

HAIR ELEMENTS



PATIENT: Hair Test 28a
SEX: Female
AGE: 51

POTENTIALLY TOXIC ELEMENTS				
TOXIC ELEMENTS	RESULT $\mu\text{g/g}$	REFERENCE RANGE	PERCENTILE	
			68 th	95 th
Aluminum	3.1	< 7.0		
Antimony	0.010	< 0.050		
Arsenic	0.036	< 0.060		
Beryllium	< 0.01	< 0.020		
Bismuth	0.32	< 2.0		
Cadmium	< 0.009	< 0.10		
Lead	0.26	< 1.0		
Mercury	0.16	< 1.1		
Platinum	< 0.003	< 0.005		
Thallium	< 0.001	< 0.010		
Thorium	< 0.001	< 0.005		
Uranium	0.032	< 0.060		
Nickel	0.20	< 0.40		
Silver	0.05	< 0.15		
Tin	0.39	< 0.30		
Titanium	0.93	< 1.0		
Total Toxic Representation				

ESSENTIAL AND OTHER ELEMENTS							
ELEMENTS	RESULT $\mu\text{g/g}$	REFERENCE RANGE	PERCENTILE				
			2.5 th	16 th	50 th	84 th	97.5 th
Calcium	1070	300- 1200					
Magnesium	180	35- 120					
Sodium	69	12- 90					
Potassium	4	8- 38					
Copper	19	12- 35					
Zinc	270	140- 220					
Manganese	0.62	0.15- 0.65					
Chromium	0.39	0.20- 0.40					
Vanadium	0.049	0.018- 0.065					
Molybdenum	0.033	0.028- 0.056					
Boron	0.40	0.30- 2.0					
Iodine	0.30	0.25- 1.3					
Lithium	0.004	0.007- 0.023					
Phosphorus	203	160- 250					
Selenium	1.2	0.95- 1.7					
Strontium	2.8	0.50- 7.6					
Sulfur	53300	44500- 52000					
Barium	1.4	0.26- 3.0					
Cobalt	0.023	0.013- 0.050					
Iron	5.5	5.4- 14					
Germanium	0.025	0.045- 0.065					
Rubidium	0.008	0.007- 0.096					
Zirconium	0.044	0.020- 0.42					

SPECIMEN DATA				RATIOS		
COMMENTS:				ELEMENTS	RATIOS	EXPECTED RANGE
Date Collected: 5/3/2007	Sample Size: 0.198 g			Ca/Mg	5.94	4- 30
Date Received: 6/19/2007	Sample Type: Head			Ca/P	5.27	1- 12
Date Completed: 6/23/2007	Hair Color: Brown			Na/K	17.3	0.5- 10
	Treatment: Dye			Zn/Cu	14.2	4- 20
Methodology: ICP-MS	Shampoo: Vo5			Zn/Cd	> 999	> 800

V06.99

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 Date Out: 16/08/06









To: Dr. Alison Drought

PATIENT INFORMATION

Name: Hair Test 28
 Sex: Female
 Age: 49
 Hair Colour: Brown

Location of Hair: Nape
 Shampoo: Other
 Bleaching: No
 Cold Wave: No
 Permanent Wave: Yes

Hair Mineral Analysis

Toxic Elements	Results (ppm)	Acceptable Level (ppm)	Acceptable	Above Acceptable Limits	
Aluminum	6.47	< 10			Al
Antimony	0.03	< 0.6			Sb
Arsenic	0.28	< 1			As
Barium	2.43	< 1.5			Ba
Beryllium	0.01	< 0.05			Be
Bismuth	0.43	< 1			Bi
Cadmium	0.01	< 0.5			Cd
Lead	0.21	< 1.5			Pb
Mercury	0.01	< 1			Hg
Silver	0.03	< 1			Ag

Nutritional Minerals	Results (ppm)	Normal Range (ppm)	Low	-2SD	-1SD	M e a n	+1SD	+2SD	High	

Boron	0.26	0.5 - 3.5							B
Calcium	1379	450 - 1105							Ca
Chromium	0.13	0.2 - 1.2							Cr
Copper	21.1	18 - 50							Cu
Iron	8.08	3.94 - 7.36							Fe
Magnesium	176.1	44 - 98							Mg
Manganese	0.41	0.2 - 0.8							Mn
Molybdenum	0.04	0.04 - 0.15							Mo
Phosphorus	176.3	145 - 250							P
Potassium	4.38	5 - 40							K
Sulfur	38051	30000 - 55000							S
Selenium	2.08	0.5 - 2							Se
Silicon	66	5 - 28							Si
Sodium	11.61	18 - 85							Na
Strontium	3.82	0.8 - 12							Sr
Zinc	197.4	150 - 250							Zn

Potentially Toxic Elements	Results (ppm)	Acceptable Level (ppm)	
Palladium	0.05	< 1	Pd
Thallium	0.01	< 1.5	Tl
Tungsten	0.06	< 2	W
Uranium	0.01	< 1.5	U
Zirconium	0.01	< 0.5	Zr

Other Elements	Results (ppm)	Normal (ppm)	
Cobalt	0.03	0.03 - 0.05	CO
Germanium	0.03	0.04 - 0.1	Ge
Iodine	0.7	0.8 - 1.6	I
Lithium	0.01	0.01 - 0.2	Li
Nickel	0.39	0.1 - 1	NI
Tin	0.51	0.3 - 1.6	SN
Vanadium	0.01	0.02 - 0.1	V

Significant Ratios	Results	Normal Range
Ca : Mg	7.83 : 1	(4.59-25.11) : 1
Fe : Cu	0.38 : 1	(0.08-0.41) : 1
Na : K	2.65 : 1	(0.45-17) : 1
Zn : Cu	9.36 : 1	(3-13.89) : 1
Zn : Mn	481.7 : 1	(187.5-1250) : 1

Interpretation of Hair Analysis Results for Marjorie Gilchrist

Lab

No:1226264019

Prepared:16/08/06

Note: Perm may increase the levels of copper, manganese and nickel in hair.

Only in the last quarter of a century, with the advent of refined technology, have researchers been able to better understand the vital role that minerals play in human health and nutrition. The literature does show clearly, that its use with other diagnostic techniques is a valuable adjunct tool to explore the metabolic balance of a patient which is not available by any other available method.

Research has shown that minerals in hair are reflective of the total nutritional environment including the input of protein, carbohydrate, fat, vitamins, minerals and toxic elements, as well as the psychological state of the individual.

The work of Gershoff [Am. J. Clin. Nutr., 30, 868 (1977)] has shown that minerals in hair are reflective of the total nutritional environment including the input of protein, carbohydrate, fat, vitamins and minerals as well as the psychological state of the individual.

Hambidge has recently pointed out that hair mineral analysis is useful for assessing environmental exposure to toxic elements such as lead, mercury, cadmium or arsenic, but is of more limited value for assessing the nutritional status of a patient in the absence of other information. In routine screening program for mineral metabolism and toxic element exposure, hair mineral samples may be more reliable than serum samples.

For proper sample procurement, the hair for mineral analysis should be head hair taken from the closest inch of growth from the scalp at the nape of the neck. Recently, a procedure has been promulgated for standardization of hair sample procurement and analysis by the Hair Analysis Standardization Board, which this laboratory endorses.

The treatment of hair by bleaching or cold waving has a significant influence on trace element values and renders them unreliable, whereas other hair preparations seemed to have only a minor influence on hair element levels. It should be recalled that some hair coloring and shampoo substances are rich in lead, selenium, manganese or nickel, and these may contaminate the sample. It should also be remembered that washing procedures and analytical techniques may vary from one commercial laboratory to another, and therefore data from one laboratory should not be compared directly to that of another.

Split samples, when submitted, should be finely divided and homogenized to guarantee randomness. Hair from two different scalp regions may vary slightly in their elemental composition.

A REDUCED level of BORON is probably an indicator of bone loss, particularly in post-menopausal women since the presence of boron is consistent with the prevention of bone loss and bone demineralization. When boron supplementation has been used in post-menopausal women to balance the estrogen hormone, calcium excretion was reduced thus enhancing decreasing calcium loss by increasing estrogen levels. The effects of boron in the human body are still being studied, and the physiology is not yet totally clear. Some researchers believe that it will soon be identified as one the essential trace minerals. Boron appears to effect calcium, magnesium and phosphorus balance. As well as being a factor in osteoporosis it may also play a role in hypertension and arthritis due to its relationship to calcium metabolism. Dietary sources are: fruits such as apples, pears and grapes, leafy greens, legumes, prunes, raisins, dates and nuts are also good sources.

An ELEVATED CALCIUM level indicates that the body is excreting calcium via the hair. It has also been found that when serum levels of calcium are measured, and compared to hair, the latter is more sensitive to demonstrate the excess excretion of the mineral. As well, high levels of hair calcium indicate increased penetration of calcium into the cells due to augmented membrane permeability. Frequent hair washing in hard water can artificially elevate the hair calcium and should not be mistaken for a systemic elevation. Elevation of calcium in the hair is often associated with deposition of calcium in soft tissues, a process that follows conditions like arteriosclerosis, osteoarthritis, and calcinosis (calcium deposits in the skin and subcutaneous tissues). Patients with some dental diseases often have elevated calcium, which is another indication of increased bone loss. High levels of calcium may result in growth retardation, iron deficiency, anemia and Vitamin D toxicity.

LOW hair CHROMIUM levels have been associated with diabetes in juveniles. Refined foods are particularly suspect in being low in chromium. Insufficient chromium is connected to diabetes and dysinsulinism, corneal lesions and arteriosclerosis. The general approach is to avoid sugar and sugar products, refined white flour products. Mild deficiencies in chromium can produce symptoms like anxiety or fatigue. Abnormal cholesterol metabolism and increase progress of arteriosclerosis, associated with chromium deficiency. Chromium was long thought to be a toxic mineral. It is now known to be the essential part of glucose tolerance factor (GTF), which serves as a bridge between the target tissue, glucose and insulin. Insufficient chromium puts undue stress on the pancreas, which then manufactures more insulin. Chromium is considered an "ultra-trace" mineral, since it is needed in very small quantities to perform its essential functions. It is also an essential mineral (not made by the body, and must be obtained from the diet). Dietary sources of chromium include Brewer's yeast (which also has the highest GTF activity), brown rice, beef, whole grains, dried beans, liver, shellfish and potatoes.

DEFICIENCY of COBALT is not really a concern if there is enough vitamin B-12 in-take. Vegetarians need to be more concerned than others about getting enough cobalt and B-12 (mostly found in animal protein). In North America, the soil is becoming deficient in cobalt, further reducing the low levels found in plant foods. Low levels may be associated with low systemic stores of cobalt and be related to

pernicious anemia (a type of anemia characterized by deficiency of hydrochloric acid in the stomach fluids, vitamin B-12, folic acid) and nervous disorders. The physiology of cobalt is still under investigation, therefore, little is known regarding toxicity and deficiencies. Cobalt is an essential mineral needed in very small amounts in the diet. It is an integral part of vitamin B-12 (which supports red blood cell production). Cobalt is available mainly as part of vitamin B-12. Dietary sources are: sea products (fish, shellfish and sea weeds). Some cobalt is available in legumes, spinach, cabbage, lettuce, beet greens and figs.

Some health authorities claim that GERMANIUM has therapeutic effects in treating the following conditions: immunodeficiency, senile osteoporosis, pain, cardiac disorder, circulatory disturbances and eye diseases. Germanium may be needed in small amounts by the human body. Research is still in progress regarding this trace mineral. Germanium (as an organo-germanium) has been tested and used for the treatment of a variety of medical problems that require improved oxygenation and immune function, ranging from simple viral infections to cancer. It is found in the soil and in many healing plants, including aloe vera, garlic and ginseng, as well as comfrey, shiitake mushrooms, onions and the herb suma.

ELEVATED IRON is associated with hemochromatosis, and siderosis (inflammation of the lungs). This is often a result of contaminated water, cooking acidic foods in cast iron cookware or excessive iron supplementation. Ratio imbalances of iron with manganese, copper and/or zinc can also contribute to its excess. Iron in drinking water and possible over-supplementation might be the first suspects as contributing agents. Serum iron and TIBC (total iron-binding capacity) should be checked to confirm the possibility of excess. Some of the symptoms of iron toxicity include loss of appetite, decreased passage of urine, diarrhea, hypothermia, and metabolic acidosis. Patients may also experience congestion of the blood vessel system, the liver, kidneys, heart, brain, spleen, adrenals, and thymus.

An IODINE DEFICIENCY may cause a wide variety of symptoms such as lowered vitality, hypothyroidism and lower basal metabolic rate (the body's use of energy), inability to think clearly, low resistance to infections, loss of control of the muscles of the mouth resulting in contortion and drooling, defective teeth, tendency to obesity, cretinism, loss of tone of the circulatory system, and slow development of the sexual organs. Some early studies correlate low iodine levels with increased risk of breast cancer. While a deficiency causes disease, e.g. goiter, supplementation of this trace mineral may lead to substantial improvement. Iodine is an essential nutrient for production of the body's thyroid hormones and therefore is required for normal thyroid function. Thyroid is required for cell respiration and the production of energy. Dietary sources of iodine include iodized salt, seafood, saltwater fish, kelp, garlic, sea salt, spinach, lettuce, squash, peanuts, cheddar cheese, onions, mushrooms and whole wheat bread.

DEFICIENCY of LITHIUM is not really known. Lithium may be required as a modulator in the conversion of essential fatty acid into prostaglandins (naturally occurring fatty acids in the body that affect many body activities). In a deficiency state of lithium the regulating influence of preventing both overproduction and underproduction may be lost. Lithium is usually found in nature in salt forms. We have about 2 – 3 mg of the element in our bodies. It is not known what particular function of lithium

may make it an essential nutrient. It influences the transport of sodium. Lithium carbonate is commonly used in the treatment manic-depressive disorders. There is very little knowledge regarding lithium in foods. However, some natural waters are high in lithium, and these are said to calm the nerves, cheer the spirit and soothe the digestion. Sugar cane and seaweed contain some lithium.

ELEVATED levels of MAGNESIUM in hair normally are associated with high calcium levels. However, the most common causes of excessive levels of magnesium are: a) very high intake, usually through supplementation, and b) enhanced turnover of bone or deficiencies of calcium. Vitamin B-6 may be useful in enhancing the body's capacity to use magnesium. The elevated levels of magnesium may be associated with the depression of the central nervous system (which can cause muscle weakness, fatigue, sleepiness, or even hyper-excitability), including glucose and hormone regulation, auto-immune difficulties and kidney problems.

LOW levels of MOLYBDENUM in hair remain to be understood clinically. Recent research suggests that molybdenum deficiency may be associated with the development of arthritis, decreased life span, anorexia, visual problems, and rapid heart rate. Molybdenum is one of our essential trace elements. In nature it serves as a catalyst to the nitrogen-fixing process. Decreased soil molybdenum can lead to deficient plant growth. Molybdenum is a vital part of three important enzyme systems that encompass iron utilization, carbohydrate metabolism, and sulfite detoxification. It can reduce the production or counteract the actions of nitrosamines, known cancer-causing agents, especially in the colon. The molybdenum levels in food depend largely on soil content. Dietary sources are: whole grains, particularly the germ, many vegetables and legumes, liver and organ meats.

POTASSIUM DEFICIENCIES in the hair can be related to diet or adrenal gland function changes. Deficiency of potassium is much more common as a consequence of aging or chronic disease. Its symptoms may include: constipation, fatigue, nervous system problems and heart beat irregularities. A magnesium deficiency also may lead to decreased retention of potassium. Low potassium levels have been associated with personality disorders when found in concert with high hair calcium levels. Endocrine disturbances rather than dietary problems may be a main factor in potassium deficiency. Potassium is a very significant body mineral. It is one of the main blood minerals called electrolytes (the others are sodium and chloride). Along with sodium, potassium regulates the water balance and the acid-base balance in the blood and tissues, the synthesis of protein from amino acids in the cell and carbohydrate metabolism. It is important for normal growth and for building muscle. Dietary sources are: fruits, leafy green vegetables (spinach, parsley, lettuce), broccoli, peas, beans, tomatoes, and especially potato skins, whole grains, seeds, nuts, avocados, raisins, salmon, sardines, cod and flounder.

The two primary sources of ELEVATED SELENIUM are through the ingestion of food, or the use of shampoos, which contain large amounts of this mineral. Selenium toxicity can be dangerous and leads to skin eruptions, irritability, fatigue, loss of hair, tooth decay, liver and/or kidney damage, and is often associated with a garlic-like odor to the breath. Elevations in hair selenium should be confirmed by a pubic hair analysis, blood or urine test before initiating therapy. High sulfur foods such as cooked beans; eggs and onions can help rid the body of selenium.

The toxic effects of ELEVATED levels of orally ingested SILICON compounds tend to affect the kidneys primarily. Most commonly, two major types of renal toxicity are observed: obstructive and toxic. Silicon containing shampoos can artificially elevate silicon level in hair. A recheck using pubic hair is recommended.

LOW levels of SODIUM in the hair very rarely indicate a dietary deficiency. Problems tend to be caused by excessive excretion or inadequate absorption and are frequently of a regulatory nature. They can be treated most effectively by normalizing endocrine function rather than increasing salt intake. Sodium is found in every cell. It is one of the electrolytes (together with potassium and chloride). Its main function is to help regulate the fluid balance of the body, both within and outside the cells. The shifting of sodium and potassium across the cell membranes helps to create an electrical charge that enables muscles to contract and nerve impulses to be conducted. Sodium is also important to hydrochloric acid production in the stomach. Almost all foods contain some sodium, particularly as sodium chloride. Dietary sources are: seafood, beef, poultry, kelp and other sea vegetables.

Even though problems related to VANADIUM DEFICIENCY have not been clearly shown in humans, there is a suspicion that low vanadium may increase susceptibility to heart disease and other degenerative diseases, or lead to higher cholesterol and triglyceride levels. Clinical studies have shown a significant decrease in insulin requirement for patients with insulin-dependent diabetes mellitus after vanadyl sulfate therapy. There is also a significant decrease in cholesterol levels in both insulin-dependent and non-insulin-dependent diabetics. Although, some vanadium must be consumed daily to prevent a deficiency state, supplementation of more than 100 mcg a day, in any form, should be avoided. Vanadium is an essential trace mineral. Not much is known about its functions. It seems to be involved in lipid metabolism. It has been shown to have an effect in reducing the production of cholesterol. The enzyme-stimulation role of vanadium may be its involvement in bone and tooth formation, in fat metabolism and through the production of coenzyme A. Dietary sources are: dill, radish, buckwheat, parsley, oats, rice, green beans, carrots and cabbage. It is also available in fats and vegetable oils (Soya, sunflower, safflower, corn and olive).

Elevated levels of BARIUM are toxic. High level contamination by natural and industrial sources of the alkali earth metal, barium has been identified in the ecosystem/workplaces that are associated with high incidence clustering of multiple sclerosis (MS) and other neurodegenerative diseases such as the transmissible spongiform encephalopathies (TSEs) and amyotrophic lateral sclerosis (ALS). M Purdey, Med Hypothesis 2004; 62(5): 746-754 Symptoms of poisoning include: vomiting, colic, diarrhea, slow, irregular pulse, convulsive tremors and muscular paralysis. Low levels of barium are present in most soils and foods. Fish and aquatic organisms tend to accumulate barium. Chronic ingestion of absorbable forms of barium has been shown to induce a significant increase in systolic blood pressure. Barium generally occurs as barium sulfate, which is used as a lubricating agent. Barium compounds are employed in the manufacture of glass, ceramics, TV picture tubes, paints, paper coating, fireworks, soap, rubber, pesticides and in sugar refining.

Elevated CALCIUM and MAGNESIUM is suggestive of metabolic acidosis, osteoarthritis, and potential

bone demineralization possibly resulting in osteoporosis. This is in certain cases associated with elevated serum parathormone concentrations, lactic acid and ionized calcium.

The particular pattern of elevated CALCIUM, MAGNESIUM, low SODIUM, POTASSIUM and CHROMIUM in hair has commonly clinically been associated with reactive blood sugar problems that are induced by inappropriate eating habits, together with hypo-adrenocorticism. These results in blood sugar sensitivity to the diet and the need for complex carbohydrate-rich, glucose tolerance factor rich vitamin B complex supplemented dietary regime

Elevated CALCIUM-to-POTASSIUM ratio has been associated with anti-social personality patterns and may represent endocrine problems that influence brain chemistry.

The naturally occurring salt regulating corticoid is aldosterone. It is secreted by the adrenal gland and provides a very close estimate of its activity. In case of higher than normal functioning adrenal cortex, the elevated level of aldosterone will retain more sodium and potassium. Therefore low sodium and potassium indicates hyper-adreno-cortical activity.

All of the above information is provided for the sole use of health care professionals as a scientific paper and is not intended for application for any specific patient problem. Any recommendation should be considered by the practitioner as one of several possible factors in dealing with a patient problem.

George M. Tamari, Ph.D.
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