HAIR ELEMENTS

DOCTOR'S DATA INC

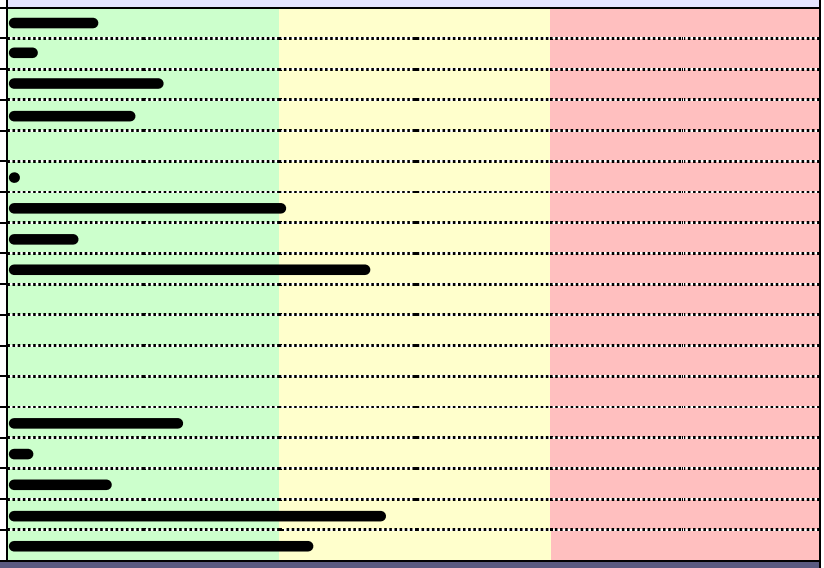
LAB#: H090828-2591-1
PATIENT: Sample
ID: LI-Y-00388
SEX: Male
AGE: 55

CLIENT#: 26743
DOCTOR: Sample, MD
Gilgal Healthcare Co Ltd
2f, No 7, Alley 3, Lane 71, Sec 1, Shihpai Rd Beitou Di
Taipei City, 112, TAIWAN

POTENTIALLY TOXIC ELEMENTS

TOXIC ELEMENTS	RESULT µg/g	REFERENCE RANGE
Aluminum	2.2	< 7.0
Antimony	0.014	< 0.066
Arsenic	0.049	< 0.080
Barium	0.47	< 1.0
Beryllium	< 0.01	< 0.020
Bismuth	0.008	< 2.0
Cadmium	0.072	< 0.065
Lead	0.19	< 0.80
Mercury	1.6	< 0.80
Platinum	< 0.003	< 0.005
Thallium	< 0.001	< 0.002
Thorium	< 0.001	< 0.002
Uranium	< 0.001	< 0.060
Nickel	0.13	< 0.20
Silver	0.01	< 0.08
Tin	0.12	< 0.30
Titanium	0.77	< 0.60
Total Toxic Representation		

PERCENTILE: 68th, 95th



ESSENTIAL AND OTHER ELEMENTS

ELEMENTS	RESULT µg/g	REFERENCE RANGE
Calcium	641	200- 750
Magnesium	86	25- 75
Sodium	160	20- 180
Potassium	29	9- 80
Copper	10	11- 30
Zinc	200	130- 200
Manganese	0.12	0.08- 0.50
Chromium	0.40	0.40- 0.70
Vanadium	0.025	0.018- 0.065
Molybdenum	0.035	0.025- 0.060
Boron	2.3	0.40- 3.0
Iodine	0.33	0.25- 1.8
Lithium	0.008	0.007- 0.020
Phosphorus	277	150- 220
Selenium	0.92	0.70- 1.2
Strontium	1.3	0.30- 3.5
Sulfur	46600	44000- 50000
Cobalt	0.006	0.004- 0.020
Iron	6.8	7.0- 16
Germanium	0.024	0.030- 0.040
Rubidium	0.030	0.011- 0.12
Zirconium	0.014	0.020- 0.44

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

SPECIMEN DATA

COMMENTS:

Date Collected: **8/21/2009**
Date Received: **8/28/2009**
Date Completed: **8/29/2009**
Client Reference:
Methodology: **ICP-MS**

Sample Size: **0.2 g**
Sample Type: **Head**
Hair Color: **Black**
Treatment: **Dye**
Shampoo:

V010.08

RATIOS

ELEMENTS	RATIOS	EXPECTED RANGE
Ca/Mg	7.45	4- 30
Ca/P	2.31	0.8- 8
Na/K	5.52	0.5- 10
Zn/Cu	20	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.

Cadmium high

Hair Cadmium (Cd) levels provide an excellent indication of body burden. Cd is a toxic heavy metal that has no metabolic function in the body. Moderately high Cd levels, about 4-8 µg/g, may be associated with hypertension, while very severe Cd toxicity may cause hypotension. Cd adversely affects the kidneys, lungs, testes, arterial walls, and bones and interferes with many enzymatic reactions. Chronic Cd excess can lead to microcytic, hypochromic anemia and proteinuria with loss of beta-2-microglobin, and functional zinc deficiency. Cd excess is also commonly associated with fatigue, weight loss, osteomalacia, and lumbar pain.

Cd absorption is reduced by zinc, calcium, and selenium. Cd is found in varying amounts in foods, from .04 µg/g for some fruits to 3-5 µg/g in some oysters and anchovies. Cigarette smoking significantly increases Cd intake. Refined carbohydrates have very little zinc in relation to the Cd.

If hair zinc is not abnormal, external contamination may have caused the elevated hair Cd level. Exogenous contamination may come from permanent solutions, dyes, bleach, and some hair sprays. A confirming test for elevated body burden of Cd is urine analysis following administration of appropriate chelating agents: EDTA, sulfhydryl agents (DMSA, D-penicillamine, DMPS).

Mercury High

Hair mercury (Hg) is an excellent indiator of exposure to Hg, particularly organic Hg derived from fish. Mercury is toxic to humans and animals. Individuals vary greatly in sensitivity and tolerance to Hg burden.

At hair levels below 3 µg/g, Hg can suppress biological selenium function and may cause or contribute to immune dysregulation in sensitive individuals. Hallmark symptoms of excess Hg include: loss of appetite, decreased senses of touch, hearing, and vision, fatigue, depression, emotional instability, peripheral numbness and tremors, poor memory and cognitive dysfunction, and neuromuscular disorders. Hair Hg has been reported to correlate with acute myocardial infarction and on average each 1 µg/g of hair Hg was found to correlate with a 9% increase in AMI risk (Circulation 1995; 91:645-655).

Sources of Hg include dental amalgams, fish, water supplies, some hemorrhoidal preparations, skin lightening agents, instruments (thermometers, electrodes, batteries), and combustion of fossil fuels, some fertilizers, and the paper/pulp and gold industries. After dental amalgams are installed or removed a transient (several months) increase in hair Hg is observed. Also, ”baseline” hair Hg levels for individuals with dental amalgams are higher (about 1 to 2 µg/g) than are baseline levels for those without (below 1 µg/g).

Confirmatory tests for elevated Hg are measurement of whole blood as an indication of recent/ongoing exposure (does not correlate with whole body accumulation) and measurement of urine Hg before and after administration of a dithiol metal binding agent such as DMSA or DMPS (an indication of total body burden).

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).

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.

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.

完整醫療領航員美國Doctor's Data Inc. 功能醫學檢測

頭髮元素檢測(Hair Elements Analysis)		
醫院/診所：吉甲科技		醫師：醫師姓名(Doctor's name)
姓名：範 例(SAMPLE)	性別：	出生日期：1954-02-20
檢體編號：H090828-2591-1		年齡：55
備註：		

頭髮元素分析介紹

頭髮是一種可排出必需、不必需及具潛在毒性元素之組織。概括來說，當某元素與生長中的毛髮不可逆地結合時，其髮內含量與身體其他組織中的元素含量是成比例的。因此，毛髮元素分析可間接篩檢測試出人體內元素過剩、缺乏或分佈不良的狀況。臨床研究顯示髮內特定元素的含量，特別是具潛在毒性的元素如鎘、汞、鉛及砷等，與疾病高度地相關。對此類元素而言，髮內含量比血液與尿液中含量為更能代表體內的存量。

所有篩檢測試都有限制必須納入考量。頭髮元素含量與生理異常的相關性取決於眾多因素。個別的變異性及代償機制，是影響髮內元素分佈與症狀病理狀況之間相關性的主要因素。另外也很重要需銘記在心的是，頭髮較易因接觸整髮相關產品而受到外在元素的污染。同樣地，有些整髮劑〈如燙髮藥水、染膏、漂色劑〉可能會將毛髮內的元素奪去，導致假性偏低的數值。在解讀頭髮分析的結果時需謹慎考量檢測本身的有限性。這份資料應與症狀、飲食分析、職業及生活型態、身體檢查及其他實驗分析檢測結果一同考量。

注意：這份報告的內容本身並不具診斷性，使用此資料的醫師也不可只根據此項篩檢測試的結果進行治療。例如，在為Wilson氏病〈銅代謝失調〉所苦的病人身上，基於髮內銅含量低而補充銅，後者為禁忌。

重金屬元素分析

鎘(Cadmium)含量：高

頭髮鎘 (Cd) 含量是體內含量的極佳指標。鎘是具毒性之重金屬，無法自身體新陳代謝排出。中高鎘含量約4-8 ppm，可能與高血壓相關，但很嚴重的鎘中毒會導致低血壓。鎘對腎、肺、睪丸、動脈壁〈粥

狀硬化〉及骨頭有不良影響，會干擾許多酵素反應，並耗盡細胞內的穀胱甘?。慢性鎘過量會導致小紅血球性、血紅素不足貧血及蛋白尿流失beta-2-microglobin、葡萄糖尿、尿中鈣及磷增加，以及功能性鋅缺乏。鎘過量也通常與疲倦、體重減輕、軟骨病，以及腰痛相關。

鎘的吸收會因鋅、鈣及硒減少。鎘在食物中的含量從某些水果中的.04 ppm，到某些牡蠣及鯷魚內的3-5 ppm各有不同。吸煙明顯地使鎘攝入量增加。其他鎘的來源包括飲用水、殺黴菌藥、橡膠產品、焊接棒、銀焊料，耐人尋味地，被用來當戶外燒烤用具的舊冰箱金屬隔架也名列其中。精緻醣類中有少量的鋅與鎘相關。鎘中毒在焊接工及建築工人〈水泥塵〉身上相當常見。

假如頭髮內鋅含量並非不正常，也許是外部污染導致頭髮鎘含量升高。整髮也可能導致外部污染。體內鎘含量升高的的確認檢測為尿液分析，在施用適當的螯合劑EDTA、DMPS後進行。鎘的糞便分析〈施用DMSA後〉提供極佳的污染及吸收指標。血清鹼磷酸鹽酵素活性通常會隨著鎘中毒升高。

汞(Mercury)含量：高

汞對人體及動物都是有毒物質。汞在體內的積蓄大體上可透過髮含汞量反映出來，但頭髮汞含量可能因使用某些染髮劑呈假性升高。汞負荷的敏感度及耐受度在不同的個體身上有極大的差異。

頭髮含量低於3 μg/g時，汞會抑制硒的生物功能，也可能會在較敏感的人體內導致或促成免疫調節功能不良。汞過量的顯著症狀包括：食慾不振、觸/聽/視覺減弱、疲勞、憂鬱、情緒不穩、末梢麻木及顫抖、記憶力差、認知功能不良及神經肌肉方面病症。曾有報告指出頭髮汞含量與急性心肌梗塞相關，發現平均每1μg/g的汞會使急性心肌梗塞發生的風險增加9%〈Circulation 1995; 91:645-655〉。

汞的來源包括補牙的汞合金、被污染的海鮮、水供應來源、某些整痔劑、皮膚美白用品、儀器〈溫度計、電極、電池〉和石油、某些肥料及紙/紙漿、金礦工業的燃廢料。牙科汞合金植入或取出時，也會發現頭髮含汞量暫時〈數月〉增加。另外，使用汞合金補牙的個體之汞含量的「基準量」〈約1-2μg/g〉較沒有用汞合金補牙的人〈1μg/g以下〉高。

汞增加的確認檢測為全血液測量，可顯示最近/持續性的污染〈不能顯示體內整體積蓄量〉；在使用dithiol螯合或如DMPS活動劑後的糞便汞含量及尿液含汞量測量，可顯示整體負荷量。超過百分之九時的汞透過膽管道於糞便中自然排出。所以，也可以用糞便元素分析來評估身體的總含汞量。DDI的初步研究顯示口服DMSA會增加糞便中的含汞量。這與只有約百分之廿及廿五的DMSA在腸胃消化道被吸收的發現一致。沒有被吸收的DMSA可能與膽管的汞結合並抑制毒素被腸與肝重新吸收。

鈦(Titanium)含量：高

二氧化鈦是工業上常用的物質，如：白色的油漆、染料及濾紙等，二氧化鈦是毒性非常低的元素，頭髮檢測鈦過高，一般都沒有臨床上任何的症狀。

營養元素分析

鎂(Magnesium)含量：高

鎂是體內電解質及酵素活化之必需元素。然而，這些功能並不發生在毛髮內。體內的鎂過量很少見，但有可能因口服或注射補充過量，或是腎受損或缺陷造成。

如果因最近整髮而將頭髮外在污染的因素排除，頭髮鎂含量升高較可能是顯示出此元素分佈不均的情形。生理鎂功能不良可能存在或不存在。鎂分佈不均可能因為長期情緒或身體壓力、有毒金屬或化學物污染、鈣及磷的生理不平衡、骨骼礦物質流失，及腎排鎂〈及其他代謝物〉功能缺陷。頭髮鎂含量升高被認為與低血糖症及食物中鈣鉀比過低相關。

鎂的狀態難以評估；全血及紅血球或白血球群的鎂含量比血清/血漿含量更具指標性。氨基酸分析有助於顯示依賴鎂的速率限制步驟〈如加磷氧基作用、甲硫胺酸代謝〉。

銅(Copper)含量：低

除了以下兩個例外，頭髮銅含量通常能反映身體狀況：(1) 添加外生性銅〈偶爾在整髮劑或泳池/熱浴池的殺藻劑中會發現〉及 (2) Wilson氏症及Menkes氏症病人頭髮銅含量低〉。Wilson氏症中銅有傳輸缺陷，在腸黏膜、肝及腎臟累積，有時導致中毒。同時間頭髮及其他末梢組織的銅含量較低。Menkes氏症中，依賴銅的酵素及藍胞漿素〈血漿蛋白〉活力相當低。針對這兩種疾病病患補充銅將適得其反。若使用口服避孕藥或雌性激素補充療法，頭髮銅含量幾乎呈現恆低，而紅血球內含量則升高。在這些情況下，頭髮銅含量低似乎與生理異常或臨床症狀無關。

銅是活化特定酵素的必要元素。紅血球超氧化物歧化脢 (SOD) 為依賴銅〈和鋅〉的酵素；lysyl氧化酵素是另一依賴銅的酵素，催化膠原之交叉鍵合。腎上兒茶酚胺合成需依賴銅，因為催化從度巴明形成正腎上腺素的度巴明β羥酵素需要銅。

銅缺乏的症狀包括：膽固醇的升高、發炎反應增強、貧血、骨骼及膠原疾病、不孕及免疫系統受損。可能導致銅缺乏的原因有：腸道的吸收不良、飲食攝取不足、使用口服避孕藥、鉬過量、鋅過量及螯

合治療。銅的狀態會受到過量拮抗金屬如汞、鉛、鎘、鎂的負面影響。

銅缺乏可透過檢測血清藍胞漿素排除Wilson氏症〈Wilson氏症中藍胞漿素會不足〉的可能，全血或紅血球群的元素分析及銅的功能性測試〈除非鋅缺乏〉可測得紅血球超氧化物歧化?的活性。銅不足時其活性在正常值之下。

磷(Phosphorus)含量：高

磷的多寡會受鈣、維他命D、新陳代謝及鎂不正常影響，磷主要存在骨骼及牙齒組織，磷也存在於每個細胞內，主掌能量的轉換及酵素協調，麟的化學反應包括醣類、蛋白質、胺基酸及脂質的新陳代謝。

鍺(Germanium)含量：低

鍺雖不是一必需元素，但在動物實驗顯示鍺有抗腫瘤、抗癌變及提昇免疫力的作用，然而鍺也會有致死的副作用，所以如何正確使用鍺仍在研究中。

鍺應用於製造電晶體、整流半導體、螢光燈及牙科用的合金。微量的鍺也會發現於食物中，平均一日1-3 mg。

鋯(Zirconium)含量：低

鋯是大量存在於土壤、植物及食物內的元素，平均一天攝取非必需的量約一天125mg，鋯是無毒元素，大部份應用於實驗室，鋯保存於軟組織、骨骼，鋯可通過胎盤、血腦障壁。

工業上鋯的來源包括：鑄造業、研磨及陶瓷業。