



## Toxic Element Exposure Profile; Hair

TOXIC METALS					
		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE	
				68 <sup>th</sup>	95 <sup>th</sup>
Arsenic	(As)	0.021	< 0.20		
Lead	(Pb)	0.05	< 5.0		
Mercury	(Hg)	0.10	< 3.0		
Cadmium	(Cd)	0.020	< 0.30		
Chromium	(Cr)	0.32	< 0.95		
Beryllium	(Be)	< 0.01	< 0.050		
Cobalt	(Co)	0.006	< 0.080		
Nickel	(Ni)	0.05	< 0.60		
Zinc	(Zn)	160	< 270		
Copper	(Cu)	12	< 60		
Thorium	(Th)	< 0.001	< 0.005		
Thallium	(Tl)	0.001	< 0.005		
Barium	(Ba)	0.06	< 3.0		
Cesium	(Cs)	< 0.002	< 0.010		
Manganese	(Mn)	0.08	< 1.3		
Selenium	(Se)	2.4	< 2.1		
Bismuth	(Bi)	0.052	< 5.0		
Vanadium	(V)	0.014	< 0.20		
Silver	(Ag)	< 0.006	< 0.50		
Antimony	(Sb)	< 0.01	< 0.15		
Palladium	(Pd)	< 0.004	< 0.010		
Aluminum	(Al)	1.4	< 19		
Platinum	(Pt)	< 0.003	< 0.010		
Tungsten	(W)	< 0.001	< 0.015		
Tin	(Sn)	< 0.02	< 0.80		
Uranium	(U)	0.007	< 0.20		
Gold	(Au)	< 0.003	< 0.30		
Tellurium	(Te)	< 0.05	< 0.050		
Germanium	(Ge)	0.031	< 0.045		
Titanium	(Ti)	0.05	< 1.0		
Gadolinium	(Gd)	< 0.001	< 0.008		

### SPECIMEN DATA

Method: ICP-MS

<dl: less than detection limit  
µg/g = ppm

Sample Type: Head

Sample Size: 0.198 g

Hair Color: Brown

Treatment:

Shampoo:

Metals are listed in descending priority order based upon data from the Agency for Toxic Substances and Disease Registry which considers not only the relative toxicity per gram metal, but also the frequency for occurrence of exposure.

HAIR ELEMENTS REPORT  
INTRODUCTION

Hair is an excretory tissue that concentrates potentially toxic elements. In general, the amount of an element that is irreversibly incorporated into growing hair is proportional to the level of the element that has been circulating in blood. Therefore, the Hair Toxic Element Profile provides a screening test for EXPOSURE to potentially toxic elements such as methyl mercury, arsenic, lead, and cadmium.

The Hair Toxic Element Exposure Profile considers the relative toxicity per gram element and the relative frequency of occurrence of exposure to the elements. The reported elements are listed in descending order of importance in accordance with guidelines provided by the U.S. Centers for Disease Control and Prevention. Any metal found at levels equal to or exceeding the reference value (95th percentile) will generate interpretive text for that element in the body of the report that follows.

All screening tests have limitations that must be taken into consideration. The correlation between hair element levels and physiological disorders is determined by numerous factors. Individual variability and compensatory mechanisms are major factors that affect the relationship between the distribution of elements in hair and symptoms and pathological conditions. It is also very important to keep in mind that scalp hair is vulnerable to external contamination of elements by exposure to hair treatments and products. Likewise, some hair treatments (e.g. permanent solutions, dyes, and bleach) can strip hair of endogenously acquired elements and result in false low values. Careful consideration of the limitations must be made in the interpretation of results of hair analysis. The data provided should be considered in conjunction with symptomology, occupation, diet analysis and lifestyle, physical examination and the results of other analytical laboratory tests.

Caution: The contents of this report are not intended to be diagnostic and the physician using this information is cautioned against treatment based solely on the results of this screening test.

## Selenium

Selenium (Se) is a nutritionally essential element, but it is also one of the most toxic essential elements when exposure is excessive (Modern Nutrition in Health and Disease, ed. Shils, Olson and Shike, 1994). Barring exogenous contamination (which is frequent for Se), hair Se levels accurately reflect tissue levels. Hair is subject to considerable Se contamination by some anti-dandruff shampoos.

Elevated hair Se is almost always from external contamination. One exposure to a Se containing anti-dandruff shampoo will elevate the Se levels. Similarly, sulfur containing shampoos are often contaminated with Se and can also cause artifactually high hair Se levels.

Se toxicity usually results from industrial exposure. Se is utilized in the electronics and related industries. Se is utilized in xerography, semiconductors, photoelectric cells and infrared optic materials. Se is also utilized in the manufacture of pink and red glasses, and for head-resistant red pigments in plastics, enamels, paints and inks. Se can be toxic when ingested at levels exceeding 15 times that needed for essential functions.

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Se toxicity (selenosis) can result in: interference with the metabolism of sulfur-bearing amino acids, structural changes and red pigmentation in hair and nails, garlic breath, metallic taste in the mouth, discoloration of teeth and skin, gastroenteritis, and neurological disorders. Some Se compounds have been reported to have carcinogenic activity and promote the carcinogenic effects of certain chemicals.

Confirmatory tests for Se excess are measurements of Se level in whole blood or packed red blood cells and urine. For urine Se measurement, diagnostic provocation with oral doses of N-acetylcysteine, glutathione, or DMSA may mobilize tissue Se and increase excretion (Toxicology of Metals, ed. Chang, 1996).