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LAB #: H181119-2491-1
PATIENT: Stephan Vaughan
ID: VAUGHAN-S-00160
SEX: Male
AGE: 36

CLIENT #: 31417
DOCTOR:
Rn Labs
18 / 93 Rivergate Pl
Murarrie, Qld, 4172 AUSTRALIA

Toxic & Essential Elements; Hair

TOXIC METALS

		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	1.6	< 7.0	
Antimony	(Sb)	0.022	< 0.066	
Arsenic	(As)	0.032	< 0.080	
Barium	(Ba)	0.46	< 1.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	< 0.002	< 2.0	
Cadmium	(Cd)	< 0.009	< 0.065	
Lead	(Pb)	0.29	< 0.80	
Mercury	(Hg)	0.11	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	0.006	< 0.060	
Nickel	(Ni)	0.03	< 0.20	
Silver	(Ag)	0.02	< 0.08	
Tin	(Sn)	0.11	< 0.30	
Titanium	(Ti)	0.37	< 0.60	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS

		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	366	200- 750	
Magnesium	(Mg)	62	25- 75	
Sodium	(Na)	52	20- 180	
Potassium	(K)	11	9- 80	
Copper	(Cu)	21	11- 30	
Zinc	(Zn)	180	130- 200	
Manganese	(Mn)	0.05	0.08- 0.50	
Chromium	(Cr)	0.34	0.40- 0.70	
Vanadium	(V)	0.013	0.018- 0.065	
Molybdenum	(Mo)	0.027	0.025- 0.060	
Boron	(B)	3.3	0.40- 3.0	
Iodine	(I)	0.26	0.25- 1.8	
Lithium	(Li)	0.005	0.007- 0.020	
Phosphorus	(P)	149	150- 220	
Selenium	(Se)	0.57	0.70- 1.2	
Strontium	(Sr)	0.95	0.30- 3.5	
Sulfur	(S)	46000	44000- 50000	
Cobalt	(Co)	0.006	0.004- 0.020	
Iron	(Fe)	5.8	7.0- 16	
Germanium	(Ge)	0.033	0.030- 0.040	
Rubidium	(Rb)	0.010	0.011- 0.12	
Zirconium	(Zr)	0.018	0.020- 0.44	

SPECIMEN DATA

COMMENTS:

Date Collected: **11/11/2018**
Date Received: **11/19/2018**
Date Completed: **11/23/2018**
Methodology: **ICP/MS**

Sample Size: **0.201 g**
Sample Type: **Head**
Hair Color: **Brown**
Treatment:
Shampoo: **Soap**

RATIOS

ELEMENTS	RATIOS	RANGE
Ca/Mg	5.9	4- 30
Ca/P	2.46	0.8- 8
Na/K	4.73	0.5- 10
Zn/Cu	8.57	4- 20
Zn/Cd	> 999	> 800

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HAIR ELEMENTS REPORT
INTRODUCTION

Hair is an excretory tissue for essential, nonessential and 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 in other body tissues. Therefore, hair elements analysis provides an indirect screening test for physiological excess, deficiency or maldistribution of elements in the body. Clinical research indicates that hair levels of specific elements, particularly potentially toxic elements such as cadmium, mercury, lead and arsenic, are highly correlated with pathological disorders. For such elements, levels in hair may be more indicative of body stores than the levels in blood and urine.

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, diet analysis, occupation 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. For example, copper supplementation based upon a result of low hair copper is contraindicated in patients afflicted with Wilson's Disease.

Copper Normal

Hair Copper (Cu) levels are usually indicative of body status, except that exogenous contamination may occur giving a false normal (or false high). Common sources of contamination include: permanent solutions, dyes, bleaches, and swimming pools/hot tubs in which Cu compounds have been used as algaecides.

Cu is an essential element that activates specific enzymes. Erythrocyte superoxide dismutase (SOD) is a Cu (and zinc) dependent enzyme; lysyl oxidase which catalyzes crosslinking of collagen is another Cu dependent enzyme. Adrenal catecholamine synthesis is Cu dependent, because the enzyme dopamine beta-hydroxylase, which catalyzes formation of norepinephrine from dopamine, requires Cu.

If hair Cu is in the normal range, this usually means tissue levels are in the normal range. However, under circumstances of contamination, a real Cu deficit could appear as a (false) normal. If symptoms of Cu deficiency are present, a whole blood or red blood cell elements analysis can be performed for confirmation of Cu status.

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Manganese Low

Hair Manganese (Mn) levels correlate well with Mn levels in other body tissues. Hair Mn levels are commonly low, in part due to low dietary Mn intake and the interaction of Mn with phosphates in the gut. Intestinal malabsorption also limits Mn uptake.

Mn is an essential element that is involved in energy metabolism, and bone and cartilage formation. Mn is an activator of many important enzymes including: mitochondrial superoxide dismutase, arginase, and pyruvate carboxylase.

Symptoms associated with Mn deficiency include: fatigue, lack of physical endurance, slow growth of fingernails and hair, impaired metabolism of bone and cartilage, dermatitis, weight loss, and reduced fertility. Increased allergic sensitivities and inflammation are often associated with low Mn. Seizures are occasionally reported to be associated with severe Mn deficiency.

An appropriate laboratory test to confirm Mn deficiency is whole blood elements analysis.

Chromium Low

Hair Chromium (Cr) is a good indicator of tissue levels and may provide a better indication of status than do urine or blood plasma/serum (Nielsen, F.H. In Modern Nutrition on Health and Disease; 8th Edition, 1994. Ed. Shils, Olson and Shike. Lea and Febiger, Philadelphia). Hair Cr is seldom affected by permanent solutions, dyes and bleaches.

Cr (trivalent) is generally accepted as an essential trace element that is required for maintenance of normal glucose and cholesterol levels; it potentiates insulin function, i.e., as a part of ”glucose tolerance factor”. Deficiency conditions may include hyperglycemia, transient hyper/hypoglycemia, fatigue, accelerated atherosclerogenesis, elevated LDL cholesterol, increased need for insulin and diabetes-like symptoms, and impaired stress responses. Marginal or insufficient Cr is common in the U.S., where average tissue levels are low compared to those found in many other countries. Low hair Cr appears to be associated with increased risk of cardiovascular disease and an atherogenic lipoprotein profile (low HDL, high LDL). Common causes of deficiency are ingestion of highly processed foods, inadequate soil levels of Cr, gastrointestinal dysfunction, and insufficient vitamin B-6. Cr status is also compromised in patients with iron overload/high transferrin saturation because transferrin is a major transport protein for Cr.

Confirmatory tests for Cr adequacy include glucose tolerance and packed red blood cell elements analysis.

Vanadium Low

Vanadium (V) is typically found at low levels in hair and the clinical significance of the measured result of lower than average hair V is not known. V is measured in hair for research purposes because it has been postulated to be an essential microtrace element. Indirect data to support this postulate have been derived from experimental models. Suggested functions for V include: regulation of sodium-potassium-ATPase, intracellular glutathione metabolism, thyroid metabolism, and insulin mimetic effects at pharmacological doses.

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Average dietary V intake varies considerably between 20 mcg to 2 mg. Food sources of V include: liver, fish, radishes, grains, nuts, and vegetable oils.

Boron High

Boron (B) is normally found in hair but the correlations among B absorption, and tissue and hair levels of B have yet to be determined. B has a low order of toxicity, but excessive intake induces riboflavinuria. Exogenous contamination of hair with B is possible since B is present in some soaps. B is also present in some cleaners, cements, ceramics, and glass.

Selenium Low

Selenium (Se) is normally found in hair at very low levels, and several studies provide evidence that low hair Se is reflective of dietary intake and associated with cardiovascular disorders. Utilization of hair Se levels to assess nutritional status, however, is complicated by the fact that use of Se- or sulfur-containing shampoo markedly increases hair Se (externally) and can give a false high value.

Se is an extremely important essential element due to its antioxidative function as an obligatory component of the enzyme glutathione peroxidase. Se is also protective in its capacity to bind and ”inactivate” mercury, and Se is an essential cofactor in the deiodination of T-4 to active T-3 (thyroid hormone). Some conditions of functional hypothyroidism therefore may be due to Se deficiency (Nature; 349:438-440, 1991); this is of particular concern with mercury exposure. Studies have also indicated significant inverse correlations between Se and heart disease, cancer, and asthma.

Selenium deficiency is common and can result from low dietary intake of Se or vitamin E, and exposure to toxic metals, pesticides/herbicides and chemical solvents.

Symptoms of Se deficiency are similar to that of vitamin E deficiency and include muscle aches, increased inflammatory response, loss of body weight, alopecia, listlessness, skeletal and muscular degeneration, growth stunting, and depressed immune function.

Confirmatory tests for Se deficiency are Se content of packed red blood cells, and activity of glutathione peroxidase in red blood cells.

Total Toxic Element Indication

The potentially toxic elements vary considerably with respect to their relative toxicities.
The accumulation of more than one of the most toxic elements may have synergistic adverse effects, even if the level of each individual element is not strikingly high. Therefore, we present a total toxic element ”score” which is estimated using a weighted average based upon relative toxicity. For example, the combined presence of lead and mercury will give a higher total score than that of the combination of silver and beryllium.

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