



Elemental Analysis Hair



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New Malden, Surrey KT3 6NB

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Patient: **RICHARD
VISSER**
DOB: April 14, 1969
Sex: M
MRN: 0001731438

Order Number: E5040733
Completed: January 06, 2012
Received: January 04, 2012
Collected: December 21, 2011
Route Number: A143008

Equilibrium Vital Health Centre
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Toxic Elements

Element	Reference Range	Reference Range in µg/g
Aluminum	0.7	<= 17.3
Antimony	0.004	<= 0.016
Arsenic	<dl	<= 0.080
Barium	1.10	<= 1.70
Bismuth	<dl	<= 0.178
Cadmium	0.008	<= 0.022
Gadolinium	0.0007	<= 0.0005
Lead	0.705	<= 0.700
Mercury	0.50	<= 1.32
Nickel	0.43	<= 0.55
Rhodium	0.0002	<= 0.0005
Rubidium	0.003	<= 0.040
Thallium	<dl	<= 0.0004
Tin	0.131	<= 0.149
Uranium	0.0092	<= 0.0057

Nutrient Elements

Element	Reference Range	Reference Range in µg/g
Calcium	4,569	192-1,588
Chromium	0.17	0.01-1.58
Cobalt	<dl	0.001-0.129
Copper	18	8-136
Iron	10.6	5.2-24.4
Magnesium	192	11-122
Manganese	0.12	0.04-1.93
Molybdenum	0.04	0.01-1.24
Phosphorous	152	104-206
Selenium	1.39	0.58-1.13
Sodium	31	14-426
Strontium	8.23	0.01-4.40
Sulfur	52,408	41,781-60,894
Vanadium	0.049	0.003-0.108
Zinc	181	119-245

Reference Range

Lithium	<dl	<= 0.302
Potassium	6	<= 174

Ratios

	Inside Range	Outside Range	Reference Range
Ca/Mg	24		5-29
Ca/P		30	1-9

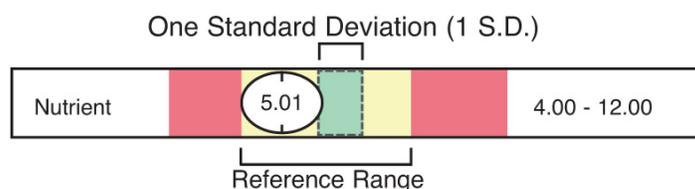
Commentary

This test has been developed and its performance characteristics determined by Genova Diagnostics, Inc. It has not been cleared or approved by the U.S. Food and Drug Administration.

Reference ranges are derived from a healthy adult population without hair treatments such as perms, dyes or bleach.

NOTE: Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Comments regarding clinical significance for the various elements are based on endogenous concentrations. Hair Analysis is always a reflection of both endogenous levels and external contamination (elements on the hair surface), thus is considered a screen rather than a definitive diagnostic assessment of body burden.

The **Reference Range** is a statistical interval representing 95% or 2 Standard Deviations (2 S.D.) of the reference population. One Standard Deviation (1 S.D.) is a statistical interval representing 68% of the reference range population. Values between 1 and 2 S.D. are not necessarily abnormal. Clinical correlation is suggested. (See example below)



NOTE: The following comments regarding clinical significance for the elements tested in this profile are based on *endogenous* concentrations. It should be noted that Hair Analysis is a reflection of both endogenous levels *and* external contamination (elements on the hair surface), thus is considered a screen rather than a definitive diagnostic assessment of tissue levels. Confirmation of toxicity may be accomplished via blood or urine testing. Provocative challenge urine testing (with the use of a chelating agent) can reflect tissue stores from previous exposure, whereas non-provoked urine or blood tests will reflect current exposure.

NOTE: Hair iron, phosphorus, sodium, and potassium are generally not thought to reflect dietary intake or body stores of these elements; however, abnormal hair levels may be associated with certain drugs and clinical conditions. Elevated hair iron may be found in smokers, x-ray technicians and individuals with certain forms of cancer. Notably low or high hair phosphorus is consistent with abnormal calcium and/or magnesium metabolism. Hair phosphorus also is typically elevated with kidney dialysis, and may be depressed in chronic hepatitis. Regular swimming in pools can elevate hair sodium. Although hair levels of sodium and potassium may be clinically significant in the presence of cystic fibrosis, celiac disease, and hyperparathyroidism, hair levels do not generally reflect tissue concentrations of these elements.

Calcium (Ca) is above the reference range. Hair Ca level correlates with long term dietary intake, absorption from the GI tract, and retention. However, hair Ca level does not necessarily reflect current serum calcium or calcium ion concentrations and may not have a linear or direct relationship with tissue deposition or bone density.

Elevated hair Ca is consistent with chronic hypercalcemia conditions, hyperparathyroidism, chronic hypervitaminosis D, vitamin D deficiency with osteoporosis, renal failure, hyperglycemia and diabetes, hepatitis and cirrhosis. Neoplastic disease may feature elevated hair Ca. In osteoporosis, hair Ca is elevated to some degree while the Ca/Mg ratio is notably elevated. Symptoms consistent with elevated hair Ca vary with conditions. Hypercalcemia may feature lethargy and muscle weakness, hypotonicity and constipation.

Cobalt (Co) is below the reference range. Hair Co reflects body cobalt stores which include cobalamin and protein

Commentary

bound Co. Recent vitamin B12 additions of dietary or therapeutic origin will not be reflected by hair Co level.

Low hair Co suggests further investigation of vitamin B12 status via urine/blood levels of homocysteine and methylmalonic acid. Symptoms which may be associated include fatigue, paresthesia, sensory loss, ataxia, dementia, macrocytic anemia and psychoses. Occlusive vascular disease is associated with homocystinuria which can result from cobalamin deficiency/dysfunction.

Chromium (Cr) is within the reference range.

Gadolinium (Gd) is above the reference range. Gadolinium is a member of a group of rare earth metals known as lanthanides. It has been used for superconductors, magnets, fluorescent materials, and as a nuclear MRI contrast agent. Toxicity appears similar to nickel and copper, and has been associated with hair loss and skin lesions. These changes are consistent with Zinc deficiency and are correlated with increased urinary zinc concentrations.

Iron (Fe) is within the reference range. Please refer to note at beginning of commentary section.

Lead (Pb) is above the reference range. Hair Pb levels correlates with body tissue deposition levels (bone, aorta, liver, kidney) and also correlates with blood levels if the exposure is periodic or chronic.

At the cellular level, lead interferes with membrane transport processes and with enzyme functions because it is able to bond to many chemically active sites. The interaction of lead with sulfhydryl (SH) sites causes most of the toxic effects which include impaired heme synthesis, inhibition of erythrocyte Na, K ATPase, diminished RBC glutathione, shortened RBC life span, impaired synthesis of RNA, DNA and protein and impaired metabolism of vitamin D. Lead may also be nephrotoxic, resulting in disordered renal transport with uricemia (possibly gout), hyperaminoaciduria, glycosuria and phosphaturia. Excess body burden of Pb can be consistent with fatigue, headaches, loss of appetite, insomnia, nervousness, anemia, weight loss, decreased nerve conduction and possibly motor neuron disorders.

Magnesium (Mg) is above the reference range. Hair Mg reflects long term dietary intake, absorption from the GI tract and retention. However, hair Mg does not necessarily reflect current plasma or cellular levels. Elevated hair Mg usually indicates maldistribution of the element without direct correlation to blood levels. Abnormal levels or imbalances of calcium or phosphorus may result in elevated hair Mg. Elevated hair Mg may be associated with renal failure, with overall Mg excess, hypoglycemia, chronic physical or emotional stress, and hypoparathyroidism.

Manganese (Mn) is within the reference range.

Molybdenum (Mo) is within the reference range.

Phosphorus (P) is within the reference range. Please refer to note at beginning of commentary section.

Potassium (K) is within the reference range. Please refer to note at beginning of commentary section.

Selenium (Se) is above the reference range in hair. Selenium supplementation decreases hair mercury concentrations. The increased ratio of selenium/mercury concentrations in hair samples indicates better protection against the toxic effects of mercury. Elevated selenium in hair has also been noted to correlate with decreased hair mercury and improvement in symptoms of atopic dermatitis. Selenium/mercury ratio decreases with increasing mercury exposure.

Sodium (Na) is within the reference range. Please refer to note at beginning of commentary section.

Strontium (Sr) is above the reference range. Sr has been reported to correlate with tissue levels. Sr usually tracks the calcium level as well. Natural Sr is a mixture of stable (not radioactive) isotopes. Sr acquired a bad reputation due to formation of radioactive Sr from fission of uranium during nuclear weapons testing. The Sr measured is a natural and stable Sr 88, associated with calcium in animal and vegetable tissues, in soils and in the earth's crust.

Conditions which may be consistent with elevated Sr include chronic hypercalcemia, hyperparathyroidism, chronic hypervitaminosis D, osteoporosis (possibly with vitamin D deficiency), renal failure, hypoglycemia, hepatitis and liver cirrhosis.

Commentary

Sulfur (S) is within the reference range.

Uranium (U) is above the reference range. Hair levels of uranium may reflect past or chronic ingestion. Most exposure comes from natural uranium in ground and drinking water. The U238 isotope of uranium is measured by GSDL, and this isotope comprises more than 99% of naturally occurring uranium. Radioactivity danger from trace quantities of natural uranium is slight because of its very long half life (billions of years). The finding of elevated U238 in this test does not imply nor does it rule out exposure to enriched uranium fuel (U235) or to other radioactive isotopes which may be radiation hazards.

The major toxicological concern of U238 excess is biochemical rather than radiochemical. U is a reactive element which is able to combine with and affect the metabolisms of: lactate, citrate, pyruvate, carbonate and phosphate. Eventually, U deposits in kidney, bone, liver and spleen. The primary symptom of low level chronic uranium excess is chronic fatigue. Possible conditions from more severe uranium contaminations include damage to kidney glomeruli with disordered renal transport (proteinuria, albuminuria, and hyperaminoaciduria) and hematopoiesis in bone marrow.

Vanadium (V) is within the reference range.

Zinc (Zn) is within the reference range.