HAIR ELEMENTS

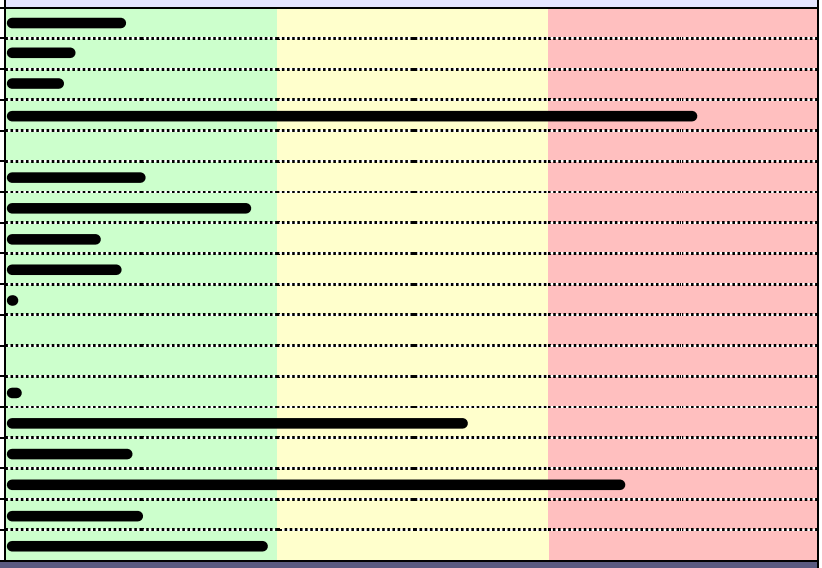
DOCTOR'S DATA INC.

LAB#: H000000-0000-0
PATIENT: Sample Patient
ID: PATIENT-S-00003
SEX: Female
AGE: 86

CLIENT#: 12345
DOCTOR:
Doctors Data, Inc.
3755 Illinois Ave.
St. Charles, IL 60174

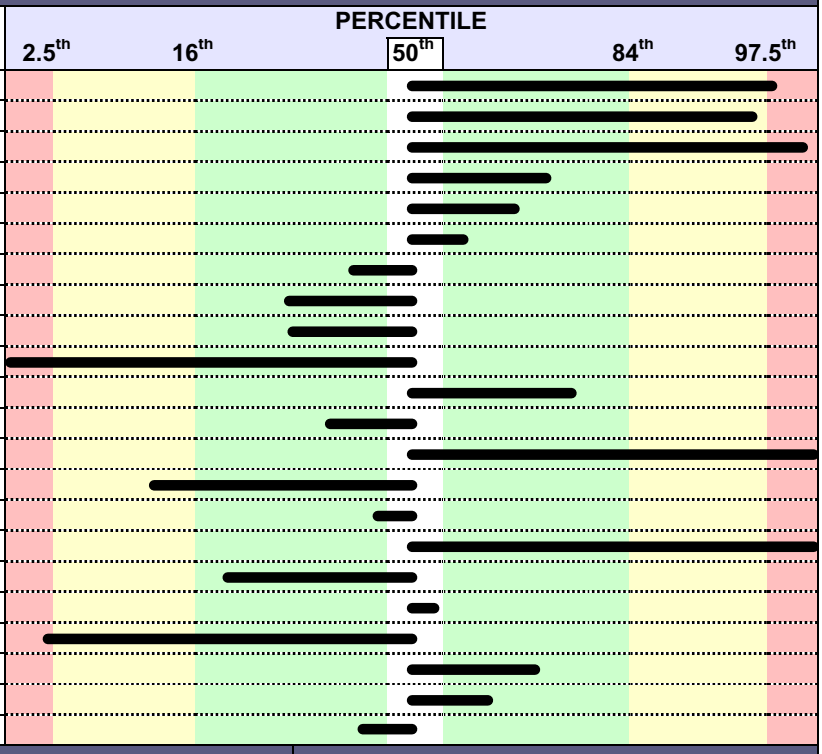
POTENTIALLY TOXIC ELEMENTS

TOXIC ELEMENTS	RESULT µg/g	REFERENCE RANGE
Aluminum	3.0	< 7.0
Antimony	0.019	< 0.050
Arsenic	0.019	< 0.060
Barium	15	< 2.0
Beryllium	< 0.01	< 0.020
Bismuth	0.99	< 2.0
Cadmium	0.046	< 0.050
Lead	0.20	< 0.60
Mercury	0.34	< 0.80
Platinum	0.003	< 0.005
Thallium	< 0.001	< 0.002
Thorium	< 0.001	< 0.002
Uranium	0.002	< 0.060
Nickel	0.83	< 0.30
Silver	0.07	< 0.15
Tin	2.0	< 0.30
Titanium	0.36	< 0.70
Total Toxic Representation		



ESSENTIAL AND OTHER ELEMENTS

ELEMENTS	RESULT µg/g	REFERENCE RANGE
Calcium	3050	300- 1200
Magnesium	310	35- 120
Sodium	700	20- 250
Potassium	55	8- 75
Copper	27	11- 37
Zinc	190	140- 220
Manganese	0.13	0.08- 0.60
Chromium	0.44	0.40- 0.65
Vanadium	0.023	0.018- 0.065
Molybdenum	0.010	0.020- 0.050
Boron	1.3	0.25- 1.5
Iodine	0.43	0.25- 1.8
Lithium	0.17	0.007- 0.020
Phosphorus	143	150- 220
Selenium	0.80	0.55- 1.1
Strontium	50	0.50- 7.6
Sulfur	44300	44000- 50000
Cobalt	0.015	0.005- 0.040
Iron	3.5	7.0- 16
Germanium	0.038	0.030- 0.040
Rubidium	0.050	0.007- 0.096
Zirconium	0.058	0.020- 0.42



SPECIMEN DATA

COMMENTS:

Date Collected: 1/31/2009
Date Received: 2/2/2009
Date Completed: 2/4/2009
Client Reference:
Methodology: ICP-MS

Sample Size: 0.195 g
Sample Type: Head
Hair Color: Gray
Treatment:
Shampoo: Pantene

V010.08

RATIOS

ELEMENTS	RATIOS	EXPECTED RANGE
Ca/Mg	9.84	4- 30
Ca/P	21.3	1- 12
Na/K	12.7	0.5- 10
Zn/Cu	7.04	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.

Nickel

Hair is a reasonable tissue for monitoring accumulated body stores of Nickel (Ni). However, hair is commonly contaminated with Ni from hair treatments and dyes. When hair Ni is measured at more than .6 ppm, the possible use of hair dyes or colorings should be investigated before concluding that excessive Ni is present.

There is substantial evidence that Ni is an essential element which is required in extremely low amounts. However, excess Ni has been well established to be nephrotoxic, and carcinogenic. Elevated Ni is often found in individuals who work in the electronic and plating, mining, and steel manufacture industries. A cigarette typically contains from 2 to 6 mcg of Ni; Ni is absorbed more efficiently in the lungs than in the gastrointestinal tract. Symptoms of chronic Ni exposure include dermatitis, chronic rhinitis, and hypersensitivity reactions. Ni can hypersensitize the immune system, subsequently causing hyperallergenic responses to many different substances.

Symptoms of Ni toxicity are dermatitis and pulmonary inflammation (following exposure to Ni dust, smoke). Long term or chronic Ni toxicity may lead to liver necrosis and carcinoma.

A confirmatory test for elevated Ni is the measurement of urine Ni before and after administration of chelating agents that mobilize Ni i.e., D-penicillamine, EDTA.

Tin High

Hair Tin (Sn) levels have been found to correlate with environmental exposure. Depending on chemical form, Sn is a potentially toxic element. Inorganic Sn has a low degree of toxicity, while organic Sn has appreciable toxicity.

The main source of Sn is food. Other possible sources are: dental amalgams, cosmetics, preservatives, food and beverage containers, pewter, bronze, and anticorrosive platings. Symptoms of excess Sn include: skin, eye, and GI tract irritation, muscle weakness, anemia, and testicular degeneration.

A confirmatory test for excessive accumulation of Sn is the measurement of Sn in urine before and after provocation with a chelation/complexing agent.

Calcium High

Hair Calcium (Ca) levels have been correlated with nutritional intake, several disease syndromes, and metabolic disorders. However, hair Ca is sensitive to contamination by permanent solutions, dyes or bleaching. If hair has been treated, the reported Ca level is likely to be artifactually high and not indicative of Ca status or metabolism.

When external contamination is ruled out, elevated Ca is most often interpreted as a maldistribution of Ca. Rarely is elevated hair Ca indicative of excess dietary Ca. However, overzealous supplementation is possible. A high result for hair Ca is more likely to be indicative of an inappropriately low ratio of dietary Ca : phosphorus. Conditions associated with elevated hair Ca include but are not limited to: hyperparathyroidism, osteoporosis, excess dietary Ca or protein, excess vitamins A and/or D, phosphorus/magnesium/calcium imbalance (assessed by whole blood element analysis), hypoglycemia, hormonal imbalances, and metabolic disorders.

Hair analysis is not the preferred way to assess body Ca stores. Ca status should be assessed through: dietary analysis, whole blood or serum Ca level, vitamin A and D levels, blood concentrations of other electrolytes (sodium, magnesium, potassium), parathyroid hormone determinations, and bone density measurement.

Magnesium High

Magnesium (Mg) is an essential element with both electrolyte and enzyme-activator functions. However, neither of these functions takes place in hair. Body excess of Mg is rare but may occur from excessive oral or parenteral supplementation or as a result of renal damage or insufficiency.

If one rules out external contamination of hair as a result of recent hair treatment, elevated hair Mg is more likely to indicate maldistribution of the element. Physiological Mg dysfunction may or may not be present. Maldistribution of Mg can occur as a result of chronic emotional or physical stress, toxic metal or chemical exposure, physiological imbalance of calcium and phosphorus, bone mineral depletion, and renal insufficiency with poor clearance of Mg (and other metabolites). Elevated hair Mg has been correlated with hypoglycemia and an inappropriately low ratio of dietary Ca : P.

Mg status can be difficult to assess; whole blood and packed blood red cell Mg levels are more indicative than serum/plasma levels Amino acid analysis can be helpful in showing rate-limited steps that are Mg-dependent (e.g. phosphorylations).

Sodium High

Sodium (Na) is an essential element with extracellular electrolyte functions. However, these functions do not occur in hair. Hair Na measurement should be considered a screening test only; blood testing for Na and electrolyte levels is much more diagnostic and indicative of status. High hair Na may have no clinical significance or it may be the result of an electrolyte imbalance. A possible imbalance for which high hair Na is a consistent finding is adrenocortical hyperactivity. In this condition, blood Na is elevated while potassium is low. Potassium is elevated (wasted) in the urine. Observations at DDI indicate that Na and potassium levels in hair are commonly high in association with elevated levels of potentially toxic elements. The elevated Na and potassium levels are frequently concomitant with low levels of calcium and magnesium in hair. This apparent phenomenon requires further investigation.

Appropriate tests for Na status as an electrolyte are measurements of Na in whole blood and urine, and measurements of adrenocortical function.

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.

Iron Low

Hair Iron (Fe) levels do not correlate with Fe assimilation as determined by serum ferritin, Fe binding capacity, or transferrin saturation. A very low hair Fe result should be viewed only as possible indication for further tests because hair is only a screening test for this element. Fe supplementation is not indicated nor recommended solely on the basis of the measured hair Fe level. Unwarranted Fe supplementation, particularly in combination with ascorbic acid, can result in Fe overload. A large body of scientific literature indicates significant relationships between dietary Fe overload and heart disease, cancer, diabetes, osteoporosis, and arthritis. (Biochem. Mol. Med.; 54(1):1-11, 1995)

Molybdenum Low

Low Molybdenum (Mo) in hair is a possible indication of Mo deficiency. Hair is very rarely contaminated with exogenous Mo.

Mo is an essential trace element that is an activator of specific enzymes such as: xanthine oxidase (catalyzes formation of uric acid), sulfite oxidase (catalyzes oxidation of sulfite to sulfate), and aldehyde dehydrogenase (catalyzes oxidation of aldehydes). Possible effects or symptoms consistent with Mo deficiency are: subnormal uric acid in blood and urine, sensitivity or reactivity to sulfites, protein intolerance (specifically to sulfur-bearing amino acids), and sensitivity or reactivity to aldehydes.

True Mo deficiency is uncommon but may result from: a poor-quality diet, gastrointestinal dysfunctions, or tungsten exposure. Tungsten (from "TIG" welding) can be a powerful antagonist of Mo retention in the body. Copper overload can also reduce Mo retention.

Because normal blood and blood cell Mo levels are very low (a few parts per billion), blood measurement is not an appropriate tissue for confirmation of subnormal molybdenum.

Confirmatory tests for Mo deficiency include measurement of urine sulfite concentration (increased in Mo deficiency), measurement of blood/urine uric acid level (decreased in Mo deficiency), and measurement of urinary Mo content.

Lithium High

Lithium (Li) is normally found in the hair at very low levels. Hair Li levels correlate with high dosage of Li carbonate in patients treated for Affective Disorders. Li occurs almost universally at low concentrations in water and in plant and animal food products. Li is used in the manufacture of lightweight metal alloys, glass, lubrication greases, and batteries.

Li at low levels may have essential functions in humans. Intracellularly, it slows the conversion of phosphorylated inositol to free inositol. In the nervous system, this moderates neuronal excitability. Li also influences monamine neurotransmitter concentrations at the synapse (this function is increased when Li is used therapeutically for mania or bipolar illness).

Li, when ingested in excessive quantities, may cause dermatitis, nausea, confusion, edema, or hypotension. Li toxicity may be more pronounced with low sodium intake. Li may compete for calcium and magnesium binding sites on biological ligands. Li at levels above two standard deviations does not necessarily constitute Li toxicity. Confirmation of excess Li levels may be obtained from blood plasma/serum levels if the uptake /exposure is recent or chronic. Point-in-time Li doses are rapidly excreted in urine, and blood analysis may not be indicative after 5 to 7 days.

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.

Barium High

Hair may be used for biological monitoring of barium (Ba) exposure. Exogenous contamination has been observed from bath water containing Ba. Elevated levels of hair Ba are often observed as a result of exposure to Ba for diagnostic medical tests.

Elevated levels of Ba may interfere with calcium metabolism and displace potassium. Very high retention of Ba can result in increased stress hormone levels (eg. catecholamines, and may cause ventricular fibrillation, bronchioconstriction, and swelling of the brain and testis. Chronic ingestion of Ba at elevated levels may be manifested by muscular and myocardial stimulation, tingling in the extremities, and loss of tendon reflexes.

Undesirable exposure to Ba may be associated with contaminated water (DDI Water Analysis), air or soil. Ba has been used in rodenticides and insecticides, and is used for medical testing (barium enemas). Mining and refining coal and combustion of coal and oil emit Ba. Mine-tailings and masonry products made from such can be a significant source of Ba to individuals producing or working with them (e.g. reconstruction, demolition). Arc-welding, metal fabrication, occupational work with fireworks can be associated with abnormal exposure to Ba.

The main dietary sources of Ba are milk, flour, potatoes and some types of nuts.

A confirmatory test for elevated Ba is measurement of blood electrolytes; hypokalemia may be associated with elevated Ba. There are no known chelating agents that are effective for use as a provocation agent for excessive Ba retention. Sweat analysis indicates that sauna therapy may increase excretion of Ba (DDI, unpublished.)

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.