

## 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 #1)**

\*\* Parasympathetic Dominant

\*\* Tendency Toward Decreased Thyroid Function (reduced secretion of hormones)

\*\* Tendency Toward Decreased Adrenal Function (reduced secretion of hormones)

The profile obtained from the test result is indicative of a slow metabolic (Type #1) pattern. A slow metabolic rate is associated with low or diminished energy production on a cellular level. This is often due to a decrease in the body's efficiency in utilizing many of the nutrients found in the foods that are consumed, or it may be a result of an improper diet which does not provide the necessary nutrients to begin with. For a child, whatever the reason, an inability to obtain or utilize the proper nutrients at optimum efficiency can oftentimes contribute to symptoms such as, fatigue and cold hands and feet.

It should be noted that even though you may not be overweight at this time, she can still have a lowered metabolic rate, as overweight and underweight tendencies may not always be reflective of metabolism, especially in children.

## **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.

### **HYPOGLYCEMIA PROFILE**

According to this laboratory's research, slow metabolizers are prone to hypoglycemia (low blood sugar). This condition has become relatively common in modern society due to a number of factors, one of which is an improper diet. Hypoglycemia can be contributed to by dietary factors other than the commonly known factors of eating excess refined carbohydrates and sugars. Dairy products, fruit juices and foods high in fat content may also produce hypoglycemic symptoms. For this reason, observance of the dietary recommendations is of special importance for individuals at risk of hypoglycemic episodes.

The most common symptoms associated with hypoglycemia include, headaches, mood swings, lethargy, loss of concentration, and mid-afternoon loss of energy.

### **HYDROCHLORIC ACID PRODUCTION AND PROTEIN DIGESTION**

Your mineral profile may be reflective of a deficiency in hydrochloric acid (HCL) production, which can result in inadequate protein digestion. Hydrochloric acid in sufficient amounts is necessary for the complete digestion and utilization of dietary protein. Symptoms, such as, bloating of the stomach, flatulence and constipation may be observed with an HCL deficiency, especially following high protein meals.

### **POTASSIUM (K)**

Low tissue potassium may be due to poor retention of this mineral, even though dietary intake of potassium may be adequate. Poor potassium retention can result from adrenal and thyroid insufficiency, prolonged diarrhea, or from the use of medications, such as diuretics and laxatives. Nonsteroidal over-the-counter anti-inflammatories will also suppress adrenal function.

### **SODIUM, POTASSIUM AND HYDROCHLORIC ACID PRODUCTION**

#### **COPPER (Cu)**

Your copper profile is indicative of excess copper in the tissues. This element will have an antagonistic effect upon the functions of other essential elements. In particular, copper has a direct antagonistic effect on zinc activity within the body. Excess accumulation of copper may produce signs of zinc deficiency, even though zinc intake may be adequate or even if the tissue zinc level is within the normal range.

#### **ELEVATED BODY BURDENS OF COPPER**

In children, especially girls, chronically high tissue copper levels increase the tendency toward, or are associated with one or more of the following symptoms:

Anemia	Iron Deficiency
Allergies	Headaches (frontal)
Hair Loss	Skin Conditions
Appetite Disturbance	Constipation
Hyperactivity	Learning Disability

#### **SOME SOURCES THAT MAY CONTRIBUTE TO ELEVATED TISSUE COPPER LEVELS**

Excess copper accumulation can be contributed to by several factors :

- \* Foods high in copper
- \* Drinking water run through copper water pipes
- \* Prolonged copper supplementation
- \* Zinc deficiency
- \* Vitamin B6 Deficiency
- \* Vitamin C Deficiency

#### **NOTE:**

\* Exogenous contamination can occur from frequently swimming in pools or spas where copper sulfate has been added as an algicide.

#### **CANDIDIASIS**

The following conditions are associated with a predisposition toward yeast and/or fungal manifestation:

- \* Brownish discoloration with thickening or proving of the nails.
- \* Eczema like Skin Conditions
- \* Abdominal Bloating
- \* Fatigue
- \* Inflammation of the nail bed
- \* Vaginal Discharge

#### **FACTORS CONTRIBUTING TO CANDIDIASIS**

The following factors may contribute to or predispose an individual to recurring fungal and/or yeast manifestations:

Hypothyroidism	Antibiotics
Oral Contraceptives	Following Pregnancy
Following Major Surgery	Stress
Zinc Deficiency	Copper Excess
Iron Deficiency	

#### **MANGANESE (Mn) AND BLOOD SUGAR REGULATION**

The mineral manganese in combination with certain vitamins and minerals essential for many biochemical reactions, including carbohydrate metabolism and energy production. Manganese deficiency is frequently related to such manifestation as, low blood sugar levels, ligamentous problems and reproductive dysfunction.

### **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).

**HIGH CALCIUM/POTASSIUM (Ca/K) RATIO**

High calcium relative to potassium will frequently indicate a trend toward hypothyroidism (underactive thyroid). The mineral calcium antagonizes the retention of potassium within the cell. Since potassium is necessary in sufficient quantity to sensitize the tissues to the effects of thyroid hormones, a high Ca/K ratio would suggest reduced thyroid function and/or cellular response to thyroxine. If this imbalance has been present for an extended period of time, the following symptoms associated with low thyroid function may occur.

Fatigue	Depression
Dry Skin	Over-weight Tendencies
Constipation	Cold Sensitivity

**ZINC/COPPER (Zn/Cu) RATIO AND THE THYROID**

Zinc is required in sufficient amounts for the retention of potassium. A low zinc-to-copper ratio is frequently indicative of a trend toward reduced thyroid activity or expression as a result of a potassium deficit.

**LOW SODIUM/MAGNESIUM (Na/Mg) RATIO**

This ratio is below the normal range. 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, and reduced adrenal activity results in increased magnesium retention. The sodium-magnesium profile is indicative of reduced adrenal cortical function. The following associated symptoms may be observed:

Fatigue	Constipation
Dry Skin	Lowered Resistance
Allergies (Ecological)	Low Blood Pressure

**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.

**LOW IRON/COPPER (Fe/Cu) RATIO**

High copper relative to iron can be antagonistic to many functions of iron metabolism, and can often contribute to iron-deficiency anemia. Copper in excess will interfere with iron absorption and decrease the utilization of iron by the body. The low Fe/Cu ratio is reflective of a positive trend toward copper-

induced anemia.

## **TOXIC METAL LEVELS**

ALL CURRENT TOXIC METAL LEVELS ARE WITHIN THE ACCEPTABLE RANGE

## **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.

### **SELENIUM/MERCURY (Se/Hg) RATIO**

Mercury, a toxic metal, causes increased oxidative damage to cells. Selenium is known to protect tissues against these adverse effects by binding with mercury, thereby, rendering it less damaging. At this time, a low selenium-to-mercury ratio may be indicative of increased free radical production.

### **ZINC/MERCURY (Zn/Hg) RATIO**

When zinc levels within the body are sufficient, zinc is able to produce an antagonistic or protective response to the adverse effects of mercury. However, when zinc is low in relation to mercury (see low Zn/Hg ratio), the protective action of zinc upon mercury may become markedly reduced. Although the current mercury level is within the acceptable range, if this imbalance becomes chronic or worsens, some minor symptoms or adverse reactions associated with mercury may occur.

## **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.

### **FOOD ALLERGIES**

In some individuals, certain foods can produce a maladaptive or "allergic-like" reaction commonly called "food allergies". Consumption of foods that one is sensitive to can bring about reactions ranging from fatigue or drowsiness to rashes, migraine headaches and arthritic pain.

Sensitivity to foods can develop due to biochemical (nutritional) imbalances, and which can be aggravated by stress, pollution and medications. Nutritional imbalance can further be contributed to by restricting food variety, such as eating only a small group of foods on a daily basis. Often a person will develop a craving for the food they are most sensitive to and may eat the same food or food group more than once a day.

The following section may contain foods that are recommended to be avoided. These foods should be considered as potential "allergy foods" or as foods that may impede a rapid and effective response. Consumption of these foods should be completely avoided for four days. After which, they should not be eaten more frequently than once every three days during course of therapy.

### **AVOID DIETARY FATS AND OILS UNLESS NOTIFIED OTHERWISE BY ATTENDING DOCTOR**

The handling of fats is difficult during a reduced metabolic state, and can contribute to a further reduction in the metabolic rate. It is suggested that all sources of high dietary fat and oil be avoided until the next evaluation.

Salad Dressings	Cheese (most)
Cream	Butter
Hazelnuts	Walnuts
Margarine	Port
Bockwurst	Milk
Salami	Peanut Butter
Bologna	Pork Links
Corn chips	Almonds
Bacon	Knockwurst
Duck	Goose
Avocado	Braunschweiger
Cocoa Powder	Peanuts
Sardines (canned)	Tuna (canned in oil)
Avocado Oil	Liverwurst
Coconut Oil	

### **FOODS ALLERGIES RELATED TO COPPER**

Individuals with excessive tissue copper accumulation will often crave foods that are high in copper. The following foods, which are high in copper relative to zinc, should be avoided until the next evaluation:

Chocolate	Liver
Crab	Walnuts
Herring	Lobster
Haddock	Bran Flakes
Pecans	Peanut Butter
Almonds	Shrimp
Sesame seeds	Trout
Bakers yeast	Brazil nuts
Mushrooms	Sunflower seeds
Avocado	Grapes

### **REACTIONS ASSOCIATED WITH COPPER FOOD ALLERGIES**

Excess intake of high copper foods has been associated with several reactions, both physical and emotional. Physical reactions may include frontal headaches, skin rashes, joint stiffness, constipation, insomnia causing morning fatigue, bloating, water retention and cold sensitivity. Emotional reactions may include depression, crying spells, fearfulness, anxiety, irritability, anger, aggressive behavior and

withdrawal.

### **HIGH POTASSIUM FOODS**

The following foods may be increased in the diet until the next evaluation. These foods which are high in potassium content in relation to calcium and sodium will help to supplement potassium requirements.

Oranges	Asparagus
Dates	Plums
Scallops	Prunes
Tomatoes	Casaba
Rhubarb	Raisins
Peas	Lentils
Apricots	Beet Greens
Chicken	Beef (lean)
Catfish	Apples
Cantaloupe	Artichokes
Bananas	Beets
Egg (White)	Summer Squash
Turkey	Flounder (baked)
Currants	Brussels Sprout
Lima Beans	Chard

### **FOODS HIGH IN NIACIN**

Niacin (vitamin B3) is known to improve circulation, increase the metabolic rate via enzymes requiring B3, as well as help lower cholesterol and excess copper accumulation. The following foods are rich sources niacin and may be eaten liberally:

Bran Flakes	Fish (broiled)
Beef	Tuna
Chicken (light)	Peas

### **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.

**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.