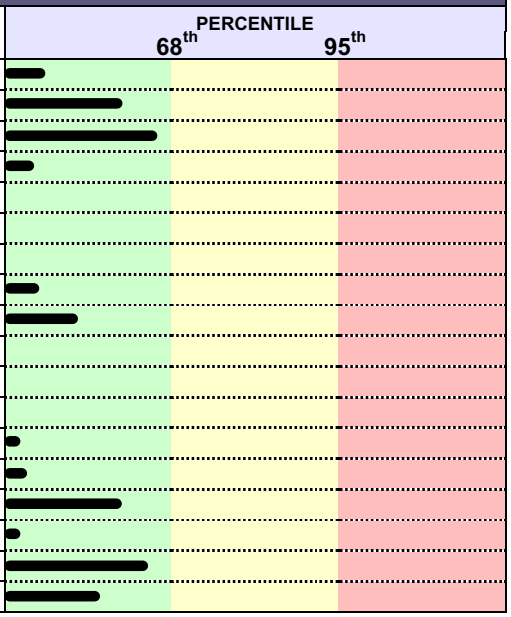
LAB #: H160429-2246-1
PATIENT: Franklin C. Cook
ID: COOK-F-00244
SEX: Male
AGE: 72

CLIENT #: 26339
DOCTOR:
Cellphysics.Org
1537 Jarrettsville Rd
Jarrettsville, MD 21084 U.S.A.

Toxic & Essential Elements; Hair

TOXIC METALS

		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	2.4	< 12
Antimony	(Sb)	0.058	< 0.080
Arsenic	(As)	0.11	< 0.12
Barium	(Ba)	0.22	< 1.5
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	< 0.002	< 2.0
Cadmium	(Cd)	< 0.009	< 0.065
Lead	(Pb)	0.24	< 1.5
Mercury	(Hg)	0.34	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	< 0.001	< 0.002
Uranium	(U)	0.003	< 0.060
Nickel	(Ni)	0.04	< 0.40
Silver	(Ag)	0.07	< 0.10
Tin	(Sn)	0.03	< 0.30
Titanium	(Ti)	0.60	< 0.70
Total Toxic Representation			



ESSENTIAL AND OTHER ELEMENTS

		RESULT µg/g	REFERENCE INTERVAL
Calcium	(Ca)	251	375- 1100
Magnesium	(Mg)	48	40- 140
Sodium	(Na)	280	60- 400
Potassium	(K)	200	28- 160
Copper	(Cu)	12	11- 32
Zinc	(Zn)	130	120- 200
Manganese	(Mn)	0.19	0.15- 0.65
Chromium	(Cr)	0.40	0.40- 0.70
Vanadium	(V)	0.036	0.018- 0.065
Molybdenum	(Mo)	0.039	0.040- 0.080
Boron	(B)	3.4	0.40- 2.5
Iodine	(I)	1.8	0.25- 1.8
Lithium	(Li)	0.098	0.008- 0.030
Phosphorus	(P)	305	200- 300
Selenium	(Se)	1.3	0.80- 1.3
Strontium	(Sr)	0.65	1.0- 6.0
Sulfur	(S)	42800	41000- 47000
Cobalt	(Co)	0.004	0.006- 0.035
Iron	(Fe)	5.6	7.0- 16
Germanium	(Ge)	0.028	0.030- 0.040
Rubidium	(Rb)	0.23	0.030- 0.25
Zirconium	(Zr)	0.007	0.040- 1.0

SPECIMEN DATA

COMMENTS:

Date Collected: **04/17/2016**
Date Received: **04/29/2016**
Date Completed: **04/30/2016**
Methodology: **ICP/MS**

Sample Size: **0.198 g**
Sample Type: **Pubic**
Hair Color: **Brown**
Treatment:
Shampoo: **Sappo Hill**

RATIOS

ELEMENTS	RATIOS	RANGE
Ca/Mg	5.23	4- 30
Ca/P	0.823	0.8- 8
Na/K	1.4	0.5- 10
Zn/Cu	10.8	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.

Pubic Hair Specimens

Pubic hair and scalp hair are very different tissues with respect to protein and chemical composition, and rate of growth. The levels of most nutrients elements in pubic and scalp hair for a given individual are typically quite different. Although we do have reference ranges for nutrient elements in pubic hair specimens, there is a lack of clinical data to support sound interpretation at this time. For the potentially toxic elements, however, there appears to be good correlation between scalp and pubic hair. Some clinicians utilize pubic hair for toxic element analyze, (a) to confirm results from scalp hair, and/or (b) when scalp hair has been recently treated with dye or permanent and bleaching reagents.

Calcium Low

Hair Calcium (Ca) levels have been correlated with nutritional intake, several disease syndromes, and metabolic disorders. Interpretation of low hair Ca levels is difficult and other variables need to be considered.

Ca is the most abundant element in the body. Although most Ca is contained in the skeletal system, Ca is actively involved in muscle contraction, the nervous system, hormone secretion, and immunological responses.

Causes of Ca deficiency include but are not limited to inadequate dietary Ca, protein or vitamin D, excess dietary phosphorus and malabsorption. Malabsorption is likely if other essential elements such as magnesium, cobalt, manganese, and chromium are also at low levels in hair. Other factors associated with poor Ca status include physical inactivity, chronic stress, hormonal imbalance, aluminum containing antacids, chronic use of diuretics or laxatives, high alcohol intake, and exposure to toxic elements (e.g. lead, cadmium).

Symptoms of Ca deficiency include: muscle cramps or tetany, myalgia, and skeletal pain. Chronic Ca deficiency (or negative balance) results in osteoporosis.

Hair is vulnerable to external contamination by Ca as a result of hair treatments (permanent solutions, dyes, bleach). Other means to assess Ca status include: dietary assessment, whole blood elements analysis, and measurement of bone density, serum vitamin D-3, and parathyroid hormone.

Potassium High

High hair Potassium (K) is not necessarily reflective of dietary intake or nutrient status. However, elevated K may be reflective of metabolic disorders associated with exposure to potentially toxic elements.

K is an electrolyte and a potentiator of enzyme functions, but neither of these functions take place in hair. Elevated K in hair may reflect overall retention of K by the body or maldistribution of this element. In adrenocortical insufficiency, K is increased in blood, while it is decreased in urine; cellular K may or may not be increased. Also, hair is occasionally contaminated with K from some shampoos. Observations at DDI indicate that K and sodium levels in hair are commonly high in association with toxic element burden. The elevated K and sodium levels are often concomitant with low levels of calcium and magnesium in hair. This apparent phenomena requires further investigation.

Elevated hair potassium should be viewed as a screening test. Appropriate tests for excess body K include measurements of packed red blood cell K; serum or whole blood K and sodium/K ratio, measurement of urine K and sodium/K ratio; and an assessment 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.

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.

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.

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.