



BLOOD CHEMISTRY TESTS

Description and Explanation

Dr. Donna F. Smith

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READ THIS FIRST!

This document provides a brief description and explanation of the various blood chemistry tests listed in the order on your **Blood Chemistry Results Report**, which will help you read through your initial and updated reports more easily. An internet search on the name of the test will provide more information if needed. If you want further clarification regarding the information from your search, please email a list of the chemistries in question at least 24-48 hours before your next telephone consultation. If you do not have internet access, please schedule a fee-based telephone consultation with Dr. Smith.

Before reading the information on each blood test, it is important to understand the difference between a Clinical Nutrition Interpretation or Analysis and a “medical” interpretation of your Laboratory Report, which is discussed in the next section of this document.

The term “chemical” can be confusing. Chemistry is a branch of science dealing with the structure, composition, properties, and reactive characteristics of substances, especially at the atomic and molecular levels. Therefore, the term “chemical,” being derived from the term “chemistry,” can be a substance with either beneficial or harmful characterizes.

Additionally, whether the characteristic has a beneficial or harmful affect is also relative to the matter it affects. For example, a chemical that could harm the human body or some other “organic” matter or substance may not be harmful to “inorganic” matter. For example, paint thinner is not harmful to the walls (inorganic) of a building, but when added as an artificial flavoring in foods (organic) and then consumed by a human (organic), it is harmful.

- **Substances with beneficial characteristics** include Nutrients from whole foods and herbs, which are substances required for the biochemistry of the human body, i.e., the healthy function of the human cells and tissue of all organs and glands. One role of the biological process called “the metabolism” is to change nutrients to bio-“chemicals” that can nourish and detoxify cells and tissue.



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- **Substances with harmful characteristics** includes synthetic substances, pharmaceutical chemicals (drugs), dyes, food colorings, chemicals used as preservatives and food additives, and other pollutants in our air, food or water.

When reviewing Laboratory Reports from blood testing, each of the tests listed are referred to as blood “chemistries.” So in this definition, Glucose, Uric Acid, even minerals like Calcium, for examples, are each a chemical of the blood.

Understanding the differences and usage of the term “chemical” is important when reading this document and other articles so you are not confused or think reference is being made to a poisonous or harmful substance, just because the term “chemical” is being used.

Chapter 1 - CLINICAL NUTRITION INTERPRETATION OF BLOOD CHEMISTRY TESTS

Clinical Nutrition Blood Chemistry Reports:

A Clinical Nutrition Analysis of your Blood Chemistry Tests comprises three separate reports stapled and presented in this order:

1. The **Blood Chemistry Results Report**, which is the Clinical Nutrition Analysis or interpretation of your medical Laboratory Report.
2. **Health Concern** Table which is the document located between the Blood Chemistry Results Report and the Laboratory Report. The “Health Concern” page does not have a large heading or title like the other documents; however, on the first row of the table, you will notice the words “Health Concern” in the first column.
3. Your **Laboratory Report** (for example from LabCorp), which is a medical report or interpretation of your blood chemistry tests.



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Medical & Clinical Nutrition Interpretation of Lab Reports

The difference between a “medical” interpretation and a “clinical nutrition” interpretation of blood chemistry tests is explained on the **Nutritional Analysis** web page linked to **Our Services** in the **Table of Contents** on our website. If you have not read this web page, [click here](#) for quick access to this information, which will help you understand the information in this section. Also, reading this web page and this document before your **Report of Findings Consultation**, scheduled to discuss your test results will:

1. Save you time and money at your consultation.
2. Establish a foundation of knowledge in blood chemistry testing.
3. Allow the educational presentation at this consultation to enhance or build upon this foundation of blood chemistry knowledge, thus taking you to the next level of knowledge.
4. Help you more easily understand the blood chemistry educational presentation at your Report of Findings consultation.

The descriptions for each blood chemistry test in this document are “medical” definitions. When your test “Results” number is “medically” abnormal, i.e., either below (LOW) or above (HIGH) when compared to the range of numbers in the “**Reference Intervals**” column located in the right column of your actual **Laboratory Report**, then your physician may diagnose the disease or life-threatening condition indicated in these definitions.

However, when your **Results** number is **medically normal**, i.e., within the **Reference Intervals** range of numbers, yet **nutritionally abnormal**, this means you are currently in a “**pattern**” of the disease or life-threatening condition. In other words, you are **progressing towards** this disease or life-threatening health condition stage and as of the test date, you have not reached that stage, yet. Abnormal Clinical Nutrition Results or **Value** numbers are indicated in the right column of your **Blood Chemistry Results Report**, as either, VERY LOW, LOW, VERY HIGH or HIGH.

This means that if you were not currently in **Clinical Nutrition Therapy** to provide the nutrients your body requires to bringing your Test Result or “Value” number into Homeostasis, i.e., within the numbers indicated by “**Range Low**” and “**Range High**” on your **Blood Chemistry Results Report**, your abnormal numbers will continue to progress further and further away from homeostasis and in due time, you will reach that stage where:



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1. Your test numbers (values) are then flagged as LOW or HIGH on your actual Medical Laboratory Report, which means they are also flagged on your Clinical Nutrition Analysis “Blood Chemistry Results Report.”
2. You experience the symptoms of the disease or life-threatening condition.

The next section of this document provides a brief definition and explanation of each blood chemistry test.

Chapter 2 - BLOOD CHEMISTRY RESULTS REPORT

These blood tests are routinely ordered for a Clinical Nutrition Analysis of Blood Chemistries, thus listed on the Blood Chemistry Results Report. The Blood Chemistry Results Reports consists of:

1. Blood Tests listed on your Laboratory Report
2. Manual Calculations of other blood chemistries, such as Osmolality, which you will notice are not listed on your medical Laboratory Report.

Chapter 3 - INDIVIDUAL BLOOD CHEMISTRY DEFINITIONS AND EXPLANATIONS

Glucose

Glucose is Blood Sugar, which is the most direct, single test to identify diabetes. Blood sugar may be used to identify diabetes or to evaluate how a diabetic is controlling their disease.

Uric Acid

Uric Acid is a by-product of protein metabolism, eliminated through the kidneys, thus making Uric Acid one of several indicators of kidney function. Excessive Uric Acid is associated with Gout Disease.

Blood Urea Nitrogen (BUN)

BUN is also a by-product of protein metabolism eliminated through the kidneys, thus making BUN one of several indicators of kidney function.



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Creatinine

Creatinine is filtered out of the blood by the kidneys and is an indicator of kidney function.

BUN/Creatinine Ratio

A more complete estimation of renal function can be made when interpreting the blood (plasma) concentration of Creatinine along with that of urea. The ratio of Blood Urea Nitrogen to Creatinine can indicate other problems besides those intrinsic to the kidney; for example, a urea level raised out of proportion to the Creatinine may indicate a pre-renal problem such as volume depletion.

Men generally tend to have higher levels of Creatinine because they have more skeletal muscle mass than women. Vegetarians have been shown to have lower Creatinine levels.

Sodium, Serum

One of the major mineral salts in body fluid and is important to the body's water balance and the electrical activity of nerves and muscles. Therefore, is essential to and used to evaluate electrolyte balance.

Osmolality

Osmolality relates to osmosis, osmotic pressure, etc. i.e., the flow or inhibition of flow of water and other substances across membranes; also associated with renal (kidney) function. You will note that this is not a blood test listed on your Laboratory Report that we ordered and it rarely appears on any blood chemistry Lab Report these days. Therefore, we calculate this manually, at no additional charge, and include it in your Blood Chemistry Results Report.

Potassium

One of the major mineral salts in body fluid and is important to the body's water balance and the electrical activity of nerves and muscles. Therefore, is essential to and used to evaluate electrolyte balance.

Chloride, Serum

One of the major mineral salts in body fluid and is important to the body's water balance and the electrical activity of nerves and muscles. Therefore, is essential to and used to evaluate electrolyte balance.

Carbon Dioxide (CO₂)

Carbon Dioxide is a by-product of combustion of metals and minerals, like Magnesium. CO₂ is toxic in higher concentrations: 1% (10,000 ppm) will make some



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people feel drowsy. Concentrations of 7% to 10% cause: dizziness, headache, visual and hearing dysfunction and unconsciousness within a few minutes to an hour.

Anion Gap

The anion gap is the difference in the measured cations and the measured anions in serum, plasma, or urine. The magnitude of this difference (i.e. "gap") in the serum is often calculated in medicine when attempting to identify the cause of **metabolic acidosis**. If the gap is greater than normal, then high anion gap metabolic acidosis is diagnosed. You will note that this is not a blood test listed on your Laboratory Report that we ordered and it rarely appears on any blood chemistry Lab Report these days. Therefore, we calculate this manually, at no additional charge, and include it in your Blood Chemistry Results Report.

Calcium, Serum

Calcium is a mineral essential for development and maintenance of healthy bones and teeth. It is also important for the normal function of muscles, nerves and blood clotting. In fact, Calcium is required for more biological functions than any other mineral, so you will find calcium in most foods. Yes, that means in fruits and vegetables, legumes/grains, etc., not just dairy products, as the general public has been led to believe by the medical and dietetic industries.

A complete Calcium Evaluation (deficiency, excess, sufficiency, metabolism, etc.) requires blood, hair and urine testing (Routine Urinalysis).

The public at large has been taking Calcium supplements, thinking they are preventing osteoporosis, osteopenia or some other bone-related disease, because this is what is being circulated by the medical and dietetic industries.

There are over 25,000 types of Calcium and of these, some are acid Calciums and others are alkaline Calciums. So not only is the public at large choosing the wrong Calciums due to lack of complete Calcium Testing, many are consuming isolated Calcium or Calcium rocks, like Calcium Carbonate. However, new client testing for decades has proven they are:

- making their bones weaker,
- causing an excessive build-up of isolated Calcium particles, which is also increasing toxicity.
- interfering with the body's metabolism of calcium in foods,
- which leads to true Nutrient (whole food) Calcium Deficiency, and
- leads to Calcium Metabolism Imbalance,
- and interference with metabolism of other Calcium-related minerals and vitamins, i.e., required to metabolize Calcium and for cells to accept and use calcium.



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Strong, healthy bones require whole food Calcium and sufficiency in some very specific and synergistic other vitamin and minerals. **It is possible to grow new bone and to strength weak bone through clinical nutrition therapy and generally takes about six months.**

Phosphorus, Serum

Phosphorus is one of the Calcium-Synergy minerals mentioned above under “Calcium.” Hence, it is also essential for healthy bones and teeth. Note: a temporary drop in Phosphorus level can be observed after a meal. Imbalanced values are also associated with:

- hormone imbalance,
- bone disease
- kidney disease

Chloride/Phosphorus Ratio

You will note that this is not a ratio included on your Laboratory Report that we ordered and it rarely appears on any blood chemistry Lab Report these days. Therefore, we calculate this manually, at no additional charge, and include it in your Blood Chemistry Results Report.

Protein, Total

Together with Albumin, this is a measurement of protein in the blood.

Albumin

Together with Protein, this is a measurement of protein in the blood.

Globulin, Total

Total Globulin is a major group of proteins in the blood comprising the infection-fighting antibodies.

Albumin/Globulin Ratio (A/G Ratio)

Protein sufficiency in the blood is not just about Albumin, Protein and Globulin having individual values in Homeostasis, the best or most ideal value is when the ratio of Albumin and Globulin is in Homeostasis at the same time the individual values are in Homeostasis.

Bilirubin, Total

A chemical involved with liver functions. For example, a high concentration of Bilirubin may results in Jaundice.



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Alkaline Phosphatase (ALP)

Body protein that is important in evaluating proper bone and liver functions.

Lactic Dehydrogenase (LDH)

An enzyme found mostly in the heart, muscles, liver, kidneys, brain and Red Blood Cells. When an organ of the body is damaged, LDH is released in greater quantity into the blood stream.

AST (SGOT)

An enzyme found in skeletal and heart muscle, liver and other organs. Abnormalities may represent liver or heart damage.

ALT (SGPT)

An enzyme found primarily in the liver. Abnormalities may represent liver disease.

GTTP (GGT)

An enzyme, which can be an early indicator of liver abnormalities; it is highly sensitive to recent ingestion of alcohol.

Iron, Serum

Serum Iron Deficiency indicates Anemia in the blood. A complete evaluation of iron levels and function requires blood and hair testing. Excessive iron in blood can suggest liver dysfunction.

Cholesterol

Cholesterol is a sterol in the blood. Cholesterol is required by the human body in order to make all other hormones, e.g., female, male, adrenal, thyroid hormones, etc. Taking liver-manipulating drugs to suppress its cholesterol production or eating low-cholesterol diets leads to a myriad of hormone imbalance and other endocrine-related health conditions.

A better approach is to improve and maintain healthy liver function, through clinical nutrition therapy, avoid foods labeled as low cholesterol, low fat, etc., which are incomplete not whole foods, and cholesterol will stay normal.

Medically, the concern for Cholesterol lies in values over 200 and they tend to make the Public think High Cholesterol is the single most important test to determine risk of heart disease. However, three important facts are either not known by physicians or not shared with patients:

1. **Homocysteine** Blood Testing is a more accurate test for risk of heart disease.



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2. **People, age 65 or older**, who have Cholesterol over 200, actually live longer.
3. **Low Cholesterol levels** have serious adverse effects, also. Brain damage, for one example. .

Triglycerides

Triglyceride is a fat in the blood responsible for providing energy to the cells of the body. Medical values for Triglycerides should be less than 400 mg/dl, even in a non-fasting state.

High Density Lipoprotein (HDL)

High-Density Lipoproteins are reported to take Cholesterol away from cells and transport it back to the liver for processing or removal. They have become known as the “good” Cholesterol as people with high levels of HDL may have less Heart Disease. Low HDL can also result from smoking and/or lack of exercise.

Low Density Lipoprotein (LDL)

Low-Density Lipoproteins contain the greatest percentage of Cholesterol and may be responsible for depositing Cholesterol on the artery walls, leading to arteriosclerosis, also called arterial disease or hardening of the arteries. Arterial walls become scarred over time from toxic substances in the blood and this makes it easier for plaque (buildup of toxic substances, which may include cholesterol) to collect and attach to its walls. This then obstructs blood flow and thus can also lead to a heart attack. For that reason, they have become known as the “bad” Cholesterol. Raising HDL will lower LDL levels.

LDL/HDL Ratio

The best state of health is when individual values of LDL and HDL are in homeostasis and their ratio. You will note that this is not a ratio listed on your Laboratory Report that we ordered and it rarely appears on any blood chemistry Lab Report these days. Therefore, we calculate this manually, at no additional charge, and include it in your Blood Chemistry Results Report.

Cholesterol/HDL Ratio

Again, Homocysteine is a more accurate test for risk and medical diagnosis of heart disease, but some physicians are still using the ratio of Cholesterol and HDL as a primary determining factor for their diagnosis. Remember that imbalances (high or low) each have their own set of adverse health challenges for the human body, which requires “balance” (homeostasis) to function. Because Cholesterol is required for hormone production, nerve repair, skin health and many other functions, individual Cholesterol and HDL in homeostasis, as well as their ratio, is our health goal.



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T4 (Thyroxine), Total

Thyroxine, or 3,5,3',5'-tetraiodothyronine (often abbreviated as T4), a form of thyroid hormones, is the major hormone secreted by the follicular cells of the thyroid gland. Total Thyroxine (Total T4) is generally elevated in hyperthyroidism and decreased in hypothyroidism. It is usually slightly elevated in pregnancy secondary to increased levels of thyroid binding globulin (TBG).

Note: When reviewing a Laboratory Report ordered by your physician or through a medical facility, Free Thyroxine (Free T4) may be ordered. This is not the same as T4 Total. Free Thyroxine (Free T4) is generally elevated in hyperthyroidism and decreased in hypothyroidism.

T3 Uptake (Triiodothyronine Uptake Test)

Triiodothyronine, C₁₅H₁₂I₃NO₄, also known as T3, is a thyroid hormone. It affects almost every physiological process in the body, including growth and development, metabolism, body temperature, and heart rate.

Production of T3 and its prohormone Thyroxine (T4) is activated by thyroid-stimulating hormone (TSH), which is released from the pituitary gland. This pathway is regulated via a closed-loop feedback process:

Elevated concentrations of T3, and T4 in the blood plasma inhibit the production of TSH in the pituitary gland. As concentrations of these hormones decrease, the pituitary gland increases production of TSH, and by these processes, a feedback control system is set up to regulate the amount of thyroid hormones that are in the bloodstream.

Note: When reviewing a Laboratory Report ordered by your physician or through a medical facility, Free or total T3 may be ordered. This is not the same as T3 Update. In both cases, Free Triiodothyronine (Free T3) and Total Triiodothyronine (Total T3) is generally elevated in hyperthyroidism and decreased in hypothyroidism

FTI (Free Thyroxine Index or T7)

The Free Thyroxine Index (FTI or T7) is considered to be a more reliable indicator of thyroid status in the presence of abnormalities in plasma protein binding. FTI is elevated in hyperthyroidism and decreased in hypothyroidism.

Thyroid-Stimulating Hormone (TSH)

Thyrotrophin-Stimulating hormone (also known as Thyroid-Stimulating Hormone, TSH or Thyrotrophin) is a peptide hormone synthesized and secreted by thyrotrope cells in the anterior pituitary gland, which regulates the endocrine function of the thyroid gland. Today, physicians only routinely include TSH in blood testing. Thyroid-



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stimulating hormone (TSH) is generally elevated in hypothyroidism and decreased in hyperthyroidism.

In closing the definitions on the above four Blood Thyroid Tests, Please Note: An increased thyroxine-binding globulin results in an increased total thyroxine and total triiodothyronine without an actual increase in hormonal activity of thyroid hormones. This is one of many reasons thyroid assessment is quite complicated and reinforces why assessing it by blood testing alone will not provide complete or accurate evaluation.

White Blood Count (WBC)

White Blood Cells are the body's primary defense against disease because white blood cells help fight infection.

Red Blood Count (RBC)

The Red Blood Count test number or value measures the number of RBCs available to carry oxygen to all cells. For organs and glands to be healthy and functional their cells must have sufficient nutrients, water and oxygen, in addition to being free of toxicity.

Hemoglobin (HGB)

Hemoglobin is a chemical compound inside Red Blood Cells that transport oxygen through the blood stream to all of the cells of the body. **Iron deficiency anemia** (or **iron deficiency anaemia**) is a common anemia that occurs when iron loss (often from intestinal bleeding or menses) occurs, and/or the dietary intake or absorption of iron is insufficient. In iron deficiency, hemoglobin, which contains iron, cannot be formed.

Hematocrit (HCT)

Hematocrit measures the volume of Red Blood Cells compared with the volume of fluid carrying Red Blood Cells (Plasma).

Mean Corpuscular Volume (MCV)

This measures Red Blood Cell Volume. The mean corpuscular volume, or "mean cell volume" (MCV), is a measure of the average red blood cell volume that is reported as part of a standard complete blood count. In patients with anemia, it is the MCV measurement that allows classification as which applies:

- **microcytic anemia** (MCV below normal range),
- **normocytic anemia** (MCV within normal range) or
- **macrocytic anemia** (MCV above normal range)



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Mean Corpuscular Hemoglobin (MCH)

This is one way to measure the average Hemoglobin concentration within Red Blood Cells, which varies from normal with different diseases.

Mean Corpuscular Hemoglobin Concentrate (MCHC)

This is Mean Corpuscular Hemoglobin concentration.

Red Cell Size Distribution Width (RDW)

The red blood cell distribution width (RDW or RCDW) is a measure of the variation of red blood cell (RBC) width that is reported as part of a standard complete blood count. Usually red blood cells are a standard size of about 6–8 μm . Certain disorders, however, cause a significant variation in cell size. Higher RDW values indicate greater variation in size. Normal reference range in human red blood cells is 11–15%. If anemia is observed,

- RDW test results are often used together with mean corpuscular volume (MCV) results to determine the possible causes of the **anemia**.
- It is mainly used to differentiate an anemia of mixed causes from an anemia of a single cause.
- Vitamin B12 deficiency produces a macrocytic anemia (large cell anemia) with a normal RDW.
- However, iron deficiency anemia initially presents with a varied size distribution of red blood cells, and as such shows an increased RDW.
- In the case of a mixed iron and B12 deficiency, there will normally be a mix of both large cells and small cells, causing the RDW to be elevated. An elevated RDW (red blood cells of unequal sizes) is known as anisocytosis

Platelets, Blood

Blood cell particles involved with the forming of blood clots.

Neutrophils, Total

This is one of five tests that reveal White Blood Cell Function. The five are Neutrophils, Lymphocytes, Monocytes, Eosinophils, and Basophils. Each is important to the body's defense against infection caused by toxic substances, including germs. Test results also provide insight as to nutrients required to assist the body in producing adequate amounts of these five chemistries.

- **Neutrophils** report activity involving bacteria.
- Lymphocytes report activity involving Virus.
- Monocytes report activity involving Worms.
- Eosinophils report activity involving Amoebas.
- Basophils report activity involving sinus infection.



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Lymphocytes

This is one of five tests that reveal White Blood Cell Function. Lymphocytes report activity involving Virus. More information provided above in definition for Neutrophils, Total.

Monocytes

This is one of five tests that reveal White Blood Cell Function. Lymphocytes report activity involving Worms. More information provided above in definition for Neutrophils, Total.

Eosinophils

This is one of five tests that reveal White Blood Cell Function. Lymphocytes report activity involving Amoebas. More information provided above in definition for Neutrophils, Total.

Basophils

This is one of five tests that reveal White Blood Cell Function. Lymphocytes report activity involving Sinus Infection. More information provided above in definition for Neutrophils, Total.

Chapter 4 - BLOOD TESTS GROUPED BY BIOLOGICAL FUNCTION

This section provides a list of the specific blood chemistries that are evaluated to determine the health state and function of a particular organ, gland, or biological (body) system.

- The **title of the blood tests for the biological function** will be listed, as well as any additional **test-related information**.
- **Definitions** will be included only **for tests listed in this section, but not listed in the previous section**.

To understand the causes of symptoms of nutritional deficiencies, toxicity, biochemical imbalances, organ and gland dysfunctions, as well as when these progress to their illness and disease stages, to provide what the body needs to correct them and restore healthy function, the human body must be evaluated as a whole, interrelated system. **This means that testing of one area of the body must also be evaluated**



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for its effect on other areas and due to proximity some areas of the body will have a greater impact or affect than other areas.

In medicine, for example, diagnosis and treatment for many means isolating one part of the body. In other words, treating just that one part without considering, unless life-threatening obvious,

- other parts of the body that affect that one part,
- that can be affected (adversely or positively) by treatment of that one part, or
- Vice versa.

In Clinical Nutrition and Naturopathic Therapy and interpretation of biochemical testing, evaluations are performed considering the whole, interrelated system whether testing is singular, multiple or comprehensive.

- **Singular** means one test. For example, if blood testing is the only test being evaluated, the clinical nutrition interpretation includes evaluating
 - The individual blood chemistries, singular,
 - The chemistries grouped per biological function and
 - How each relates to and/or affects the other.
- **Multiple** means, for example, when two or more tests are evaluated, then each test is evaluated singularly as defined above and in relationship to the findings from the other tests that were ordered.
- **Comprehensive** means all specimens have been ordered (blood, urine, hair, saliva and stool) and both singular and multiple evaluations have been performed for each test and considering the findings as a whole for all tests.

Comprehensive Testing is essential for those truly interested in **Wellness and Preventative Health Care.** Ordering testing for the specimens that relate to current symptoms is a good place to start because you can address priorities and start feeling better faster. However, in due time, it is wise to have each specimen tested to:

- Correct their deficiencies, imbalances, dysfunctions, etc., to prevent them from becoming worse.
- Thereby, avoiding having to experience the symptoms they would produce in the progression towards their disease stages.
- Additionally, prevention (preventative therapy) is always a savings in time, energy and money when compared to corrective therapy.

Now to provide the individual blood tests for various biological functions:



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Bone Function

A comprehensive evaluation of bone health and function requires testing hair, urine and blood and among all the blood chemistries listed on your Laboratory Report, the following relate to bone health and function.

- **Calcium** – Serum Calcium indicates deficient, excess or normal Calcium levels in the blood, whereas a hair tissue mineral testing indicate deficient, excess or normal Calcium levels in the cells. To evaluate calcium requires both blood and hair testing. To evaluate its relationship to bone requires blood, hair and urine testing.
- **Phosphorus** – The information above regarding Calcium applies to Phosphorus also, i.e., simply substitute the word “Calcium” with “Phosphorus.”

Cardiovascular Function

Heart and Circulatory Function

To determine heart and circulatory health and function, there are biochemical, bioelectrical and physiological tests, each providing uniquely different information. A few examples are...

- **Bioelectrical** testing includes the Electrocardiograph (ECG), for example.
- **Physiological** testing, Treadmill Stress Test, pulse test, blood pressure readings, etc.
- **Biochemical** testing includes blood and tissue mineral hair.

Though all blood tests provide collective feedback regarding the heart and circulatory health and function, as well as other organs, glands and system, some blood tests are classified as more heart-blood specific tests than others. These are listed below.

- Triglycerides
- Cholesterol
- HDL Cholesterol
- LDL Cholesterol
- Ratios, such as Cholesterol/HDL and HDL/LDL



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Blood Testing For Risk of Heart Disease

- **Homocysteine** – this is a more accurate test for heart disease than the misleading medical information about monitoring Cholesterol levels.
- **C-Reactive Protein (CRP)** – indicates inflammation in the arteries as well as throughout the body, hence evaluates risks of cardiovascular disease. In general, the main causes of increased CRP and other markers of inflammation are: burns, trauma, infections, active inflammatory arthritis, and certain cancers. Inflammation is also a factor in arteriosclerosis, therefore, monitoring Cholesterol and CPR is more effective than just cholesterol levels alone for prevention of arteriosclerosis

Complete Blood Count (CBC)

Nutrients determine the quality, concentration and volume of blood and is measured by the below tests, which also determines the blood's ability to nourish the cells so they have what is required to repair damaged cells and/or grow new healthy cells.

- White Blood Count (WBC)
- Red Blood Count (RBC)
- Hemoglobin (HGB)
- Hematocrit (HCT)
- Mean Corpuscular Volume (MCV)
- Mean Corpuscular Hemoglobin (MCH)
- Mean Corpuscular Hemoglobin Concentration (MCHC)
- Platelets
- Neutrophil
- Lymphocyte
- Monocyte
- Eosinophil
- Basophil



BLOOD CHEMISTRY TESTS

Description and Explanation

Dr. Donna F. Smith

Diabetic or Hypoglycemic Function of Blood Sugar

- **Glucose – is Blood Sugar**
 - When High or Elevated Glucose (Blood Sugar) is present, a Hemoglobin A1C blood test may be required to rule out Diabetes.
 - Low Glucose indicate the opposite, i.e., Hypoglycemia (low blood sugar).
- **Hemoglobin A1C** is a component of hemoglobin which attaches to blood sugar in the body. Hemoglobin A1C measurements are the standard for evaluating glycemic control, thus used to determine and monitor Diabetes.

Electrolyte Function

For electrolytes to be balanced, i.e., healthy function, all three of these minerals **in the blood** must be in homeostasis.

- Sodium, Serum
- Chloride, Serum
- Potassium, Serum

Kidney Function

- Blood Urea Nitrogen (BUN)
- Creatinine, Serum
- BUN/Creatinine Ratio
- Uric Acid

Liver Function

- Albumin, Serum
- Globulin, Total
- Albumin/Globulin Ratio
- Alkaline Phosphatase



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- ALT (SGPT)
- AST (SGOT)
- Bilirubin, Total
- GGTP
- Lactate Dehydrogenase (LDH)
- Protein, Total

Minerals

- **Iron, Total** – Serum Iron Deficiency indicates Anemia in the blood. A complete evaluation of iron levels and function requires blood and hair testing.
- **Iron Binding Capacity** – IBC is tested to refine the evaluation of the body's iron status. Iron is important for proper metabolism of Red Blood Cells.
- **Magnesium** – Magnesium is required for many biological functions. For example, Magnesium has a role in calcium-related functions and disorders, muscle pain and other musculo-skeletal system functions. To evaluate Magnesium requires testing levels in blood and hair. Blood alone is not enough.

Prostate Function

Prostate Specific Antigen (PSA) Test when medically out of range (HI) may indicate Prostatic Disease. The probability of disease increases as the number increases. If this test applies to you, PSA test results should be reviewed by your physician in order to make a complete determination of your condition.

A Clinical Nutrition interpretation, i.e., evaluating PSA according to homeostasis, can identify a pattern or progression towards this disease state, giving the client the opportunity to restore test value to its homeostasis value and prevent this disease.

Thyroid Function

Thyroid function tests (TFTs) is a collective term for blood tests used to check the function of the thyroid. Thyroid glands control the body's metabolic rate and body temperature, to name two of their primary functions. The thyroid gland controls how quickly the body uses energy, makes proteins, and controls how sensitive the body should be to other hormones. It participates in these processes by producing thyroid hormones, the principal ones being Triiodothyronine (T3) and Thyroxine (T4). These hormones regulate the rate of metabolism and affect the growth and rate of function of



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many other systems in the body. T3 and T4 are synthesized from both iodine and tyrosine. The thyroid also produces calcitonin, which plays a role in calcium homeostasis

Thyroid Function Tests (TFTs) may be requested if a patient is thought to suffer from hyperthyroidism (overactive thyroid) or hypothyroidism (underactive thyroid), or to monitor the effectiveness of either thyroid-suppression or hormone replacement therapy. It is also requested routinely in conditions linked to thyroid disease, such as atrial fibrillation and anxiety disorder.

A TFT panel typically includes thyroid hormones such as thyroid-stimulating hormone (TSH, Thyrotrophin) and Thyroxine (T4), and Triiodothyronine (T3) depending on local laboratory policy.

Having stated the above, however, Comprehensive Testing of Thyroid Function includes the following blood tests, saliva thyroid hormone testing and tissue mineral hair testing, which provides the most complete and accurate evaluation of thyroid function.

As you read the individual definitions of each of the thyroid tests below, you will begin to understand how an elevation in one or more thyroid test value can cause a decrease or elevation in one, two, or more of the others. Today, physicians routinely test TSH only in blood testing and have omitted all other thyroid tests because Insurance and Medicare now control these decisions due to which tests they will or will not pay the physician.

- T-4
- T-3 Update
- FTI (Free Thyroxine Index)
- TSH (Thyroid Stimulating Hormone)

Hyperthyroidism is the term for overactive tissue within the thyroid gland causing an overproduction of thyroid hormones (Thyroxine or "T4" and/or Triiodothyronine or "T3"). Hyperthyroidism is thus a cause of thyrotoxicosis, the clinical condition of increased thyroid hormones in the blood. Hyperthyroidism and thyrotoxicosis are not synonymous. For instance, thyrotoxicosis could instead be caused by ingestion of exogenous thyroid hormone or inflammation of the thyroid gland, causing it to release its stores of thyroid hormones. Its opposite is hypothyroidism which is an underproduction of the hormone.

Hypothyroidism is a condition in which the thyroid gland does not make enough thyroid hormone. (a deficiency of thyroid hormone). Iodine deficiency is the most common cause of hypothyroidism worldwide but it can be caused by other causes such as several conditions of the thyroid gland or, less commonly, the pituitary gland or hypothalamus. It can result from a lack of a thyroid gland or from iodine-131 treatment,



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and can also be associated with increased stress. (Note: it is whole food Iodine that is lacking, i.e., the isolated and synthetic Iodine added to packaged foods is a contributing factor as to why many people have thyroid dysfunctions now.

To determine patterns or progression towards the above or for a physician to diagnosis the above (Hyper- or Hypo-thyroid) requires blood and hair tests, not just blood alone.

Important Notes:

1. Accepting thyroid treatment of any kind based upon blood testing alone can have adverse and even damaging consequences. For example, taking a thyroid drug that in time destroys the thyroid gland when the original dysfunction was caused by mineral imbalance, which can only be identified through hair testing.
2. Presently, Laboratories do not provide thyroid saliva hormone tests so no health care professional of any specialty can order them for their patients/clients. Therefore, until they are available, the most accurate evaluation of thyroid function at this time requires all four blood thyroid tests and hair mineral tests.

Chapter 5 - OTHER BLOOD TESTS

Chapter 3 provides a list of the **most frequently-ordered blood tests**, which are routinely ordered for clinical nutrition analysis, and Chapter 4 includes examples of a few other blood tests frequently ordered, but not included in our **Routine Blood Chemistry Profiles** (Chapter 3). However, any blood test for any purpose can be ordered for a clinical nutrition analysis or interpretation.

This even includes various blood and urine tests for cancer screening. Keep in mind that a Clinical Nutrition interpretation of any blood test, even cancer-screening tests, is evaluating test results according to homeostasis (the true definition of health) and comparing to homeostasis can identify a pattern or progression towards this disease state, giving the client the opportunity to restore test value to its homeostasis value and prevent this disease.

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