g
1041	Thorium (**Th**), Hair 	0,006 µg/g	●	< 0.010 µg/g

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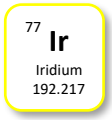
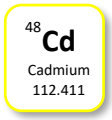
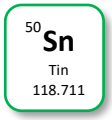
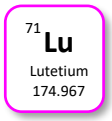
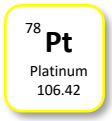
Potentially Toxic Elements

Code	TEST	RESULT		REFERENCE VALUES
1048	Thulium (**Tm**), Hair 	0,001 µg/g	●	< 0.010 µg/g
1112	Iridium (**Ir**), Hair 	0,000 µg/g	●	< 0.010 µg/g
1131	Cadmium (**Cd**), Hair 	0,012 µg/g	●	< 0.200 µg/g
1140	Cesium (**Cs**), Hair 	0,004 µg/g	●	< 0.010 µg/g
1187	Tin (**Sn**), Hair 	0,141 µg/g	●	Adults < 0.700 µg/g Children < 0.330 µg/g
1259	Lanthanum (**La**), Hair 	0,011 µg/g	●	< 0.021 µg/g
1303	Lutetium (**Lu**), Hair 	0,001 µg/g	●	< 0.010 µg/g
1284	Platinum (**Pt**), Hair 	0,002 µg/g	●	Adults < 0.010 µg/g Children < 0.007 µg/g

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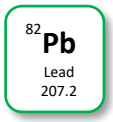
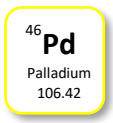
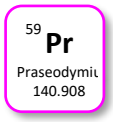
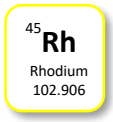
Potentially Toxic Elements

Code	TEST	RESULT		REFERENCE VALUES
1361	Lead (**Pb**), Hair 	1,087 µg/g	●	< 3.000 µg/g
1418	Nickel (**Ni**), Hair 	0,079 µg/g	●	Adults < 1.000 µg/g Children < 0.850
1479	Uranium (**U**), Hair 	0,032 µg/g	●	< 0.100 µg/g
1497	Palladium (**Pd**), Hair 	0,000 µg/g	●	Adults < 0.100 µg/g Children < 0.020 µg/g
1562	Praseodymium (**Pr**), Hair 	0,002 µg/g	●	< 0.010 µg/g
1596	Rhenium (**Re**), Hair 	0,003 µg/g	●	< 0.010 µg/g
1608	Rhodium (**Rh**), Hair 	0,000 µg/g	●	< 0.010 µg/g
1616	Ruthenium (**Ru**), Hair 	0,001 µg/g	●	< 0.100 µg/g

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Potentially Toxic Elements

Code	TEST		RESULT		REFERENCE VALUES
1627	Samarium (**Sm**), Hair	^{62}Sm Samarium 150.36	0,001 µg/g	●	< 0.010 µg/g
1685	Tantalum (**Ta**), Hair	^{73}Ta Tantalum 180.948	0,000 µg/g	●	< 0.010 µg/g
1693	Tellurium (**Te**), Hair	^{52}Te Tellurium 127.6	0,000 µg/g	●	< 0.010 µg/g
1711	Titanium (**Ti**), Hair	^{22}Ti Titanium 47.867	0,094 µg/g	●	Adults < 1.500 µg/g Children < 0.650 µg/g
1754	Mercury (**Hg**), Hair	^{80}Hg Mercury 200.952	0,134 µg/g	●	Adults < 0.600 µg/g Children < 0.300 µg/g
1772	Ytterbium (**Yb**), Hair	^{70}Yb Ytterbium 173.055	0,001 µg/g	●	< 0.010 µg/g

Note: Children reference values apply to ages < 10

* **ND** = Not Detected

The methodology used to measure all elements is **ICP-MS**: Inductively Coupled Plasma Mass Spectroscopy

For reference values µg/g = mg/kg = ppm (parts per million)

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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 CDC (Center for Disease Control and Prevention, USA), WHO (World Health Organization) and other international agencies.

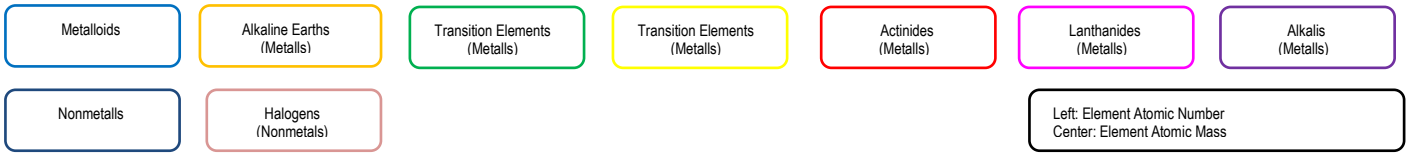
Results are reported in µg/g = mg/kg = ppm (parts per million).

Important Note: As it is extremely difficult to distinguish between chemically dyed and non-dyed hair, we consider that the spectroscopic analysis was performed on undyed hair, as explained in detail to the person concerned prior to analysis. Chemically treated hair, such as dyed, do not provide reliable results and our laboratory cannot be held responsible for data obtained from hair that have been dyed or chemically treated.

Heavy Metals become toxic to the body because they can take the place of 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 important enzymes that contain Zinc in their structure, thus rendering them inactive.

All the above are general notes and comments.
Consult your Physician for interpreting the results and administering the most appropriate treatment regimen for your very specific 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 in conjunction with other established medical data (e.g., medical history, symptoms, clinical examination, results of other lab tests, etc.).



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1. Analytical Biochemistry, Holme & Peck, 3rd ed., 1998, Prentice Hall
2. Laboratory Tests and Diagnostic Procedures, Chernecky & Berger, 5th ed., 2008, Saunders Elsevier
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Metals & Traces®

HEAVY METALS & TRACE MINERALS EXTENDED PROFILE, HAIR

Name:	Gender: **MALE**	Age: **40 YEARS**
Date of Sampling: **12 SEPTEMBER 2022**	Date of Analysis: **12 SEPTEMBER 2022**	
Specimen: **Hair**	Patient Code Number:	

Special Comments

COBALT

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

ZINC

Zinc is a cofactor for many metalloenzymes, including those involved in RNA and DNA synthesis. It is an essential element for growth, normal cell division and insulin production. Pregnant women, children, cancer patients, and burn victims are at high risk for zinc deficiency, causing fatigue, poor growth, menstrual problems, and reproductive system problems. The causes of deficiency are malnutrition and malabsorption. The most common symptoms of zinc deficiency are skin problems, diarrhea, anorexia, hair loss, growth retardation, extreme irritability, and increased susceptibility to infections. The absorption of zinc takes place mainly in the small intestine and the presence of vitamin B6 is necessary for its use. The minimum daily requirement is 3-10 mg, depending on age and gender. In severe zinc deficiencies, a higher intake can be accomplished with appropriate supervision.

Children: Zinc is distributed in all tissues, with significant concentrations in the eye, (especially the retina, iris, and choroid), kidneys, liver, brain, muscles, and testes. Thus, young boys have a great need for zinc. In acute zinc deficiency, taste is impaired and wound healing is slow. Thus, zinc deficiency is a common problem among children suffering from dermatitis and other skin problems. Zinc acts as a binding material for certain amino acids, including cysteine, an amino acid required for healthy hair growth. It is also needed for insulin and protein synthesis and children with zinc deficiency are prone to sugar intolerance, digestive problems in protein digestion and food intolerances. Zinc is vital for maintaining normal levels of vitamin A and for certain enzyme reactions necessary for the normal functioning of the sebaceous glands of the skin. Strictly vegetarian diets and children with a diet that includes a high intake of refined carbohydrates, sugars and fat are prone to low zinc levels. If zinc deficiency occurs during a period of rapid growth, the clinical manifestations are most severe.

Sources: Yeast, meat, fish, legumes, and eggs. Zinc in cereals has low bioavailability. Phytic acids interfere with zinc absorption, and a large intake of whole grains can cause zinc deficiency. Thus, a diet high in cereals and low in animal protein can cause zinc deficiency. Zinc in infant formulas is not absorbed as well as zinc in breast milk, which contains a zinc-binding protein that increases intestinal absorption. Thus, formula-fed children are prone to zinc deficiency at an early age, and if not properly treated, it can persist and intensify over the following years.

Therapeutic Consideration: Zinc supplementation and increased intake of vitamin B6. Geophagy and intestinal parasites also contribute to low zinc absorption. Over-exposure to toxic metals reduces zinc absorption and increases the need for zinc and vitamin B6. A high intake of molybdenum and iron also affects zinc absorption.

STRONTIUM

Strontium has similar physiological and chemical properties to calcium, but its necessity has not yet been established. In humans, strontium is poorly absorbed in the intestinal tract, with younger people having a higher rate of absorption. Clinically, strontium has been associated with strong teeth and bones. Studies show that strontium improves tooth decay resistance. It

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has been found that in areas where the water contains higher concentrations of strontium and molybdenum, the rate of caries is lower than in areas where the drinking water is enriched with fluoride. Strontium can improve cell structures and its functions are similar to those of calcium.
Sources: Drinking water, depending on geographic area, Brazil nuts, bran, all root vegetables (bulbs), and milk. Vitamin D (and sun exposure), lysine and arginine improve strontium absorption. When magnesium is deficient, strontium absorption is reduced.

CALCIUM
Calcium is necessary for the development of bones and teeth, the function of muscle and nerve cells, the secretion of hormones and the proper functioning of the immune system, among others. Symptoms of calcium deficiency include muscle cramps, musculoskeletal pain, particularly severe menstrual pain, periodontal disease, and osteoporosis. The average recommended daily intake is 800-1800, depending on age, sex, lactation, or pregnancy. The lowest daily intake is 500 mg for children up to 1 year of age, 600 mg for ages 1-3 years, 700 mg for ages 4-6 years, 800 mg for ages 7-9 years, and 900-1000 mg for ages 10-14 years, depending on the child's condition. The body's ability to absorb calcium decreases with age, due to hormonal changes, reduced gastric function and reduced activity levels.
Sources of Calcium: Dairy products, green leafy vegetables, citrus fruits, molasses, and fish with edible bones.
Therapeutic Approaches: If low calcium levels are detected in people who consume moderate to high amounts of dairy products, digestive problems and intolerance to dairy products may be present. High fat consumption prevents calcium absorption. To further support calcium absorption, it is recommended to increase physical activity and especially muscle strengthening exercises. Taking dietary supplements such as vitamin D, the amino acid lysine, and digestive enzymes containing hydrochloric acid and pepsin, along with probiotics (lactobacilli) help with intestinal absorption of calcium.

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