

## 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 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 follow 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 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)

This child's current mineral pattern is indicative of Slow Metabolism, Type #4. This is not unusual in children and young adults, as it is reflective of increased metabolic activity due to adrenal and thyroid dominance.

## 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.

### **INSOMNIA (TYPE #2)**

#### **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 level 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).

#### **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.

## 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 tissue potassium level relative to calcium (see low Ca/K ratio), is indicative of potassium loss or what may be termed as bio-unavailability. Bio-unavailability can be described as the mineral or nutrient being within the body, but it cannot be mobilized and used by the proper cells. If this profile remains chronic, potassium deficiency signs may develop, and which may include:

Tachycardia	Water Retention
Fatigue	Cramps

**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.

**HIGH CALCIUM/MAGNESIUM (Ca/Mg) RATIO**

Calcium and magnesium should always be in a proper balance to one another. If this normal equilibrium is upset, one mineral will become dominant relative to the other. In this case, calcium is high relative to magnesium (see high Ca/Mg ratio), which may be indicative of abnormal calcium metabolism, resulting in excessive deposition of calcium into the soft tissues. This profile is indicative of a suppressing effect upon magnesium function within the body, and increased need for magnesium in the diet.

**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.

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**TOXIC METAL LEVELS**

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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.

**Uranium (U)**

Naturally occurring uranium is found throughout the environment (air, water, food and soil). While it is a slightly radioactive element, its radioactive properties are quite mild and are not considered a health risk, as compared to the enriched, industrial-processed form of uranium commonly associated with nuclear materials and weapons. It is import to note that this uranium measurement is not indicative of exposure to, or accumulation of the enriched and highly-radioactive from of uranium.

**Sources:**

Most often, elevated hair levels of uranium are found to occur in people living in areas where the natural concentration of this element is high. In particular, geographical regions with granite and rocky soils are typically higher when compared to other areas of the country.

Root vegetables grown in high uranium soils and ground water are also two of the most common sources. Other potential sources include ceramics, colored glass, light bulbs, photographic chemicals, coal-burning plants and mining areas. Uranium is also found higher in agricultural areas due to the use of phosphate fertilizers which contain slightly higher amounts of natural uranium.

Although the uranium level is elevated when compared to the population in general, this tissue level should not be considered as clinically significant at this time.

**Note:**

A reduction in exposure and improved nutritional status will, in time, assist in mobilizing and excreting this element.

**NOTE :**

At this time, further confirmation 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.

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**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.

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**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.

**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

**FOODS HIGH IN MAGNESIUM**

The following foods are high in magnesium content relative to calcium. These foods may be increased in the diet until the next evaluation.

Blackstrap Molasses	Corn	Cashews
Prunes		
Figs (dried)	Wild Rice	
Bananas	Tofu	
Bass (broil)	Garbanzo Beans	

**METHIONINE RICH FOODS**

The following foods are a rich source of the essential amino acid methionine, which supplies sulfur to the cells for the activation of enzymes, and energy metabolism. Sulfur is also involved in detoxification processes. Toxic substances are combined with sulfur, converted to a nontoxic form and then excreted. The following foods may be consumed liberally during course of therapy;

Bass	Mackerel
Trout	Short Ribs
Cod	Perch
Tuna	Sirloin
Flounder	Pumpkin Seeds
Round Steak	Swordfish
Turkey	

The above list of foods are also high in glutamic and aspartic acid. These amino acid proteins help to improve tissue alkalinity.

**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.

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**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.

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