

INTRODUCTION TO HAIR TISSUE MINERAL ANALYSIS (HTMA)

Hair is formed from clusters of matrix cells that make up the follicles. During the growth phase, the hair is exposed to the internal metabolic environment such as the circulating blood, lymph, and extracellular fluids. As the hair continues to grow and reaches the surface of the skin, its outer layers harden, locking in the metabolic products accumulated during this period of hair formation. This biological process provides us with a blueprint and lasting record of nutritional metabolic activity that has occurred during this time.

Determining the levels of the elements in the hair is a highly sophisticated analytical technique; when performed to exacting standards and interpreted correctly, it may be used as a screening aid for mineral deficiencies, excesses, and/or biochemical imbalances. Hair tissue mineral analysis (HTMA) provides the doctor with a sensitive indicator of the long-term effects of diet, stress, and toxic metal exposure.

The laboratory test results and the comprehensive report that follows should not be construed as diagnostic. This analysis is provided only as an additional source of information to the attending doctor.

Test results were obtained by a licensed clinical laboratory adhering to analytical procedures that comply with governmental protocol and standards established by Trace Elements, Inc. U.S.A. The interpretive data based upon these results is defined by research conducted by David L. Watts, Ph.D.

UNDERSTANDING THE GRAPHICS

NUTRITIONAL ELEMENTS

This section of the cover page graphically displays the test results for each of the reported nutritional elements and how they compare to the established population reference range. Values that are above or below the reference range indicate a deviation from "normal". The more significant the deviation, the greater the possibility a deficiency or excess may be present.

TOXIC ELEMENTS

The toxic elements section displays the results for each of the reported toxic elements. It is preferable that all levels be as low as possible and within the lower white section. Any test result that falls within the upper dark red areas should be considered as statistically significant, but not necessarily clinically significant. Further investigation may then be warranted to determine the possibility of actual clinical significance.

ADDITIONAL ELEMENTS

This section displays the results of additional elements for which there is limited documentation. These elements may be necessary for biochemical function and/or may adversely effect biochemical function. Further

study will help to reveal their function, interrelationships and eventually their proper therapeutic application or treatment.

SIGNIFICANT RATIOS

The significant ratios section displays the important nutritional mineral relationships. This section consists of calculated values based on the respective elements. Mineral relationships (balance) is as important, if not more so, than the individual mineral levels. The ratios reflect the critical balance that must be constantly maintained between the minerals in the body.

TOXIC RATIOS

This section displays the relationships between the important nutritional elements and toxic metals. Each toxic metal ratio result should be in the white area of the graph, and the higher the better. Toxic ratios that fall within the darker red area may indicate an interference of that toxic metal upon the utilization of the nutritional element.

ADDITIONAL RATIOS

The additional ratios section provides calculated results on some additional mineral relationships. At this time, there is limited documentation regarding these ratios. For this reason, these ratios are only provided as an additional source of research information to the attending health-care professional.

METABOLIC TYPE

This section of the report will discuss the metabolic profile, which is based on research conducted by Dr. D. L. Watts. Each classification is established by evaluating the tissue mineral results and determining the degree to which the minerals may be associated with a stimulating and/or inhibiting effect upon the main "energy producing" endocrine glands. These glands regulate nutrient absorption, excretion, metabolic utilization, and incorporation into the tissues of the body: the skin, organs, bone, hair, and nails. How efficiently each nutrient is utilized depends largely upon proper functioning of the endocrine glands.

SLOW METABOLISM (TYPE #4)

- ** Para-Sympathetic Dominance
- ** Tendency Toward Increased Thyroid Function (increased secretion of hormones)
- ** Tendency Toward Increased Adrenal Activity (increased secretion of hormones)

The current mineral pattern is indicative of Slow Metabolism (Type #4). In Slow Metabolism (Type #4) a strong tendency toward an acute stress reaction may occur. The stress may be physical in that there can be a necessary response due to a health-related problem, or there may be an emotionally related stress response. The actual

response by the body to the specific stress, however, is the same, whether it is physical or emotional. This is a temporary reaction and will change when the stress is relieved.

NUTRIENT MINERAL LEVELS

This section of the report may discuss those nutritional mineral levels that reveal moderate or significant deviations from normal. The light blue area's of each graph section represent the reference range for each element based upon statistical analysis of apparently healthy individuals. The following section, however, is based upon clinical data, therefore an element that is moderately outside the reference range may not be commented on unless determined to be clinically significant.

NOTE:

For those elements whose levels are within the normal range, it should be noted that nutritional status is also dependent upon their critical balance with other essential nutrients. If applicable, discussion regarding their involvement in metabolism may be found in the ratio section(s) of this report.

SODIUM (Na) AND POTASSIUM (K)

Both sodium and potassium are markedly elevated above normal. Sodium and potassium are affected by the adrenal glands. When elevated, these levels are often indicative of the body's adrenal cortical response to a stressor. In the slow metabolizer (Type #4), this profile is reflective of the body's response to a considerable stress (physical or emotional).

CONDITIONS ASSOCIATED WITH HIGH TISSUE SODIUM (Na)

There are several factors that may produce increased adrenal activity and concomitant tissue sodium retention, such as; physical or emotional stress. Either or both will initiate an alarm reaction, resulting in a sodium elevation. An elevation of sodium in the tissues may contribute to transient high blood pressure and water retention.

FACTORS THAT MAY CONTRIBUTE TO AN ELEVATED SODIUM LEVEL

High Sodium Intake	Inflammatory Conditions
Toxic Metal Accumulation or Elimination	Biological Stress Response

IRON (Fe)

Elevation of tissue iron within the body is not unusual. Excess iron is stored in the liver, but if accumulation becomes too great, storage will then begin in other tissues of the body such as the kidneys, pancreas, joints, and

eventually the brain.

CONDITIONS ASSOCIATED WITH HIGH IRON

Headaches	High Blood Pressure
Pancreatic Disturbance	Arthritis
Allergies	Blood Sugar Disturbance
Hives	Liver Dysfunction
Cardiac Irregularities	

ENVIRONMENTAL FACTORS CONTRIBUTING TO HIGH IRON LEVELS

Excess iron accumulation within the body is most often due to excess intake or occupational exposure.

SOURCES OF IRON

High Iron Foods	Iron Cooking Utensils
High Iron Soils	Iron Water Pipes
Auto Shops	Iron Nutritional Supplements
Welding Environment	

SOURCES OF IRON (HERBS)

Some herbs naturally contain significant levels of iron. At this time, the following herbs should be discontinued if presently being consumed.

Peppermint	Chickweed
Black Cohosh	Goldenseal
Comfrey	Licorice Root
Chamomile	Alfalfa
Valerian Root	Catnip
Cascara Sagrada	Chaparral

CHROMIUM (Cr)

Although your chromium is moderately high, this level should not be considered as clinically significant at this time. However, if a disturbance between this element and another mineral exists, clinical significance may be noted in the appropriate ratio section of this report.

NICKEL (Ni)

High nickel found in the hair is not uncommon. Its sources are high in our environment and include:

Ceramics
 Hydrogenated Oils
 Rubber Products
 Electroplating
 Metal Prosthesis
 Dyes
 Dental Alloys

Plastics
 Fungicides
 Fuel Additives
 Tobacco
 Paint and Wallpaper pigments
 Insecticides

FOOD SOURCES OF NICKEL

Tea
 Legumes
 Cocoa
 Hydrogenated Fats

Whole Grains
 Oysters
 Margarine

Other sources of nickel include herbal preparations, particularly peppermint and chickweed. These herbs should be discontinued or reduced significantly if currently being taken.

Note: Nickel contributes to more instances of dermatitis than any other metal, and in excess has also been reported to be related to renal disturbance.

COBALT (Co)

The current cobalt level is elevated. Studies have found that industrial exposure to cobalt is associated with allergy symptoms and contact dermatitis. If this pattern becomes chronic, potential sources of this element should be evaluated and reduced.

Sources of Cobalt:

Cobalt metal and it's compounds are used extensively for the production of:

High Temperature Alloys	Hard Metals
Diamond Tools	Drying Agents in Paints
Additives in Animal Feeds and Pigments	Salts Used for Electroplating

HERBAL SOURCES OF COBALT INCLUDE:

Some herbs naturally contain significant levels of cobalt. At this time, the following herbs should be discontinued if presently being consumed.

Goldenseal	Alfalfa
Black Cohosh	Chamomile
Slippery Elm	

MOLYBDENUM (Mo)

Your molybdenum level of 0.069 mg% is above the established reference range for this element. Some researchers have reported that elevated levels of molybdenum may adversely affect calcium transport into the bone. Excess molybdenum may also reduce the normal elasticity of connective tissues, such as tendons, and can contribute to joint stiffness. Other symptoms associated with molybdenum excess include gout, arthralgia, and increased uric acid levels. Occupational and environmental sources of molybdenum include:

- | | |
|-------------------------|---------------|
| Water | Mining |
| Milling | Lubricants |
| Paints | Fertilizers |
| Stainless Steel | Armor Plating |
| Metal Prosthesis (some) | |

Excess molybdenum will antagonize copper metabolism and the sulfur amino acids, particularly methionine and cystine. Reduced glucose-6-phosphate and increased xanthine oxidase activity is seen with molybdenum excess.

RUBIDIUM (Rb)

The current level of rubidium is elevated above the established reference range. Rubidium is a non-toxic element and is known to be associated with lithium. It is also frequently found to be elevated with potassium, however, its biological function remains to be seen. Therefore, significance of an elevated HTMA level is unknown at this time.

Sources include; fertilizers, corn and cereals. Rubidium is more commonly found in areas with acidic soils.

TUNGSTEN (W)

The current level of tungsten is above the established reference range for this element. Currently, there are no known toxic effects of elevated tungsten.

Note: Tungsten at high levels is reported to have an antagonistic effect upon molybdenum metabolism.

NUTRIENT MINERAL RATIOS

This section of the report will discuss those nutritional mineral ratios that reveal moderate or significant deviations from normal.

Continuing research indicates that metabolic dysfunction occur not necessarily as a result of a deficiency or excess of a particular mineral level, but more frequently from an abnormal balance (ratio) between the minerals.

Due to this complex interrelationship between the minerals, it is extremely important that imbalances be determined. Once these imbalances are identified, corrective therapy may then be used to help re-establish a more normal biochemical balance.

NOTE: The "Nutritional Graphic" developed by researchers at Trace Elements, and presented on the cover of this report shows the antagonistic relationships between the significant nutrients, including the elements (arrows indicate antagonistic effect upon absorption and retention).

LOW CALCIUM/POTASSIUM (Ca/K) RATIO

A high potassium level relative to calcium (see low Ca/K ratio), is indicative of elevated thyroid function. This profile is often the result of the body's response to an acute stress episode. This is not uncommon in this metabolic sub-type, and is usually only temporary.

HIGH SODIUM/MAGNESIUM (Na/Mg) RATIO

This ratio is above the normal range (4.0/1). When sodium is high relative to magnesium, there is frequently an increase in magnesium requirements.

The adrenal glands play an essential role in regulating sodium retention and excretion. Studies have also shown that magnesium will affect adrenal cortical activity and response, while an increase in adrenal activity will result in decreased magnesium retention. This sodium-magnesium profile is indicative of increased adrenal cortical function.

MINERAL METABOLISM AND VITAMIN B6

A deficiency of, or increased requirement for vitamin B6 (pyridoxine) leads to alterations in the metabolism, utilization and balance between calcium and magnesium. Calcium retention will increase and the excretion of magnesium will also increase when vitamin B6 is lacking. Therefore, an increased need for vitamin B6 may be indicated by your current HTMA pattern.

TOXIC METAL LEVELS

Hair is used as one of the tissue's of choice by the Environmental Protection Agency in determining toxic metal exposure. A 1980 report from the E.P.A. stated that human hair can be effectively used for biological monitoring of the highest priority toxic metals. This report confirmed the findings of other studies which concluded that human hair may be a more appropriate tissue than blood or urine for studying community exposure to some trace metals.

A heavy metal may be elevated in this HTMA and yet no known environmental exposure can be ascertained at

this time. This is not unusual, as exposure may have originated years earlier. Additionally, research has found that heavy metals can be inherited by the fetus during pregnancy. Heavy metals can be found in the body for years following the original exposure and will remain in body tissues until removal is initiated. For example, the half-life of cadmium in some tissues will range from ten to thirty years.

CADMIUM (Cd)

Cadmium is a toxic metal that interferes with the absorption and function of several minerals such as; zinc, iron, copper and manganese. Cadmium has an affinity to accumulate mainly in the kidneys, but will also deposit in the liver and bones if excessive. Some sources of cadmium are:

Tobacco	Zinc Smelters
Burning Plastics	Galvanized Water Pipes
Superphosphate Fertilizers	Auto Exhaust
Electronics Industry	

METABOLIC DYSFUNCTIONS AND CADMIUM

Chronic or long term exposure to cadmium has been related to kidney disturbance, abnormal bone changes, emphysema, pneumonitis, liver disturbance, anemia and discoloration or yellowing of the dental enamel. These abnormalities may occur only after several years of exposure to cadmium.

IMPORTANT NOTE:

ELIMINATION OF CADMIUM FROM THE BODY CAN OFTEN PRODUCE SYMPTOMS THAT ARE SIMILAR TO FLU SYMPTOMS.

ALCOHOL AND CADMIUM RETENTION

Studies have revealed that alcohol increases the retention of heavy metals. Therefore if applicable, it is important to reduce alcohol intake in order to assist in reducing heavy metal burden.

LEAD (Pb)

Although the World Health Organization and governments around the world recognize the dangers of lead and are beginning to enact safety regulations regarding lead exposure, it is still one of the most common environmental pollutants. It is antagonistic to nearly every nutrient mineral, and contributes directly or indirectly, to many mineral excesses or deficiencies. The following are some sources of lead:

Leaded Gasoline	Lead Water Mains and Joints
Leaded Paint	Cosmetics (some)
Lead Crystal	Printing Industry

Hair Coloring (some)
 Burning metallic-based candle wicks

Wines (some)

ALUMINUM (Al)

The aluminum level is within the cautionary range. Since aluminum is omnipresent in soils and waters, virtually all foods contain measurable amounts of natural aluminum. However, a much larger amount of aluminum compounds are typically ingested in the form of intentional additives, such as; preservatives, coloring agents, leavening agents, etc. Other sources include processed cheeses, spices, pickles and baked goods.

SOME ADDITIONAL SOURCES OF ALUMINUM

Antacids (most)	Treated Water
Salt (some)	Baking Powder (some)
Aluminum Cookware	Antiperspirants (some)
Buffered Aspirin (some)	Aluminum Cans
White Flour (some)	Vaccines (many)

AVOID

- * Antacids containing aluminum as hydroxide. This is a major source of ingested aluminum.
- * Cooking acidic foods in aluminum cookware and storage in aluminum foil.
- * Inhaling antiperspirant spray, especially those containing aluminum chlorohydrate.

NOTE:

At this time, further confirmation of heavy metal toxicity using a blood test may or may not reveal an elevated level. This is due to the protective response of the body, in which following a toxic metal exposure, the element is sequestered from the blood and stored in various other tissues. Therefore, if the exposure is not ongoing or chronic, elevated levels in the blood may not be present. It is recommended that another analysis be performed in at least one year to monitor any changes in toxic metal accumulation.

TOXIC METAL RATIOS

Every person is exposed to toxic metals to some degree. The retention of these toxic metals, however, is dependent upon the individual's susceptibility. The balance of the protective nutrient minerals within the body in relation to the heavy metals can frequently be the determining factor to this susceptibility. As an example, the accumulation of lead will have a more detrimental effect upon body chemistry when sufficient levels of calcium and iron are not available. By examining the toxic metal levels in relation to the protective minerals, the extent to which the heavy metals may be involved in abnormal chemistry can frequently be seen.

ZINC/CADMIUM (Zn/Cd) RATIO

Cadmium is antagonistic to zinc in both absorption and utilization. Since zinc is required for the storage of histamines, a low zinc-to-cadmium ratio (see Zn/Cd ratio), may contribute to high histamine type allergies. If this pattern is chronic, a depletion of histamine may eventually develop, with tendencies toward food and/or chemical allergies.

SULFUR AND HEAVY METALS

The absorption and retention of toxic metals, such as; cadmium, lead and mercury, are enhanced in the presence of a protein deficiency, particularly the sulfur compounds. Sulfur is known to protect cells from the toxic effects of heavy metals, such as enzyme inhibition and excessive free radical production. A low S/Hg, S/Cd or S/Pb suggests a need for increased protein intake. Foods high in sulfur amino acids include, animal protein, fish, poultry and garlic.

DIETARY SUGGESTIONS

The following dietary suggestions are defined by several factors: the individual's mineral levels, ratios and metabolic type, as well as the nutrient value of each food including protein, carbohydrate, fat, and vitamin and mineral content. Based upon these determinations, it may be suggested that foods be avoided or increased temporarily to aid in the improvement of your biochemistry.

SLOW METABOLISM

Dietary habits may contribute to slow metabolism. Low protein, high carbohydrate, high fat intake and the consumption of refined sugars and dairy products have an excessive slowing-down effect upon metabolism and energy production.

GENERAL DIETARY GUIDELINES FOR THE SLOW METABOLIZER

* EAT A HIGH PROTEIN FOOD AT EACH MEAL...Lean protein is recommended and which should constitute at least 40% of the total caloric value of each meal. Recommended sources are fish, fowl and lean beef. Other good sources of protein include bean and grain combinations and eggs. Increased protein intake is necessary in order to increase the metabolic rate and energy production.

* INCREASE FREQUENCY OF MEALS...while decreasing the total caloric intake for each meal. This is suggested in order to sustain the level of nutrients necessary for energy production, and decrease blood sugar fluctuations.

- * EAT A MODERATE AMOUNT OF UNREFINED CARBOHYDRATES...Carbohydrate intake should not exceed 40% of total daily caloric intake. Excellent sources of unrefined carbohydrates include whole grain products, legumes and root vegetables.
- * AVOID ALL SUGARS AND REFINED CARBOHYDRATES...This includes white and brown sugar, honey, candy, soda pop, cake, pastries, alcohol and white bread.
- * AVOID HIGH PURINE PROTEIN...Sources of high purine protein include: liver, kidney, heart, sardines, mackerel and salmon.
- * REDUCE OR AVOID MILK AND MILK PRODUCTS...Due to elevated fat content and high levels of calcium, milk and milk products including "low-fat" milk should be reduced to no more than once every three to four days.
- * REDUCE INTAKE OF FATS AND OILS...Fats and oil include fried foods, cream, butter, salad dressings, mayonnaise, etc... Fat intake should not exceed 20% of the total daily caloric intake.
- * REDUCE FRUIT JUICE INTAKE...until the next evaluation. This includes orange juice, apple juice, grape juice and grapefruit juice. Note: Vegetable juices are acceptable.
- * AVOID CALCIUM AND/OR VITAMIN D SUPPLEMENTS...unless recommended by physician.

THE FOLLOWING HIGH SODIUM FOODS SHOULD BE REDUCED UNTIL THE NEXT EVALUATION

Table Salt	Corn Chips
White Bread	Snack Dips
Potato Chips	Ritz Crackers
Canned Foods	Pickles
Margarine	Butter (salted)
Biscuit Mix	Baking Powder
Frankfurter	Ham (cured)
Bacon	Chipped Beef
Soups (most)	Corned Beef

SPECIAL NOTE

This report contains only a limited number of foods to avoid or to increase in the diet. FOR THOSE FOODS NOT SPECIFICALLY INCLUDED IN THIS SECTION, CONTINUED CONSUMPTION ON A MODERATE BASIS IS ACCEPTABLE UNLESS RECOMMENDED OTHERWISE BY YOUR DOCTOR. Under some circumstances, dietary recommendations may list the same food item in the "TO EAT" and the "TO AVOID" categories at the same time. In these rare cases, always follow the avoid recommendation.

CONCLUSION

This report can provide a unique insight into nutritional biochemistry. The recommendations contained within are specifically designed according to metabolic type, mineral status, age, and sex. Additional recommendations may be based upon other supporting clinical data as determined by the attending health-care professional.

OBJECTIVE OF THE PROGRAM

The purpose of this program is to re-establish a normal balance of body chemistry through individually designed dietary and supplement suggestions. Properly followed, this may then enhance the ability of the body to more efficiently utilize the nutrients that are consumed, resulting in improved energy production and health.

WHAT TO EXPECT DURING THE PROGRAM

The mobilization and elimination of certain metals may cause temporary discomfort. As an example, if an excess accumulation of iron or lead is contributing to arthritis, a temporary flare-up of the condition may occur from time to time. This discomfort can be expected until removal of the excess metal is complete.

CONCLUSION

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REMOVAL OF HEAVY METALS:

Re-establishing a homeostatic balance or equilibrium of body chemistry will enhance the body's ability to remove heavy metals naturally. The elimination of a heavy metal involves an intricate process of attachment of the metal to proteins, removal from storage areas, and transport to the eliminative organs for excretion. Improvement in ones nutritional balance will improve the capability of the body to perform these tasks and eliminate toxins more easily.

However, the mobilization and elimination of metals may cause temporary discomfort. As an example, if an excess accumulation of iron or lead is contributing to arthritic symptoms, a temporary flare-up of the condition may

PATIENT: JOE PATIENT

occur from time to time. This discomfort can be expected until removal of the excess metal is complete.



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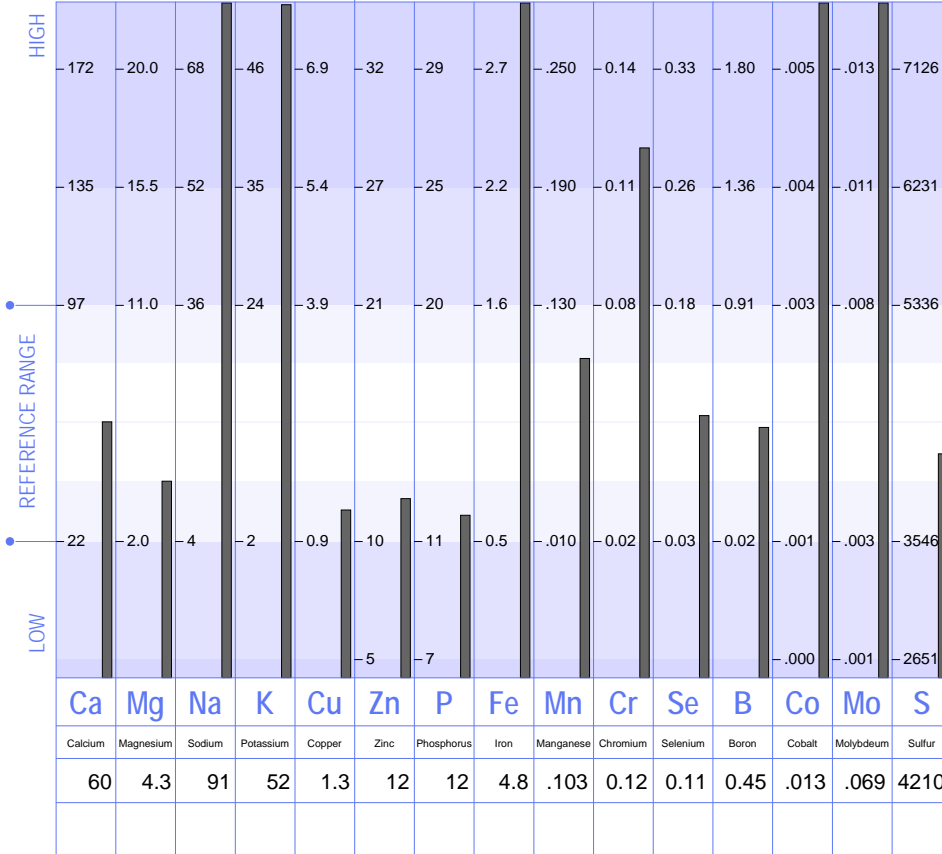
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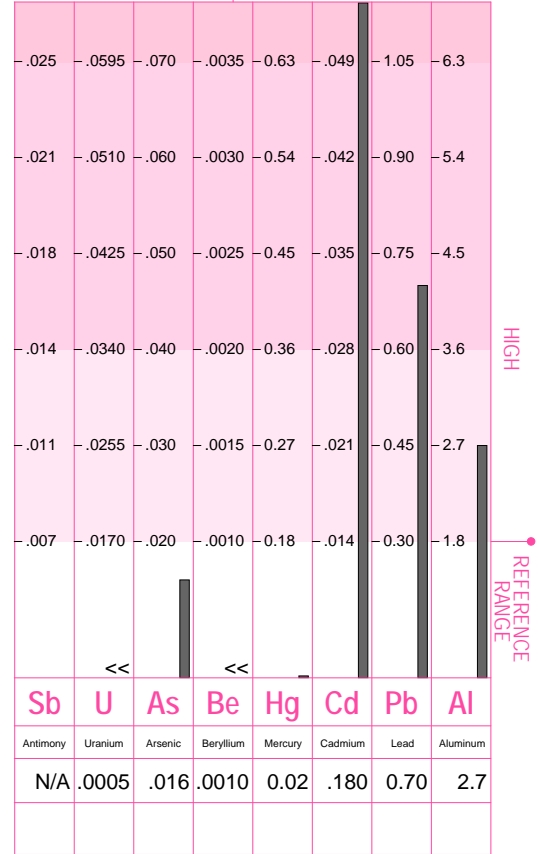
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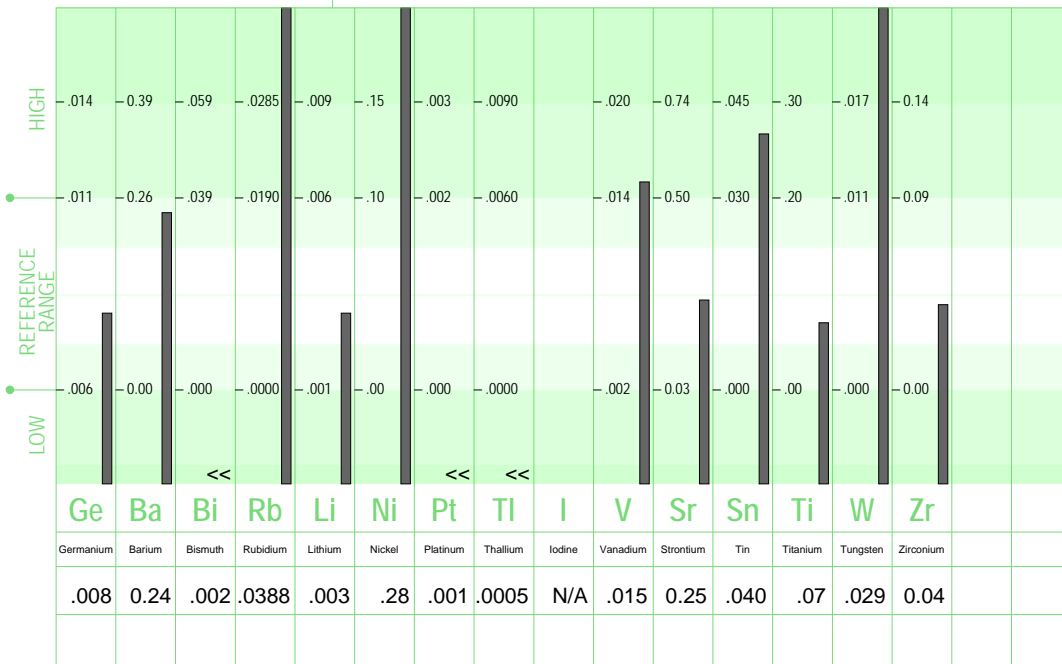
NUTRITIONAL ELEMENTS



TOXIC ELEMENTS



ADDITIONAL ELEMENTS



"<<": Below Calibration Limit; Value Given Is Calibration Limit

"ONS": Sample Size Was Inadequate For Analysis.

"N/A": Currently Not Available

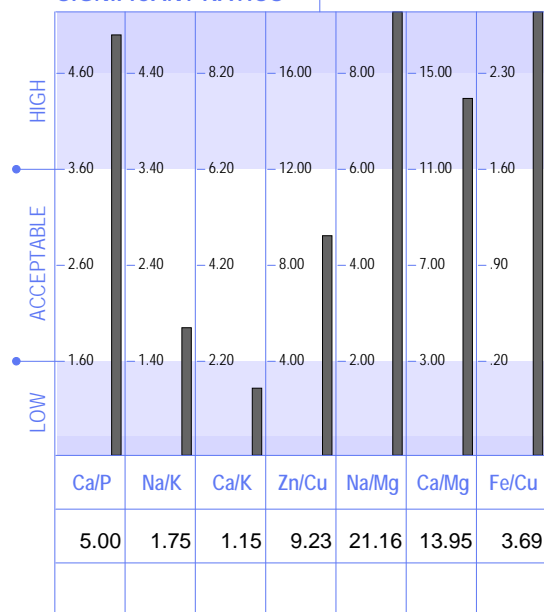
Ideal Levels And Interpretation Have Been Based On Hair Samples Obtained From The Mid-Parietal To The Occipital Region Of The Scalp.

Laboratory Analysis Provided by Trace Elements, Inc., an H. H. S. Licensed Clinical Laboratory. No. 45 D0481787

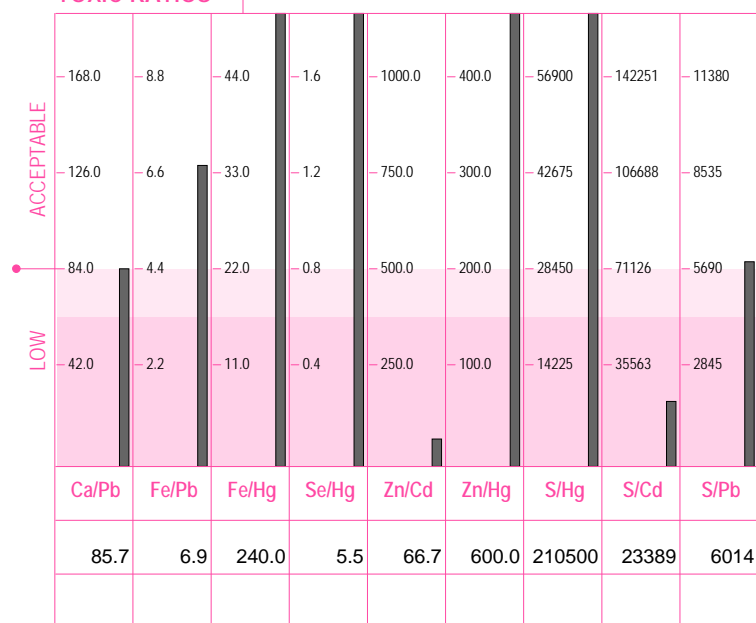
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CURRENT TEST RESULTS

PREVIOUS TEST RESULTS

SIGNIFICANT RATIOS



TOXIC RATIOS



ADDITIONAL RATIOS

RATIO	CALCULATED VALUE		EXPECTED
	Current	Previous	
Ca/Sr	240.00		131/1
Cr/V	8.00		13/1
Cu/Mo	18.84		625/1
Fe/Co	369.23		440/1
K/Co	4000.00		2000/1
K/Li	17333.33		2500/1
Mg/B	9.56		40/1
S/Cu	3238.46		1138/1
Se/Tl	220.00		37/1
Se/Sn	2.75		0.67/1
Zn/Sn	300.00		167/1

LEVELS

All mineral levels are reported in milligrams percent (milligrams per one-hundred grams of hair). One milligram percent (mg%) is equal to ten parts per million (ppm).

NUTRITIONAL ELEMENTS

Extensively studied, the nutrient elements have been well defined and are considered essential for many biological functions in the human body. They play key roles in such metabolic processes as muscular activity, endocrine function, reproduction, skeletal integrity and overall development.

TOXIC ELEMENTS

The toxic elements or "heavy metals" are well-known for their interference upon normal biochemical function. They are commonly found in the environment and therefore are present to some degree, in all biological systems. However, these metals clearly pose a concern for toxicity when accumulation occurs to excess.

ADDITIONAL ELEMENTS

These elements are considered as possibly essential by the human body. Additional studies are being conducted to better define their requirements and amounts needed.

RATIOS

A calculated comparison of two elements to each other is called a ratio. To calculate a ratio value, the first mineral level is divided by the second mineral level.

EXAMPLE: A sodium (Na) test level of 24 mg% divided by a potassium (K) level of 10 mg% equals a Na/K ratio of 2.4 to 1.

SIGNIFICANT RATIOS

If the synergistic relationship (or ratio) between certain minerals in the body is disturbed, studies show that normal biological functions and metabolic activity can be adversely affected. Even at extremely low concentrations, the synergistic and/or antagonistic relationships between minerals still exist, which can indirectly affect metabolism.

TOXIC RATIOS

It is important to note that individuals with elevated toxic levels may not always exhibit clinical symptoms associated with those particular toxic minerals. However, research has shown that toxic minerals can also produce an antagonistic effect on various essential minerals eventually leading to disturbances in their metabolic utilization.

ADDITIONAL MINERALS

These ratios are being reported solely for the purpose of gathering research data. This information will then be used to help the attending health-care professional in evaluating their impact upon health.

REFERENCE RANGES

Generally, reference ranges should be considered as guidelines for comparison with the reported test values. These reference ranges have been statistically established from studying an international population of "healthy" individuals.

Important Note: The reference ranges should not be considered as absolute limits for determining deficiency, toxicity or acceptance.