### SIGNIFICANT RATIOS

<table>
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<tr>
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<th>Ca/P</th>
<th>Na/K</th>
<th>Ca/K</th>
<th>Zn/Cu</th>
<th>Na/Mg</th>
<th>Ca/Mg</th>
<th>Fe/Cu</th>
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<tbody>
<tr>
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<td>2.60/1</td>
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<td>2.60/1</td>
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<td>2.60/1</td>
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<table>
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<tr>
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<th>Na/K</th>
<th>Ca/K</th>
<th>Zn/Cu</th>
<th>Na/Mg</th>
<th>Ca/Mg</th>
<th>Fe/Cu</th>
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### TOXIC RATIOS

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<td>140.00</td>
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<table>
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### ADDITIONAL RATIOS

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<th>OPTIMUM</th>
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<tr>
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<tr>
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<td>K/Co</td>
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<tr>
<td>Zn/Sn</td>
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</tr>
</tbody>
</table>

### 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 minerals 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 minerals 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 minerals 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 minerals 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 RATIOS

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 a population of "healthy" individuals.

**Important Note:** The reference ranges should not be considered as absolute limits for determining deficiency, toxicity or acceptance.
INTRODUCTION TO HAIR TISSUE MINERAL ANALYSIS (HTMA)

Hair is used for mineral testing because of its very nature. Hair is formed from clusters of specialized cells that make up the hair follicle. During the growth phase the hair is exposed to the internal environment such as blood, lymph and extra-cellular 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 the period of formation. This biological process provides a blueprint and lasting record of mineral status and nutritional metabolic activity that has occurred during this time.

The precise analytical method of determining the levels of minerals in the hair is a highly sophisticated technique: when performed to exacting standards and interpreted correctly, it may be used as a screening aid for determining mineral deficiencies, excesses, and/or imbalances. HTMA provides you and your healthcare professional with an economical and sensitive indicator of the long-term effects of diet, stress, toxic metal exposure and their effects on your mineral balance that is difficult to obtain through other clinical tests.

It is important for the attending healthcare professional to determine your mineral status as minerals are absolutely critical for life and abundant health. They are involved in and are necessary for cellular metabolism, structural support, nerve conduction, muscular activity, immune functions, anti-oxidant and endocrine activity, enzyme functions, water and acid/alkaline balance and even DNA function.

Many factors can affect mineral nutrition, such as; food preparation, dietary habits, genetic and metabolic disorders, disease, medications, stress, environmental factors, as well as exposure to heavy metals. Rarely does a single nutrient deficiency exist in a person today. Multiple nutritional imbalances however are quite common, contributing to an increased incidence of adverse health conditions. In fact, it is estimated that mild and sub-clinical nutritional imbalances are up to ten times more common than nutritional deficiency alone.

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.

FAST METABOLISM (TYPE #1)

** 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 a fast metabolic rate (Fast Metabolism, Type #1). The Fast Metabolizer has increased activity of the energy producing endocrine glands, particularly the adrenal and the thyroid. Fast Metabolizers convert nutrients into energy at a rapid rate, resulting in energy and mood swings unless the energy level remains constant. Fast Metabolizers are usually under stress and
function best under stress due to the body’s response of increasing energy production when confronted by a stressor, whether physical or emotional. Stress seeking, starting several projects at once, and waiting to the last minute to meet deadlines are common descriptions of the Fast Metabolizer (Type #1).

Often, Fast Metabolizers will eat frequently in order to maintain their energy level. This may result in weight gain in the abdominal region. Fast Metabolism may result in warm body temperature, moist skin and a tendency to perspire easily.

It should be noted that stress is a normal part of life and serves a useful purpose when it is controlled. However, chronic uncontrolled stress will eventually contribute to various vitamin and mineral imbalances, and the ability to maintain adequate energy levels and optimum health will decrease.

**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)**
Your tissue potassium level is elevated above normal. Increased potassium retention will result in sodium retention and visa-versa. The glandular relationship of these electrolytes and their metabolic retention are influenced by the adrenal and thyroid glands, as well as dietary habits. High thyroid activity is associated with elevated tissue potassium retention, which secondarily increases sodium retention by stimulating the adrenal cortex.

**CONDITIONS ASSOCIATED WITH HIGH SODIUM AND POTASSIUM**
The following conditions are associated with chronically high levels of sodium and potassium:
- Elevated Thyroid Activity
- Increased Oxidative Activity
- Elevated Blood Pressure
- Renal Dysfunction
- Increased Protein Breakdown
- Fast Metabolism

**SOME FACTORS THAT MAY CONTRIBUTE TO HIGH LEVELS OF SODIUM AND POTASSIUM**
- Excess Vitamin A Intake and Retention
- Vitamin D Deficiency
- Calcium Deficiency
- Relative Copper Deficiency

**SODIUM, POTASSIUM AND DIGESTIVE DISTURBANCE**
As chloride is removed from sodium chloride (NaCl) for the production of hydrochloric acid (HCl), an elevated tissue sodium level can be indicative of increased HCl production and peptic conditions. Excessive HCl production can in turn lead to the depletion of pancreatic enzymes affecting digestion,
absorption and the integrity of intestinal permeability.

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.

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.

VANADIUM (V)
Although your vanadium level is moderately elevated, it 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.

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
The mineral potassium is antagonistic to calcium utilization and retention. A low tissue calcium in relation to potassium (see low Ca/K ratio), may be indicative of decreased absorption and increased excretion of calcium from the body. A tendency toward the following symptoms is usually associated with this mineral profile.

Muscle Cramps
Anxiety
Insomnia

LOW CALCIUM/POTASSIUM (Ca/K) RATIO
A low calcium level relative to potassium is indicative of decreased calcium absorption and retention, or increased excretion of this essential mineral. In addition to potassium's antagonistic effect upon calcium function within the body, the increased secretion of adrenal and thyroid hormones also antagonizes calcium. This mineral imbalance reflects a decrease in thymus activity and therefore, a compromised immune system. This pattern further indicates an increased requirement for calcium and vitamin D.

**TOXIC METAL LEVELS**

**ALL CURRENT TOXIC METAL LEVELS ARE WITHIN THE ACCEPTABLE RANGE**

**TOXIC METAL RATIOS**

**ALL CURRENT TOXIC METAL RATIOS ARE WITHIN THE ACCEPTABLE RANGE**

**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 in the diet to aid in the improvement of your biochemistry.

**GENERAL DIETARY GUIDELINES FOR THE FAST METABOLIZER**

* INCREASE INTAKE OF HIGH PURINE PROTEIN FOODS...high purine protein sources include liver, kidney and heart. Other good sources include sardines, tuna, clams, crab, lobster and oysters. Unless notified otherwise, high purine and moderate purine protein intake should constitute approximately 33% of total daily caloric intake.

* INCREASE INTAKE OF MILK AND MILK PRODUCTS...such as cheese, yogurt, cream, butter (unsalted). Increase intake of nuts and seeds such as almonds, walnuts, peanuts, peanut butter and sunflower seeds. Foods high in fat unless notified otherwise should constitute approximately 33% of total daily caloric intake.

* REDUCE CARBOHYDRATE INTAKE...including unrefined carbohydrates. Sources such as cereals, whole grains and whole grain products are contraindicated for frequent consumption until the next evaluation. Carbohydrate intake in the form of unrefined carbohydrates should be approximately 33% of total daily caloric intake.
* AVOID ALL SUGARS AND REFINED CARBOHYDRATES...this includes white and brown sugar, honey, candy, soda pop, cake, pastries, alcohol and white bread.

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 drowsiness to hyperactivity in children, itching and rashes, headaches, high-blood pressure and arthritic pain.

Sensitivity to foods can develop due to biochemical (nutritional) imbalances, and which stress, pollution, and medications can aggravate. 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 avoid. 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 avoided completely for four days. After which, they should not be eaten more frequently than once every three days during course of therapy.

CANNED FOODS - (CONTRAINDED)
Canned foods should be eliminated from the diet. Most canned foods are high in salt and as such will contribute to excessive sodium levels and disturbed calcium metabolism.

NOTE: Canned foods frequently contain higher levels of toxic metals.

FOODS THAT STIMULATE HISTAMINES
Consumption of the following foods can stimulate histamine release in certain metabolic types and may contribute to respiratory-type allergy reactions. These foods are to be avoided until the next evaluation or until notified otherwise by attending doctor.

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<thead>
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<tbody>
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PHYTIC ACID AND REDUCED CALCIUM ABSORPTION
The following foods contain high amounts of phytic acid. Phytic acid will combine with dietary calcium to form an insoluble calcium phytate that will reduce absorption. These sources should be avoided until calcium utilization has improved.

<table>
<thead>
<tr>
<th>Strawberries</th>
<th>Oatmeal</th>
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</thead>
<tbody>
<tr>
<td>Rye Bread</td>
<td>Wheat Bran</td>
</tr>
<tr>
<td>Wheat Germ</td>
<td>Rye Crackers</td>
</tr>
<tr>
<td>Whole Wheat</td>
<td>Blackberries</td>
</tr>
</tbody>
</table>
Foods that contribute to a calcium/potassium imbalance

The following foods should be avoided until the next evaluation or until notified otherwise by attending doctor:

- Apricots
- Peas
- Rye Crackers
- Clams
- Cantaloupe
- Tomatoes
- Cucumbers
- Coffee
- Spinach
- Whole Rye
- White Rice
- Apples
- Chestnuts
- Blackberries
- Oranges
- Brewers Yeast
- Kelp
- Potatoes
- Peaches

The following high sodium foods should be avoided until the next evaluation:

- Table Salt
- Corn Chips
- Snack Dips
- Pickles
- Butter (salted)
- Frankfurter
- Kelp
- White Rice
- Pork Links
- Cornbread
- Italian Bread
- Pancake Mix
- Ham (cured)
- Potato Chips
- Corned Beef
- Ritz Crackers
- White Bread
- Bacon
- Soups (most)
- Rye Bread
- Cinnamon Rolls
- Canned Foods
- Bologna
- Pancake Mix
- Biscuit Mix
- Rye Bread

Dietary considerations

Magnesium is required in higher amounts in the presence of increased dietary sodium intake or retention. Sodium is currently high relative to magnesium.

1. Reduce sodium intake until magnesium status has improved.
2. Increase selection of calcium and magnesium foods.
3. Use mineral water for drinking.
4. Avoid distilled or softened water for drinking.
5. Reduce alcohol intake.
6. Limit excessive protein consumption (should not exceed 30%).

Amino acids that improve calcium absorption

Calcium absorption is greatly enhanced when the diet is high in the amino acids, lysine, arginine and histadine. These proteins also help to reduce acidity of the tissues. Both effects are favorable for the fast metabolizer, therefore addition of any of the following foods to the diet is recommended at this time:

- Lima Beans
- Soybeans
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.

NO PART OF THIS INTERPRETIVE REPORT MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR ANY INFORMATION STORAGE OR RETRIEVAL SYSTEM WITHOUT PERMISSION IN WRITING FROM TRACE ELEMENTS, INC., U.S.A.
Email: lab@interclinical.com.au

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Authorized Representative for Australia and New Zealand