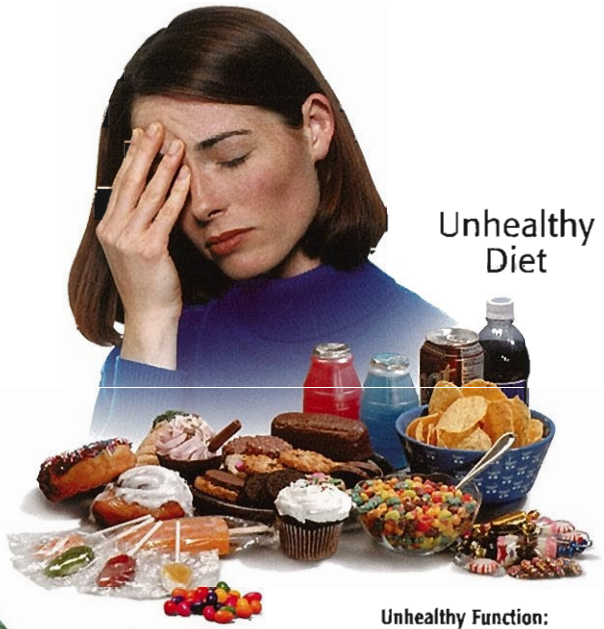
# BLOOD SUGAR METABOLISM


**Healthy Function:**
Complex, unrefined carbohydrates from whole foods are absorbed more slowly through the intestine causing the release of appropriate, healthy levels of insulin from the pancreas.

**Unhealthy Function:**
Refined carbohydrates and sugars are absorbed more rapidly through the intestine and can trigger the release of excess, unhealthy levels of insulin from the pancreas.

Rapid sugar absorption
Intestine
Healthy sugar absorption
Excess insulin release
Excess insulin
Excess sugar
Pancreas
Healthy insulin release
A low glycemic index dietary program (including soy protein, special fibers and high-amylose starch) supports a healthy rate of sugar absorption and insulin release.
Sugar transport channels
Unhealthy insulin receptor
Insulin signal is diminished by:
Phosphotyrosine phosphatases
TNF alpha and other cytokines
NF-kappaB and other inflammatory substances
Unhealthy Cell:
A diminished insulin signal is unable to direct the sugar transport channel vesicles to fuse with the cell membrane, reducing sugar transport into the cell.
Mitochondrion
Static sugar transport channel vesicles
Altered gene expression reduces fat and sugar utilization by mitochondrion. (also associated with ↑NF-kappaB and altered fat metabolism)
EPA DHA
Healthy insulin receptor
Insulin signal is supported by:
Vanadium
Chromium
CLA
Lipoic acid
Inositol
Magnesium
Vitamin E
Insulin
Sugar
Active sugar transport channel vesicles
Healthy Cell:
A strong insulin signal directs the sugar transport channel vesicles to fuse with the cell membrane, facilitating sugar transport into the cell.
Adequate gene expression supports fat and sugar utilization by mitochondrion. (also associated with ↓NF-kappaB, ↓LDL, ↓triglycerides, ↑HDL and healthy fat cell changes)
Nuclear receptors:
PPAR Gamma
PPAR Alpha
CLA binds to nuclear receptors to support adequate gene expression.
Nucleus
Biotin
Lipoic acid
Mitochondrion

# THE IMPORTANCE OF HEALTHY SUGAR METABOLISM

Achieving and maintaining proper blood sugar metabolism is essential for a lifetime of excellent health. Prolonged unhealthy blood sugar metabolism can significantly affect the health of your nerves, eyes, blood vessels, kidneys and pancreas. It can impact your weight, body shape, energy levels, blood pressure, cholesterol, triglycerides, overall cardiovascular health and more. Over 60 million Americans have "insulin resistance," a form of unhealthy blood sugar metabolism that frequently goes unrecognized but can often progress to the point where signs of significant health deterioration appear.

Don't let this happen to you! It is never too early or too late to learn how you can achieve and maintain healthy blood sugar metabolism and experience the benefits of sustained good health. The illustration on the reverse side of this sheet was created to help you do just that. By understanding how blood sugar metabolism works, and with the guidance of your healthcare provider, you can take the necessary steps to achieve and enjoy the long lasting benefits of healthy blood sugar metabolism.

## Diet, Lifestyle and Healthy Blood Sugar Metabolism

The illustration on the reverse side of this sheet begins by depicting the importance of eating a healthy, nutrient-rich diet containing unrefined carbohydrates from whole foods. Through normal, healthy digestion, the unrefined carbohydrates in our diet are progressively broken down to smaller sugars, which are then absorbed through the intestine into the blood. This sugar absorption stimulates the pancreas to secrete an appropriate quantity of insulin into the blood, which facilitates the delivery of sugar into cells throughout the body.

When insulin binds to insulin receptors embedded in the cell membrane, a signal is sent to sugar transport channel vesicles inside the cell. These vesicles respond to the insulin signal by carrying sugar transport channels ("sugar entryways") to the surface membrane of the cell. The vesicles then fuse with the cell membrane, flatten out and position their sugar transport channels to facilitate effective sugar delivery from the blood into the cell. The sugar then enters the cell and is used for energy production by the mitochondria (the energy factories of the cell) or is stored for future use. The response of the cell to insulin binding and the resultant insulin signal is critical to healthy blood sugar metabolism.

Poor diet, obesity and lack of exercise are considered major contributors to developing poor blood sugar metabolism. Incorporating lifestyle changes that focus on effective weight control, healthy eating habits and a program of regular exercise are very important to promoting healthy blood sugar metabolism.

## Factors That Lead to Unhealthy Blood Sugar Metabolism

Over time, inactivity and an unhealthy diet can lead to unhealthy sugar metabolism. When we consume excess sweets and refined or processed foods the simple sugars they contain are absorbed very quickly and can cause a rapid and dramatic increase in our blood sugar levels. With a high concentration of sugar in the blood, the pancreas responds by producing a proportionally high surge of insulin in an effort to help the sugar gain entrance into the cell. In unhealthy blood sugar metabolism, the cell may be unresponsive or "insulin resistant" and sugar delivery into the cell can be reduced. The pancreas then tries to compensate by producing even more insulin. Over time these high levels of insulin can lead to a host of problems, including increased triglyceride levels, decreased HDL ("good") cholesterol levels, high blood pressure, other cardiovascular manifestations and hormone disruption.

This "insulin resistance" may occur because, along with excess sweets and refined carbohydrates, an unhealthy diet is also frequently deficient in the nutrients necessary to support healthy cell membranes, insulin receptors and a strong insulin signal. Unhealthy insulin receptors can result in poor binding of insulin and, in concert with other factors, a diminished insulin signal, thereby reducing sugar delivery into the cell. These other factors include the negative effects of specific enzymes and cytokines, such as phosphotyrosine phosphatases, nuclear factor-kappaB (NF-kappaB), and tumor necrosis factor alpha (TNF-alpha).

An unhealthy diet may even alter the way the genetic information within our cells influences blood sugar metabolism. Scientists now know that a poor diet, along with other contributors, can alter our genetic potential or gene expression. Appropriate gene expression is important for healthy blood sugar metabolism because it stimulates sugar utilization by the mitochondria of the cells, producing energy and, in effect, clearing sugar from the blood.

Taken as a whole, excess weight, lack of exercise and an unhealthy diet can reduce the "sensitivity" of your cells to insulin and even impact their genetic expression. Without effective insulin binding and signaling, the sugar transport channel vesicles remain static and unable to travel to and fuse with the cell membrane. As a result, the number of sugar transport channels is reduced, leading to poor cellular sugar absorption and utilization, excess blood sugar and insulin, low energy and a host of other possible manifestations of deteriorating health.

## Suggestions to Help Achieve Healthy Blood Sugar Metabolism

As mentioned earlier, implementing a program of regular exercise and effective weight control is important. Following specific dietary guidelines can also have a tremendous effect on your body's ability to establish and maintain healthy blood sugar metabolism.

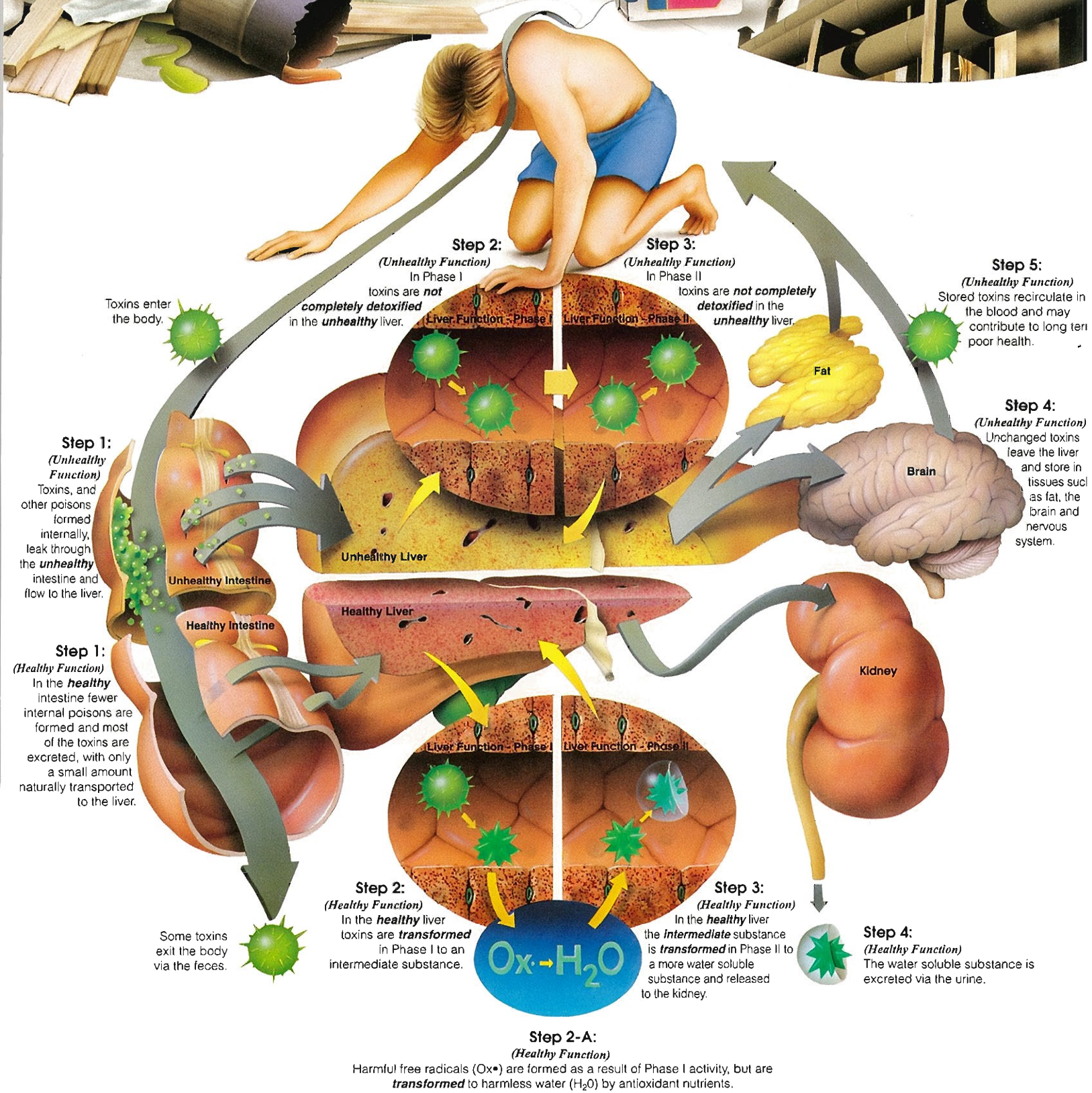
The dietary guidelines should focus on two primary goals: 1.) Choosing foods that have a moderate effect on raising blood sugar, referred to as "low glycemic index" foods, and 2.) Choosing foods that improve the body's ability to support the effect of insulin, functionally reducing "insulin resistance." With the guidance of your healthcare provider, this can be an easy process that results in a healthy and delicious dietary plan.

Nutritional supplementation may also offer great benefit. Your healthcare provider may recommend that you supplement your diet with a combination of macro-nutrients that include soy protein, special fibers and a low glycemic index starch known as high-amylose starch. These help support healthy carbohydrate absorption and blood sugar metabolism.

Supplementing your diet with various fatty acids and micro-nutrients may also be very helpful. These include the essential fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) to support healthy cell membranes; conjugated linoleic acid (CLA) to support the insulin signal and promote adequate gene expression for improved utilization of sugar by the mitochondrion; lipoic acid to further support the insulin signal and sugar utilization by the mitochondrion; the minerals vanadium, chromium and magnesium to provide additional support to the insulin signal; vitamin E and inositol for further insulin signal support; and biotin to support sugar utilization by the mitochondria. Other herbs and accessory nutrients may also be helpful.

Take the first step to achieving healthy blood sugar metabolism and sustained good health right now! Ask your healthcare provider for the program that is right for you.

# DETOXIFICATION




**Step 2-A:**
*(Healthy Function)*
Harmful free radicals (Ox•) are formed as a result of Phase I activity, but are ***transformed*** to harmless water ($H_2O$) by antioxidant nutrients.

# DETOXIFICATION

## The Growing Problem of Toxicity

In recent history, mankind has managed to drastically change the chemistry of the environment in which we live. For example, in 1989 alone, more than 1,000,000,000 pounds of chemicals were released into the ground, threatening a portion of the soil we grow our food in and the natural underground water tables that supply some of our drinking water. Over 188,000,000 pounds of chemicals were also discharged into surface waters such as lakes and rivers. More than 2,400,000,000 pounds of chemical emissions were pumped into the air we breathe. A grand total of 5,705,670,380 pounds of chemical pollutants were released into the environment we eat, breathe and live in, all in just one year.

To compound the problem of our toxic environment, we have refined away much of the nutritional value of our food supply and replaced it with artificial colorings, preservatives, flavorings, conditioners, etc. This poor quality diet–combined with extensive use of antibiotics in medicine and agriculture–may have predisposed many of us to experience a kind of "internal" pollution. Internal pollution occurs when the healthful bacteria in the intestinal tract are overcome by unhealthful bacteria. These unhealthful bacteria release toxic by-products into our circulation which can negatively impact many aspects of our overall health.

## Will Toxicity Have An Effect on You?

What does this problem of toxicity mean for us individually? It may present a threat to the vibrant level of health we would like to enjoy. But whether we succumb to the adverse effects of toxicity depends on our knowledge of the subject and the choices we make. We need to take personal responsibility to make sure that we do not fall victim to toxicity. That involves learning what we need to do to help our body protect itself from toxicity.

## Basic Ways to Avoid Toxicity

Let's begin with some of the basic requirements to avoid toxicity. Do all you can to purify your work and home environments. If you know the source of any toxic materials at work, such as stored or leaking chemicals, dyes, paints, solvents, glues, acids, or household offenders such as insecticides or cleaning agents, remove them if possible. If the offending materials cannot be removed, an effective air purification system may be needed. At least, wear protective clothing and/or breathing apparatus when using any toxic materials. Regular replacement of furnace and air conditioning filters may also be helpful.

It is also very important to eat a good diet with plenty of fresh, wholesome foods. Avoid eating excess fat, refined sugar and foods high in additives and preservatives. Eat moderate levels of protein (approximately 15% to 20% of your calories) and fat (approximately 20% of your calories), while increasing levels of complex carbohydrates (approximately 60% of your calories). Substitute organically-raised animals and organically-grown fruits and vegetables whenever possible. Drink plenty of purified water (ideally, eight 8-ounce glasses a day). A home water purification system is highly desirable to provide pure water for drinking and cooking.

## Support Your Body's Efforts to Eliminate Toxicity

One thing is certain in our effort to purify our work and home environments; it is impossible to avoid toxicity completely! With that realization, the importance of supporting your body's efforts to eliminate accumulated toxins cannot be overstated. The illustration on the reverse side of this sheet outlines the body's natural detoxification mechanism and helps us understand the best way to strengthen and support it. Please take a minute now and consider it closely.

## Water or Juice Fasts Less Complete

Formerly it was believed that a water or juice fast was a preferred detoxification program. These fasts were thought to work under the principle that the body will be able to clear stored toxins and heal itself when the "stress" of digestion and the further accumulation of toxins were eliminated. The modern-day realization that the body's detoxification mechanism is a heavily nutrient-supported process has made it clear that simple juice or water fasting is less complete and no longer the method of choice. Prolonged fasting may weaken muscles and various organs because of protein losses and a gradual slowing of metabolic activity as the body endeavors to conserve its depleted energy resources.

## More Complete Support for Detoxification

A more current approach to detoxification is to nourish the body thoroughly, fueling its natural detoxification mechanism with the nutrients needed to achieve optimal detoxification activity. By providing high-quality protein, complex carbohydrates and essential fats, the body gets what it needs to prevent muscle and organ breakdown and depleted energy resources. But that is just the beginning. Nutrients are needed to support the function of the organs directly involved in detoxification: *the liver, the intestinal tract and the kidneys*. Intelligent application of nutrition may help in the following ways:

***Intestine:*** The nutrients zinc and pantothenic acid, the amino acid L-glutamine, carbohydrates known as fructooligosaccharides, and microorganisms known as acidophilus and bifidus, are a few of the substances that provide support for the health and integrity of intestinal function. In a proper state of health, the intestine promotes elimination of toxins through (1) regular bowel movements, (2) eliminating the build-up of unhealthful microorganisms and internal toxins, and (3) providing a strong and intact barrier to prevent the leaking of toxic materials from the intestines into circulation.

***Liver:*** The vitamins A, $B_3$, $B_6$, C, E, beta-carotene, the amino acids L-cysteine and L-glutamine, and components known as glutathione and phospholipids are some of the substances that support liver function. In a proper state of function, the liver filters out and transforms toxic substances that have entered the blood into harmless substances that can be excreted in the urine. Interestingly, it appears that the ratio of dietary protein to carbohydrate may be a very important factor in determining the ability of the liver to detoxify certain substances.

***Kidney:*** The vitamins A, C, $B_6$, and the minerals magnesium and potassium, are just some of the substances that support kidney activity. The kidney provides a major route of toxin excretion via the urine.

***Fat:*** Weight reduction and management is helpful for those who are overweight. Excess fat provides a ready storage site for fat-loving toxins entering the body. Once deposited there, it is very difficult to remove them. Unless the excess fat is removed, they remain there with the possibility of being a continual source of toxicity.

## Find the Help You Need

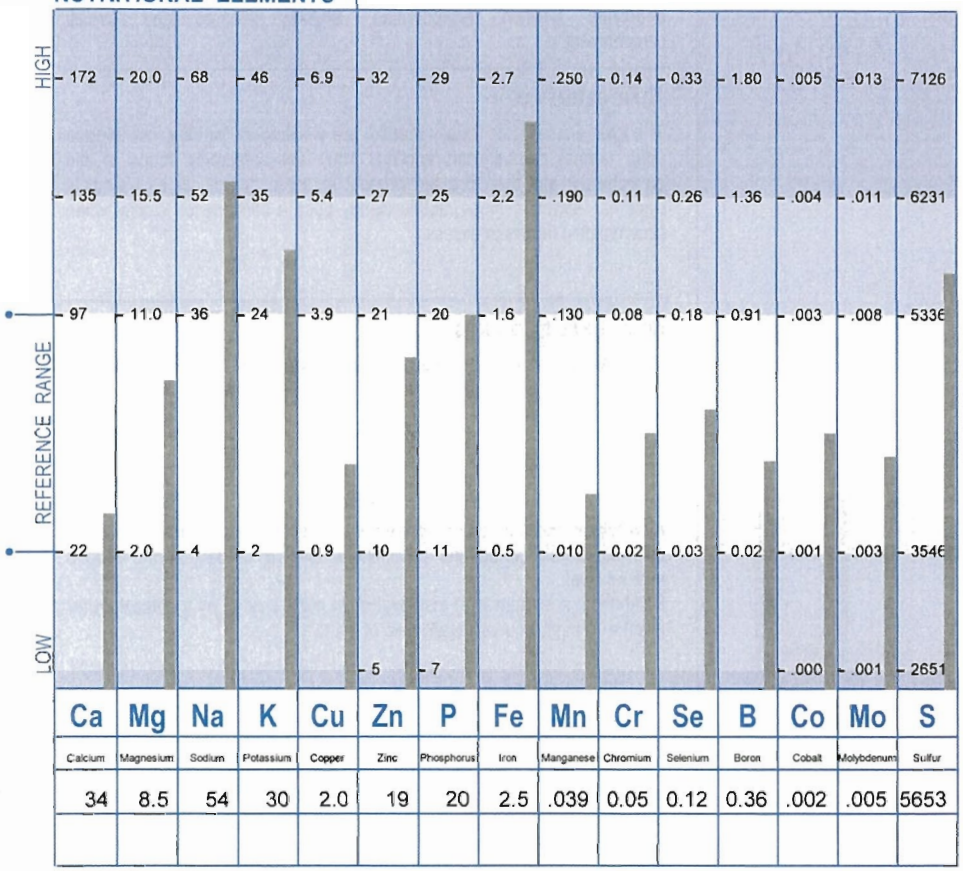
If you have any questions as to what you can do to help eliminate internal pollution, do not hesitate to ask us.

# TRACE ELEMENTS

4501 Sunbelt Drive · Addison, Tx · 75001 · U.S.A.

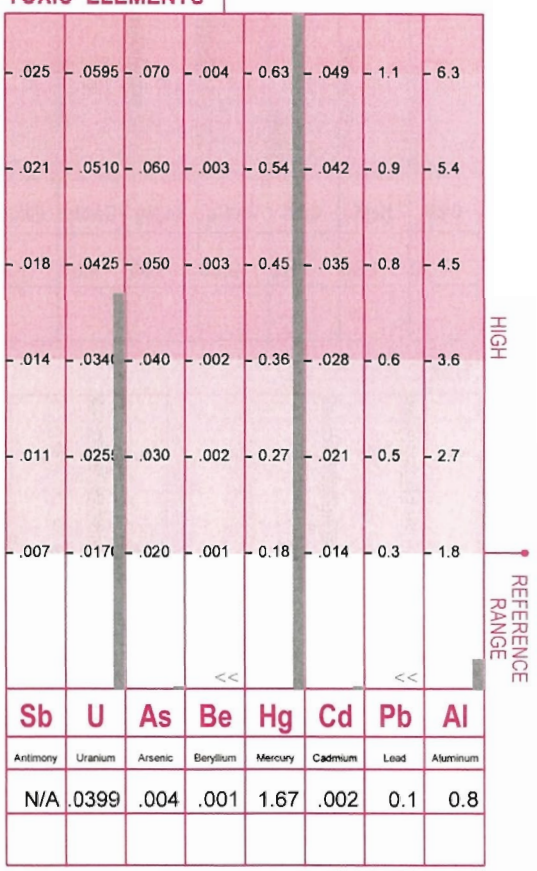
| | | | |
|---|---|---|---|
| LABORATORY NO.: | 1437285 | | |
| PROFILE NO.: 2 | | SAMPLE TYPE: | SCALP |
| PATIENT: | AGE: 63 | SEX: M | METABOLIC TYPE: FAST 1 |
| REQUESTED BY: SARVESTANI, A. | ACCOUNT NO.: 4714 | | DATE: 6/29/2018 |

## NUTRITIONAL ELEMENTS



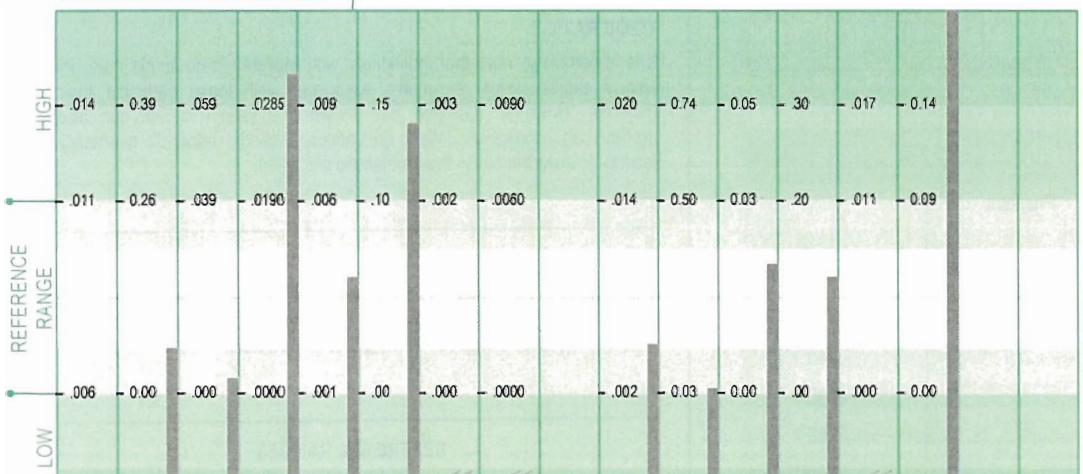

| Ca | Mg | Na | K | Cu | Zn | P | Fe | Mn | Cr | Se | B | Co | Mo | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | Magnesium | Sodium | Potassium | Copper | Zinc | Phosphorus | Iron | Manganese | Chromium | Selenium | Boron | Cobalt | Molybdenum | Sulfur |
| 34 | 8.5 | 54 | 30 | 2.0 | 19 | 20 | 2.5 | .039 | 0.05 | 0.12 | 0.36 | .002 | .005 | 5653 |

## TOXIC ELEMENTS




| Sb | U | As | Be | Hg | Cd | Pb | Al |
|---|---|---|---|---|---|---|---|
| Antimony | Uranium | Arsenic | Beryllium | Mercury | Cadmium | Lead | Aluminum |
| N/A | .0399 | .004 | .001 | 1.67 | .002 | 0.1 | 0.8 |

## ADDITIONAL ELEMENTS




| Ge | Ba | Bi | Rb | Li | Ni | Pt | Tl | V | Sr | Sn | Ti | W | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Germanium | Barium | Bismuth | Rubidium | Lithium | Nickel | Platinum | Thallium | Vanadium | Strontium | Tin | Titanium | Tungsten | Zirconium |
| .001 | 0.06 | .003 | .0315 | .004 | .14 | .001 | .0005 | .005 | 0.04 | 0.02 | .12 | .001 | 0.26 |

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

"QNS": Sample Size Was Inadequate For Analysis.

"N/A": Currently Not Available

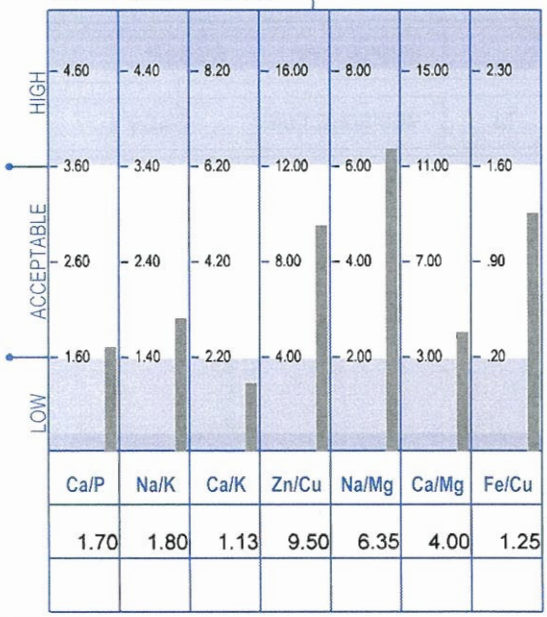
Ideal Levels And Interpretation Have Been Based On Hair Samples Obtained From The Mid-Parietal To The Occipital Region Of The Scalp.

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

6/29/2018
CURRENT TEST RESULTS

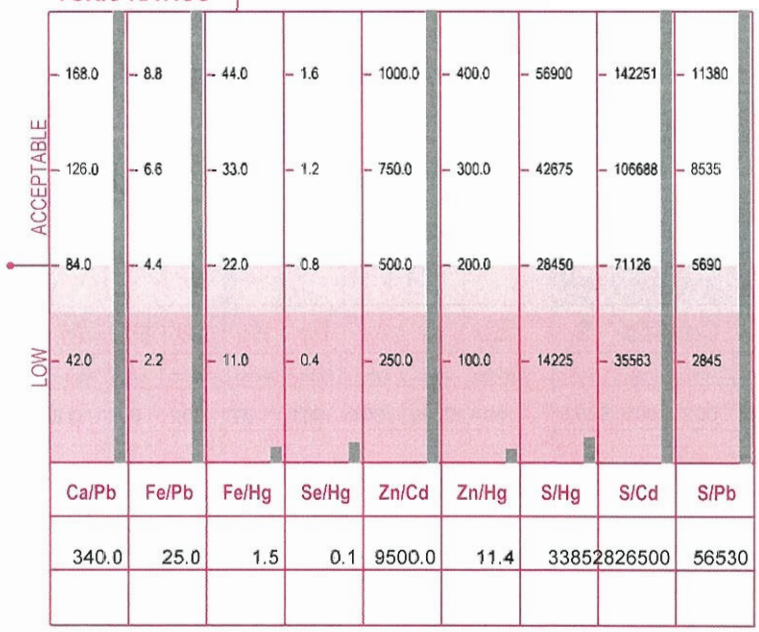
PREVIOUS TEST RESULTS

## SIGNIFICANT RATIOS




| Ca/P | Na/K | Ca/K | Zn/Cu | Na/Mg | Ca/Mg | Fe/Cu |
|---|---|---|---|---|---|---|
| 1.70 | 1.80 | 1.13 | 9.50 | 6.35 | 4.00 | 1.25 |

## TOXIC RATIOS




| Ca/Pb | Fe/Pb | Fe/Hg | Se/Hg | Zn/Cd | Zn/Hg | S/Hg | S/Cd | S/Pb |
|---|---|---|---|---|---|---|---|---|
| 340.0 | 25.0 | 1.5 | 0.1 | 9500.0 | 11.4 | 33852 | 826500 | 56530 |

## ADDITIONAL RATIOS

| RATIO | CALCULATED VALUE | | EXPECTED |
|---|---|---|---|
| | Current | Previous | |
| Ca/Sr | 850.00 | | 131/1 |
| Cr/V | 10.00 | | 13/1 |
| Cu/Mo | 400.00 | | 625/1 |
| Fe/Co | 1250.00 | | 440/1 |
| K/Co | 15000.00 | | 2000/1 |
| K/Li | 7500.00 | | 2500/1 |
| Mg/B | 23.61 | | 40/1 |
| S/Cu | 2826.50 | | 1138/1 |
| Se/Tl | 240.00 | | 37/1 |
| Se/Sn | 6.00 | | 0.67/1 |
| Zn/Sn | 950.00 | | 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.

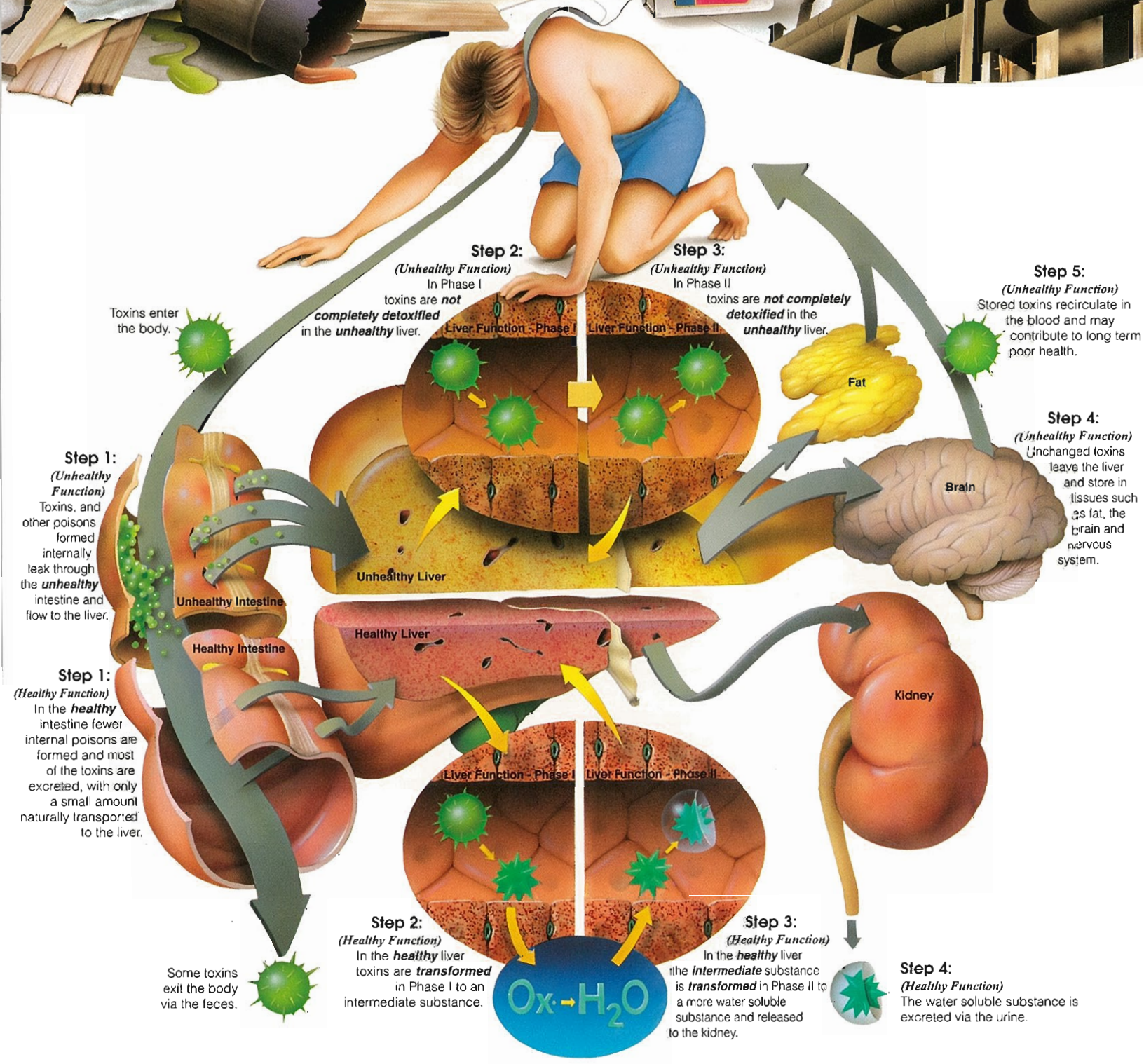
### ADDITIONAL RATIOS

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 an international population of "healthy" individuals.
Important Note: The reference ranges should not be considered as absolute limits for determining deficiency, toxicity or acceptance.

# DETOXIFICATION

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To compound the problem of our toxic environment, we have refined away much of the nutritional value of our food supply and replaced it with artificial colorings, preservatives, flavorings, conditioners, etc. This poor quality diet – combined with extensive use of antibiotics in medicine and agriculture – may have predisposed many of us to experience a kind of "internal" pollution. Internal pollution occurs when unhealthful bacteria overcome the healthful bacteria in the intestinal tract. These unhealthful bacteria release toxic by-products into our circulation, which can negatively impact many aspects of our overall health.

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MET010 REV. 1/01