DOCTOR'S DATA INC.

LAB #: H111227-2177-1
PATIENT: Nikolay Danielov Petrov
ID: PETROV-N-00006
SEX: Male
AGE: 5

CLIENT #: 27728
DOCTOR: Anju I. Usman, MD
True Health Medical Center, Sc
603 E Diehl Rd 135
Napervlle, IL 60563 USA

1/3/12

Toxic & Essential Elements; Hair

TOXIC METALS

		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	6.1	< 8.0	
Antimony	(Sb)	0.030	< 0.066	
Arsenic	(As)	0.10	< 0.080	
Barium	(Ba)	0.08	< 0.50	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.003	< 2.0	
Cadmium	(Cd)	0.010	< 0.070	
Lead	(Pb)	1.2	< 1.0	
Mercury	(Hg)	0.15	< 0.40	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	0.055	< 0.060	
Nickel	(Ni)	0.18	< 0.20	
Silver	(Ag)	0.02	< 0.20	
Tin	(Sn)	0.15	< 0.30	
Titanium	(Ti)	0.34	< 1.0	
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS

		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Calcium	(Ca)	173	125- 370	
Magnesium	(Mg)	8	12- 30	
Sodium	(Na)	52	20- 200	
Potassium	(K)	71	12- 200	
Copper	(Cu)	9.3	11- 18	
Zinc	(Zn)	59	100- 190	
Manganese	(Mn)	0.14	0.10- 0.50	
Chromium	(Cr)	0.53	0.43- 0.80	
Vanadium	(V)	0.057	0.030- 0.10	
Molybdenum	(Mo)	0.076	0.050- 0.13	
Boron	(B)	6.7	0.70- 5.0	
Iodine	(I)	0.44	0.25- 1.3	
Lithium	(Li)	0.005	0.007- 0.020	
Phosphorus	(P)	138	150- 220	
Selenium	(Se)	0.58	0.70- 1.1	
Strontium	(Sr)	0.14	0.16- 1.0	
Sulfur	(S)	48000	45500- 53000	
Cobalt	(Co)	0.008	0.004- 0.020	
Iron	(Fe)	9.1	7.0- 16	
Germanium	(Ge)	0.035	0.030- 0.040	
Rubidium	(Rb)	0.14	0.016- 0.18	
Zirconium	(Zr)	0.032	0.040- 1.0	

SPECIMEN DATA

COMMENTS:

Date Collected: 12/22/2011
Date Received: 12/27/2011
Date Completed: 12/28/2011
Methodology: ICP/MS

Sample Size: 0.2 g
Sample Type: Head
Hair Color: Brown
Treatment:
Shampoo: Bio

RATIOS

ELEMENTS	RATIOS	RANGE
Ca/Mg	21.6	4- 30
Ca/P	1.25	0.8- 8
Na/K	0.732	0.5- 10
Zn/Cu	6.34	4- 20
Zn/Cd	> 999	> 800

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.

Arsenic High

In general, hair provides a rough estimate of exposure to Arsenic (As) absorbed from food and water. However, hair can be contaminated externally with As from air, water, dust, shampoos and soap. Inorganic As, and some organic As compounds, can be associated with toxicity. Inorganic As accumulates in hair, nails, skin, thyroid gland, bone and the gastrointestinal tract. Organic As, such as that derived from shellfish, is rapidly excreted in the urine.

As can cause malaise, muscle weakness, vomiting, diarrhea, dermatitis, and skin cancer. Long-term exposure may affect the peripheral nervous, cardiovascular and hematopoietic systems. As is a major biological antagonist to selenium.

Common sources of As are insecticides (calcium and lead arsenate), drinking water, smog, shellfish (arsenobetaine), and industrial exposure, particularly in the manufacture of electronic components (gallium arsenide).

As burden can be confirmed by urine elements analysis. Comparison of urine As levels pre and post provocation (DMPS, DMSA, D-penicillamine) permit differentiation between recent uptake and body stores.

Lead High

This individual's hair Lead (Pb) level is considered to be moderately elevated. Generally, hair is a good indicator of exposure to Pb. However, elevated levels of Pb in head hair can be an artifact of hair darkening agents, or dyes, e.g. lead acetate. Although these agents can cause exogenous contamination some transdermal absorption does occur.

Pb has neurotoxic and nephrotoxic effects in humans as well as interfering with heme biosynthesis. Pb may also affect the body's ability to utilize the essential elements calcium, magnesium, and zinc. At moderate levels of body burden, Pb may have adverse effects on memory, cognitive function, nerve conduction, and metabolism of vitamin D. Children with hair Pb levels greater than 1 µg/g have been reported to have a higher incidence of hyperactivity than those with less than 1 µg/g. Children with hair Pb levels above 3 µg/g have been reported to have more learning problems than those with less than 3 µg/g. Detoxification therapy by means of chelation results in transient increases in hair lead. Eventually, the hair Pb level will normalize after detoxification is complete.

Symptoms associated with excess Pb are somewhat nonspecific, but include: anemia, headaches, fatigue, weight loss, cognitive dysfunction and decreased coordination.

Sources of exposure to Pb include: welding, old leaded paint (chips/dust), drinking water, some fertilizers, industrial pollution, lead-glazed pottery, Ayruvedic herbs and use of firemarms.
Tests for Pb body burden are: urine elements analysis following provocation with intravenous Ca-EDTA, or oral DMSA. Whole blood analysis for Pb reflects recent or ongoing exposures and does not correlate well with total body burden.

Magnesium Low

Low hair Magnesium (Mg) levels may be indicative of Mg deficiency, but this has not been unequivocally demonstrated. When hair Mg is low, dietary intake and malabsorption should be considered. Mg is an essential element/electrolyte that is necessary for the activity of many important enzymes. Low hair Mg may or may not be associated with physiological dysfunction.

Causes of Mg deficiency include: consumption of a "junk food" diet or Mg-deficient foods, intestinal malabsorption, hypocalcemia with decreased Mg retention, chemical toxicity with renal wasting, alcoholism, alkalosis, prolonged diarrhea/laxative abuse, and iatrogenic causes (digoxin therapy, occasionally from oral contraceptives, hypercalcemic drugs, gentamicin, neomycin).

Symptoms of Mg deficiency include: muscle twitching, cramps, tremor or muscle spasms, paresthesia, and mental depression. Low Mg status is associated with arrythmias and increased cardiovascular risk.

Mg status can be difficult to assess; whole blood and packed red cell levels are more indicative than serum/plasma levels. Amino acid analysis can be helpful in showing rate-limited steps that are Mg-dependent such as phosphorylations. Taurine deficiency is often associated with urinary loss of Mg. The Mg challenge method may be indicative: baseline 24-hour urine Mg measurement, followed by 0.2 mEq/Kg intravenous mg, followed by 24-hour Mg measurement. A deficiency is judged to be present if less than 80% of the administrered Mg is excreted in the urine.

Copper Low

Hair Copper (Cu) levels are usually indicative of body status with two exceptions: (1) addition of exogenous Cu (occasionally found in hair preparations or algaecides in swimming pools/hot tubs), and (2) low hair Cu in Wilson's or Menkes' diseases. In Wilson's disease, Cu transport is defective and Cu accumulates, sometimes to toxic levels, in intestinal mucosa, liver and kidneys. At the same time, it is low in hair and deficient in other peripheral tissues. In Menkes' disease, the activity of Cu dependent enzymes is very low. Cu supplementation is contraindicated in these diseases.

Cu is an essential element that is required for the activity of certain 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.

Symptoms of Cu deficiency include: elevated cholesterol, increased inflammatory responses, anemia, bone and collagen disorders, reproductive failure, and impaired immunity. Possible reasons for a Cu deficiency include: intestinal malabsorption, insufficient dietary intake, use of oral contraceptives, molybdenum excess, zinc excess, and chelation therapy. Cu status is adversely affected by excess of antagonistic metals such as mercury, lead, cadmium, and manganese.

Confirmatory tests for Cu deficiency are serum ceruloplasmin to rule out Wilson's disease (ceruloplasmin is deficient in Wilson's disease), a whole blood or packed red blood cell elements analysis, and a functional test for Cu (barring zinc deficiency) is measurement of erythrocytes SOD activity. Erythrocyte SOD activity is subnormal with Cu deficiency.

Zinc Low

A result of low hair Zinc (Zn) is very likely to be indicative of low Zn in whole blood, red blood cells, and other tissues. Hair analysis is a good screen for Zn deficiency provided that the hair sample has not been chemically treated (permanent solutions, dyes, and bleaches); such hair treatments can significantly lower the level of Zn in hair.

Zn is an essential element that is required in numerous biochemical processes including protein, nucleic acid and energy metabolism. Zn is an obligatory co-factor for numerous enzymes including alcohol dehydrogenase, carbonic anhydrase, and superoxide dismutase.

Zn competes for absorption with copper and iron. Cadmium, lead and mercury are potent Zn antagonists. Zn deficiency can be caused by malabsorption, chelating agents, poor diet, excessive use of alcohol or diuretics, metabolic disorder of metallothionein metabolism, surgery, and burns. Hair levels of Zn (copper and selenium) were decreased in human subjects after switching from a mixed to a lactovegetarian diet (Am. J. Clin. Nutr.; 55:885-90,1992).

Hair Zn is commonly low in diabetics, and in association with ADD/ADHD and autism (DDI observation). Reported symptoms of Zn deficiency include: fatigue, apathy, hypochlorhydria, decreased vision and dysgeusia, anorexia, anemia, dermatitis, weak/brittle nails and hair, white spots on nails, alopecia, impaired would healing, sexual dysfunction (males), and hypogonadism.

Other laboratory tests to confirm Zn status are whole blood or packed red blood cell elements analysis, and urine amino acid analysis (Zn dependent peptidase activity).

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.