HAIR ELEMENTS

DOCTOR'S DATA INC.

LAB#: H070227-0256-1
PATIENT: Bill Asenjo
SEX: Male
AGE: 58

CLIENT#: 24237
DOCTOR: Justin Caulfield, MD
Direct Laboratory Services
300 Mariners Plaza #320
Mandeville , LA 70448

POTENTIALLY TOXIC ELEMENTS

TOXIC ELEMENTS	RESULT µg/g	REFERENCE RANGE
Aluminum	**2.9**	< 7.0
Antimony	**0.018**	< 0.066
Arsenic	**0.092**	< 0.080
Beryllium	**< 0.01**	< 0.020
Bismuth	**0.022**	< 0.060
Cadmium	**0.077**	< 0.15
Lead	**1.3**	< 2.0
Mercury	**0.36**	< 1.1
Platinum	**< 0.003**	< 0.005
Thallium	**< 0.001**	< 0.010
Thorium	**< 0.001**	< 0.005
Uranium	**0.019**	< 0.060
Nickel	**0.16**	< 0.40
Silver	**0.03**	< 0.12
Tin	**0.06**	< 0.30
Titanium	**0.62**	< 1.0
Total Toxic Representation		

PERCENTILE: 68th, 95th

ESSENTIAL AND OTHER ELEMENTS

ELEMENTS	RESULT µg/g	REFERENCE RANGE
Calcium	**1040**	200- 750
Magnesium	**73**	25- 75
Sodium	**32**	12- 90
Potassium	**13**	9- 40
Copper	**26**	10- 28
Zinc	**290**	130- 200
Manganese	**0.18**	0.15- 0.65
Chromium	**0.57**	0.20- 0.40
Vanadium	**0.048**	0.018- 0.065
Molybdenum	**0.095**	0.025- 0.064
Boron	**5.9**	0.40- 3.0
Iodine	**0.52**	0.25- 1.3
Lithium	**0.014**	0.007- 0.023
Phosphorus	**201**	160- 250
Selenium	**1.2**	0.95- 1.7
Strontium	**12**	0.30- 3.5
Sulfur	**48000**	44500- 52000
Barium	**0.27**	0.16- 1.6
Cobalt	**0.009**	0.013- 0.035
Iron	**12**	5.4- 13
Germanium	**0.051**	0.045- 0.065
Rubidium	**0.009**	0.011- 0.12
Zirconium	**0.24**	0.020- 0.44

PERCENTILE: 2.5th, 16th, 50th, 84th, 97.5th

SPECIMEN DATA

COMMENTS:

Date Collected: **2/22/2007**
Date Received: **2/27/2007**
Date Completed: **3/5/2007**
Methodology: **ICP-MS**

Sample Size: **0.131 g**
Sample Type: **Head**
Hair Color: **Brown**
Treatment:
Shampoo: **Suave**

V06.99

RATIOS

ELEMENTS	RATIOS	EXPECTED RANGE
Ca/Mg	**14.2**	4- 30
Ca/P	**5.17**	0.8- 8
Na/K	**2.46**	0.5- 10
Zn/Cu	**11.2**	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 cause toxicity. Some research suggests that As may be essential at extremely low levels but its function is not understood. Inorganic As accumulates in hair, nails, skin, thyroid gland, bone and the gastrointestinal tract. Organic As 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), well 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.

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.

Zinc High

A result of high hair Zinc (Zn) may be indicative of low Zn in cells, and functional Zn deficiency. Zn can be displaced from proteins such as intracellular metallothionein by other metals, particularly cadmium, lead, copper, and mercury (Toxicology of Metals, 1994), resulting in paradoxically elevated hair Zn. Zn may also be high in hair as a result of the use of Zn-containing anti-dandruff shampoo. Rough or dry, flaky skin is a symptom of Zn deficiency, so it is not uncommon for Zn deficient patients to use an anti-dandruff shampoo. A result of high hair Zn warrants further testing to assess Zn status.

Zn is an essential element that is required in many very important biological processes. However, Zn can be toxic if exposure is excessive. Although very uncommon, high hair Zn might be indicative of Zn overload which could result from Zn contaminated water (galvanized pipes), welding or gross, chronic over-supplementation (100 mg/day). Other sources of Zn include: manufacture of brass, bronze, white paint, and pesticide production. Symptoms of Zn excess include: gastrointestinal disorders, decreased heme synthesis (copper deficiency), tachycardia, blurred vision, and hypothermia.

Confirmatory tests for Zn status are whole blood or packed red blood cell elements analysis, urine amino acid analysis, and serum ceruloplasmin (low with Zn induced copper deficiency).

Chromium High

A high hair Chromium (Cr) level is likely to indicate excess exposure to Cr. Hair Cr levels do not appear to be affected by permanent solutions, dyes, or bleaches, but external contamination is possible.

Trivalent Cr is considered to be an essential trace element with a low order of toxicity. Cr toxicity via oral ingestion is not likely. However, it is noteworthy that self-supplementation has been reported to be associated with insomnia and increased unpleasant dream activity in some individuals (J. Nutr. Med.; 3(43), 1992).

In contrast, hexavalent Cr compounds are considerably more toxic and are primarily absorbed via inhalation as a result of industrial exposure. Industrial exposure to high amounts of Cr has been reported to be associated with allergic dermatitis, skin ulcers, bronchitis, and lung carcinoma. Elevated hair Cr levels have also been observed in patients with cerebral thrombosis and cerebral hemorrhage.

Sources of exposure to hexavalent Cr include: manufacture and use of ferrochromium and stainless steel, wood finishing and leather tanning industries, and handling of cement.

Tests to confirm excess exposure to Cr include analysis of Cr in plasma (trivalent) versus packed red blood cells (hexavalent); both analyses are more indicative of recent exposure than of body burden. A urine elements analysis will confirm recent exposure and serum hyaluronidase activity is reported to be elevated with excessive exposure to Cr.

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.

Based upon experience at Doctor's Data, B is frequently high in hair in association with high levels of potentially toxic elements (i.e. lead, mercury, cadmium) and exposure to toxic chemicals.

Strontium High

Hair usually reflects the body burden of Strontium (Sr), and Sr levels usually correlate with calcium levels in body tissue. However, hair levels of Sr can be raised by external contamination, usually from hair treatment products. Elevated Sr in hair treated with permanent solutions, dyes, or bleaches is likely to be an artifact of hair treatment and probably does not reflect the level of Sr in other tissues.

Diseases of excess Sr have not been reported, except for Sr rickets. In general, Sr excess is not of clinical concern in the U.S. It's bad reputation comes from it's radioactive isotopes which were widespread in the western U.S. as a result of nuclear testing in the 1950's. Stable Sr (not radioactive Sr) is measured and reported by DDI.

Other tests indicative of Sr status or excess are measurements of Sr in whole blood, Sr/calcium ratio in blood, and Sr in urine.

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.