



Elemental Analysis Hair



Genova
Diagnostics®

Innovative Testing for Optimal Health

63 Zillicoa Street
Asheville, NC 28801
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Patient:
Age: 32
Sex: F
MRN: 0001122000

Order Number: 96060565
Completed: December 12, 2007
Received: December 06, 2007
Collected: December 04, 2007

ARL Pathology
Referring Laboratory
3/568 St Kilda Road
Melbourne, Victoria 3004
Australia

Toxic Elements

Element	Reference Range	Reference Range in µg/g
Aluminum	3.7	<= 17.3
Antimony	0.010	<= 0.016
Arsenic	0.017	<= 0.080
Barium	4.21	<= 1.70
Bismuth	0.268	<= 0.178
Cadmium	0.068	<= 0.022
Gadolinium	0.0120	<= 0.0005
Lead	0.495	<= 0.700
Mercury	1.32	<= 1.32
Nickel	0.16	<= 0.55
Rhodium	0.0002	<= 0.0005
Rubidium	0.003	<= 0.040
Thallium	<dl	<= 0.0004
Tin	0.100	<= 0.149
Uranium	0.0026	<= 0.0057

Nutrient Elements

Element	Reference Range	Reference Range in µg/g
Calcium	1,531	192-1,588
Chromium	0.06	0.01-1.58
Cobalt	0.090	0.001-0.129
Copper	40	8-136
Iron	7.8	5.2-24.4
Magnesium	219	11-122
Manganese	0.49	0.04-1.93
Molybdenum	0.02	0.01-1.24
Phosphorous	115	104-206
Selenium	0.64	0.58-1.13
Sodium	8	14-426
Strontium	3.46	0.01-4.40
Sulfur	51,476	41,781-60,894
Vanadium	0.013	0.003-0.108
Zinc	179	119-245

Ratios

	Inside Range	Outside Range	Reference Range
Ca/Mg	7		5-29
Ca/P		13	1-9

Reference Range

Lithium	<dl	<= 0.302
Potassium	<dl	<= 174

Commentary

Bismuth Reference Range Update

A recent Quality Control review of Hair Element testing resulted in the update of the Bismuth reference range. This report includes the new reference range. A statistical analysis was performed on the data, in compliance with NCCLS guidelines and recommendations for reference ranges.

January 24, 2006

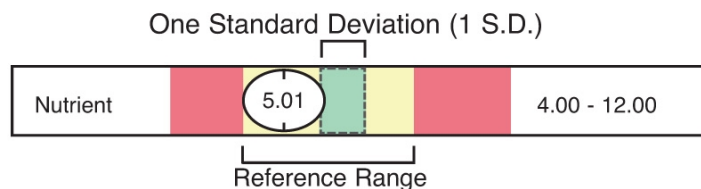
Please note that the reference ranges for Lithium, Potassium and Thorium have been updated. This report includes the new reference ranges. A statistical analysis was performed on the data, in compliance with NCCLS guidelines and recommendations for reference ranges.

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.

Commentary

Barium (Ba) is above the reference range. Hair Ba may be used for monitoring the accumulated body burden. Insoluble Ba compounds are not absorbed from the GI tract, and Ba salts such as Ba sulfate are commonly administered for diagnostic purposes such as x-ray procedures. Soluble Ba salts (chloride, carbonate, nitrate, sulfide) are absorbed when ingested and can have detrimental effects. Biochemically, Ba displaces or antagonizes potassium-dependent functions and stimulates adrenal medullary secretion of catecholamines. Early or mild symptoms of Ba excess include nausea, diarrhea, muscle stimulation, and tingling in the extremities. Later or more severe manifestations are cardiac fibrillation, loss of tendon reflexes, convulsive tremors or muscular paralysis, and respiratory distress.

Bismuth (Bi) is above the reference range. Hair levels of bismuth may reflect past or chronic ingestion. Bismuth can be a mildly toxic element if ingested and absorbed in excessive quantities. Over the counter anti-diarrheal preparations and therapeutic bismuth compounds with antimicrobial and anti inflammatory actions are not toxic when used appropriately. Soluble Bi can be absorbed into the blood, and excessive soluble Bi can have deleterious effects on the liver, kidney, stomach and skin. Manifestations of Bi excess usually start with stomatitis and a blue black line or shading of gums, foul breath and constipation or bowel irregularity. Conditions consistent with more severe Bi contamination include dermatitis, ulceration of oral tissues, nephrosis with proteinuria, jaundice and fatty changes in liver tissue. Severe Bi poisoning may result in "bismuth encephalopathy," featuring myoclonic jerks, tremors, dysarthria and mental confusion.

Cadmium (Cd) is above the reference range. Hair Cd correlates with body burden and with past or chronic ingestion of this element. Cadmium can exert toxic effects by inhibiting sulfur -bearing enzymes and by displacing enzyme bound zinc or copper. In cells, Cd can inhibit gluconeogenesis and phosphorylation processes. Cadmium's deleterious effects may be delayed and insidious with a latent period of years before manifestations are apparent. Excessive body burden of Cd is associated with hypertension and impaired renal transport with proteinuria and urinary wasting of beta 2-microglobulin. Cd can also adversely affect the heart, bone and testes. Inhalation of Cd salts or vapors may produce emphysema. Smoking and high sugar diets appear to increase Cd levels. In children, elevated Cd has been correlated with lowered IQ.

Calcium (Ca) level is within the reference range. Hair Ca correlates with long term dietary intake, absorption from the GI tract and retention. The 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.

Cobalt (Co) level is within the reference range.

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.

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.

Commentary

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

Selenium (Se) is within the reference range.

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

Strontium (Sr) is within the reference range.

Sulfur (S) is within the reference range.

Vanadium (V) is within the reference range.

Zinc (Zn) is within the reference range.