



# Elemental Analysis Hair



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Patient: **YATRA BARBOSA**  
DOB: April 28, 1953  
Sex: F  
MRN: 0001248582

**Order Number: E1120002**  
Completed: September 13, 2011  
Received: September 12, 2011  
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## Toxic Elements

Element	Reference Range	Reference Range in µg/g
Aluminum	1.5	<= 17.3
Antimony	0.006	<= 0.016
Arsenic	0.058	<= 0.080
Barium	0.61	<= 1.70
Bismuth	<dl	<= 0.178
Cadmium	0.008	<= 0.022
Gadolinium	0.0012	<= 0.0005
Lead	1.657	<= 0.700
Mercury	0.92	<= 1.32
Nickel	0.06	<= 0.55
Rhodium	0.0005	<= 0.0005
Rubidium	0.016	<= 0.040
Thallium	0.0010	<= 0.0004
Tin	0.029	<= 0.149
Uranium	0.0546	<= 0.0057

## Nutrient Elements

Element	Reference Range	Reference Range in µg/g
Calcium	1,017	192-1,588
Chromium	0.13	0.01-1.58
Cobalt	0.004	0.001-0.129
Copper	22	8-136
Iron	6.4	5.2-24.4
Magnesium	91	11-122
Manganese	0.07	0.04-1.93
Molybdenum	0.03	0.01-1.24
Phosphorous	145	104-206
Selenium	1.07	0.58-1.13
Sodium	48	14-426
Strontium	17.72	0.01-4.40
Sulfur	51,274	41,781-60,894
Vanadium	0.037	0.003-0.108
Zinc	187	119-245

## Ratios

	Inside Range	Outside Range	Reference Range
<b>Ca/Mg</b>	11		5-29
<b>Ca/P</b>	7		1-9

## Reference Range

Lithium	<dl	<= 0.302
Potassium	10	<= 174

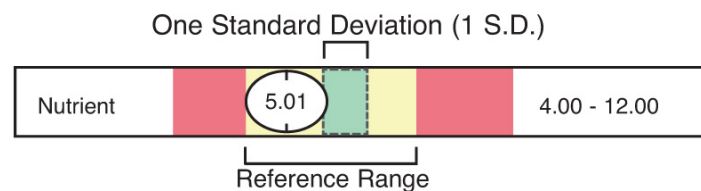
## Commentary

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) 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.

## Commentary

**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 within the reference range.

**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.

**Thallium (Tl)** is above the reference range. Hair Tl is representative of body burden and may be used to monitor past or chronic exposure. Thallium is an extremely toxic element that can be ingested, inhaled, or assimilated transdermally or transplacentally.

Both oxidation states, Tl+1 and Tl+3, are harmful. Subacute or toxic maternal doses of Tl can be fatal to fetuses via placental transport. In cells, Tl+1 displaces potassium and can uncouple phosphorylation processes in mitochondria. Tl+3 disrupts protein synthesis. Low level chronic or mild Tl exposures may have latency periods before manifestations appear. Symptoms may include hair loss (varying to total alopecia), polyneuritis, sleep disturbances (dozing by day, insomnia by night), fatigue, and mental confusion.

**Selenium (Se)** is within the reference range.

**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.

**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

**Commentary**

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.