

Functional and Blood Lab Test Summary

Common Functional Lab Tests

Adrenal Cortex Stress Profile:

Diagnos-Tech, Genova Diagnostic, Neuroscience, and several others offer this test. A four-sample saliva test that measures cortisol levels throughout the day. Can add DHEA to the test as well.

diagnostechs.com, neuroscience.com, genova.com

Liver Detoxification Profile:

Doctors Data Labs

Doctorsdata.com

This test evaluates the ability of the liver to properly detoxify foreign substances. Standard blood liver panels are used to uncover elevated liver enzymes and gross liver diseases. Functional medical tests like this one are designed to assess the body's or organ's performance when challenged with a potentially harmful substance.

Doctor Data Labs:

Hepatic Detox Profile

Methylation Profile

Glutathione test

Intestinal Permeability Profile:

Genova Diagnostic

This is a functional medical test that measures the permeability of the cells that line the intestinal tract. These cells are known as mucosal cells. They act as a barrier to help prevent toxic substances from leaking into the rest of the body. Increased permeability of the intestinal tract is associated with a number of health problems, including food allergies, malabsorption, irritable bowel syndrome, and rheumatoid arthritis. Genova.com

Food and Inhalant Allergy Testing:

ALCAT and Immuno-Labs are my go to food allergy labs. www.alcat.com
www.immunolabs.com

Food and inhalant allergies have been implicated in a wide range of health problems. Normal RAST test or skin prick tests aren't accurate for food allergy detection.

Yeast Overgrowth, Dysbiosis Stool Test (included in Genova Diagnostics Comprehensive Parasitology test). This stool test, tests for yeast overgrowth and or bacterial overgrowth. Genova and Diagnos-Tech.

Comprehensive Parasitology Profile:

Genova Diagnostic, Diagnos-tech and a few others offer this test kit.

This profile checks for parasites, bacteria (good and bad) and yeast overgrowth inhabiting the intestinal tract-the test requires a 1-3 stool samples.

In a study of outpatients at the Gastroenterology Clinic in Elmhurst, New York, a 74-percent incidence of parasites was found. Genova Diagnostics in Asheville, North Carolina, is arguably the best stool-testing lab in the world. They report that 30 percent of all examined specimens are positive for parasites.

Hair Elemental Analysis:

Genova Diagnostic, Doctors Data and others.

This test is not an accurate test for mineral levels and shouldn't be used to measure mineral stores. Still, an inexpensive screening like a hair analysis is an ideal way to uncover any potential heavy metal toxicity. Heavy metals include cadmium (in smokers), aluminum, lead, mercury, tin, silver, and arsenic. Heavy metal toxicity can present a host of unwanted symptoms.

Blood Labs

Alanine Aminotransferase (ALT):

10-26 U/L

Alanine transaminase (ALT) is an enzyme found in the highest amounts in the liver. Injury to the liver results in release of the substance into the blood.

Increased levels of ALT often mean that liver disease is present. Liver disease is even more likely when levels of other liver blood tests are also increased.

Increased in:

Cirrhosis

Liver necrosis

Hepatitis

Hemochromatosis

Lack of blood flow to the liver (liver ischemia)

Liver tumor or cancer

Medications that are toxic to the liver

Mononucleosis

Pancreatitis

If between 27 and 150 with elevated triglycerides, suspect fatty liver (steatosis).

This is usually due to insulin resistance, diabetes or alcohol abuse. If elevated ALT is twice that of AST, then alcohol induced liver disease should be suspected.

ALT levels above 200 UL suggest hepatitis, especially when WBC are depressed or elevated.

Decreased in:

Vitamin B6 anemia

Elevated triglycerides, along with low ALT, suggests fatty liver syndrome. Elevated ALT with normal triglyceride levels indicates possible vitamin B6 deficiency.

Albumin

4.0-5.0 G/dl

Albumin is a protein made by the liver. A serum albumin test measures the amount of this protein in the clear liquid portion of the blood. Albumin helps move many small molecules through the blood, including bilirubin, calcium, progesterone, and medications. It plays an important role in keeping the fluid from the blood from leaking out into the tissues. Decreased albumin levels are always a sign of either severe liver disease or immune dysfunction. When albumin is decreased and globulins are elevated, suspect liver disease.

Increased in:

- Dehydration
 - High protein diet
- Having a tourniquet on for a long time when giving a blood sample

Decreased in:

Liver/biliary dysfunction
Cancer
Protein deficiency

Alkaline Phosphatase

70-90 U/L

Alkaline phosphatase (ALP) is a protein found in all body tissues. Tissues with particularly high amounts of ALP include the liver, bile ducts, and bone. Many drugs affect the level of alkaline phosphatase in the blood. Drugs that may affect the ALP level may include:

Allopurinol
Antibiotics
Birth control pills
Certain diabetic meds
Chlorpromazine
Cortisone
Male hormones
Methyldopa
Narcotic pain medicines
Non-steroidal anti-inflammatory drugs (NSAIDs)
Propranolol
Tranquilizers
Tricyclic antidepressants

Increased in:

Liver cancer
Cirrhosis
Third trimester
Impaired bile flow
Paget's bone disease
Healing bone fracture

Decreased in:

Biliary obstruction
Zinc deficiency
Vitamin C deficiency

Antinuclear Antibodies (ANA)

This is a blood test that measures autoimmune reactions. A positive finding may indicate rheumatoid arthritis, scleroderma, or lupus (if accompanied by glucuronic acid) in the liver.

ANA shows up on indirect immunofluorescence as fluorescent patterns in cells that are fixed to a slide that is evaluated under a microscope. Different patterns have been associated with a variety of autoimmune disorders, although overlap may occur. Some of the more common patterns include:

- Homogenous (diffuse) - associated with SLE and mixed connective tissue disease
- Speckled - associated with SLE, Sjogren syndrome, scleroderma, polymyositis, rheumatoid arthritis, and mixed connective tissue disease
- Nucleolar - associated with scleroderma and polymyositis
- Centromere pattern (peripheral) - associated with scleroderma and CREST (Calcinosis, Raynaud's syndrome, Esophageal dysmotility, Sclerodactyly, Telangiectasia)

An example of a positive result might be: "Positive at 1:320 dilution with a homogenous pattern."

A positive ANA test result may suggest an autoimmune disease, but further specific testing is required to assist in making a final diagnosis. ANA test results can be positive in people without any known autoimmune disease. While this is not common, the frequency of a false positive ANA result increases as people get older. Also, ANA may become positive before signs and symptoms of an autoimmune disease develop, so it may take time to tell the meaning of a positive ANA in a person who does not have symptoms. Most positive ANA results don't have significance, so physicians should reassure their patients but should also still be vigilant for development of signs and symptoms that might suggest an autoimmune disease.

About 95% of those with SLE have a positive ANA test result. If someone also has symptoms of SLE, such as arthritis, a rash, and autoimmune thrombocytopenia, then she probably has SLE. In cases such as these, a positive ANA result can be useful to support SLE diagnosis. Two subset tests for specific types of autoantibodies, such as anti-dsDNA and anti-SM, may be ordered (often as an ENA panel) to help confirm that the condition is SLE.

A positive ANA can also mean that the person has drug-induced lupus. This condition is associated with the development of autoantibodies to histones, which are water-soluble proteins rich in the amino acids lysine and arginine. An anti-

histone test (order anti-histone antibodies test) may be ordered to support the diagnosis of drug-induced lupus.

Other conditions in which a positive ANA test result may be seen include:

- Sjögren syndrome: Between 40% and 70% of those with this condition has a positive ANA test result. While this finding supports the diagnosis, a negative result does not rule it out. The doctor may want to test for two subsets of ANA: Anti-SS-A (Ro) and Anti-SS-B (La). About 90% or more of people with Sjögren syndrome have autoantibodies to SSA.
- Scleroderma (systemic sclerosis): About 60% to 90% of those with scleroderma have a positive ANA finding. In people who may have this condition, ANA subset tests can help distinguished two forms of the disease, limited versus diffuse. The diffuse form is more severe. Limited disease is most closely associated with the anticentromere pattern of ANA staining (and the anticentromere test), while the diffuse form is associated with autoantibodies to the anti-Scl-70. A positive result on the ANA also may show up in people with Raynaud's disease, rheumatoid arthritis, dermatomyositis or polymyositis, mixed connective tissue disease, and other autoimmune conditions.

AST (aspartate aminotransferase)

10-26 U/L

Serum glutamic-oxaloacetic transaminase; SGOT is an enzyme found in high amounts in liver, heart, and muscle cells. It is also found in lesser amounts in other tissues.

Increased AST levels are usually a sign of liver disease. Liver disease is even more likely if other liver-related blood tests are abnormal.

AST levels may rise during pregnancy and after exercise.

Increased in:

Cirrhosis
Death of liver tissue
Heart attack
Hemochromatosis
Hepatitis
Lack of blood flow to the liver (liver ischemia)
Liver cancer or tumor
Medicines that are toxic to the liver
Mononucleosis
Muscle disease or trauma
Pancreatitis

AST levels may also increase after:

Burns
Heart procedures
Seizure
Surgery

If between 27 and 150 with elevated triglycerides, suspect fatty liver (steatosis). This is usually due to insulin resistance, diabetes or alcohol abuse. If elevated ALT is twice that of AST, then alcohol induced liver disease should be suspected. AST levels above 200 UL suggest hepatitis, especially when WBC are depressed or elevated.

Decreased in:

B6 deficiency
Renal disease
Elevated triglycerides, along with low AST, suggests fatty liver. Elevated AST with normal triglyceride levels indicates possible vitamin B6 deficiency.

Basophils

0-1%

Increased in:

Numerous pathologies

Bilirubin

.2-1.2 mg/dl

Bilirubin is the main bile pigment. Free bilirubin is released into the blood when red blood cells (RBCs) are broken down by the spleen, liver kupfer cells, and the bone marrow. In the liver, the indirect bilirubin is combined with glucuronic acid to form a water-soluble compound, direct or conjugated bilirubin, which is secreted in the bile.

Bilirubin is classified as:

Total bilirubin- a combination of direct and indirect bilirubin

Direct bilirubin-post hepatic, water-soluble (conjugated)

Indirect bilirubin-pre-hepatic, water-insoluble (unconjugated)

Increased Conjugated Bilirubin

Gallstones (biliary obstruction)

Liver metastasis

Extra hepatic duct obstruction

Increased Unconjugated Bilirubin

Gilbert syndrome (congenital enzyme deficiency which prevents conjugation of bilirubin)

Hepatitis

Cirrhosis

Hemolytic anemia

Decreased levels-NA

Blood Urea Nitrogen

12-18 mg/dl

This blood test measures urea. Urea is the end product of protein metabolism and is formed in the liver. It is excreted by the kidneys.

Increased in:

Kidney damage or urinary tract obstruction.

Chronic renal dysfunction

Renal hypertension

Diuretic medication

Dehydration

Cirrhosis

BPH

Urinary obstruction

In renal disease should see elevated serum creatinine and phosphorous.

Decreased in:

Liver failure or pregnancy

Liver failure

Protein malnutrition

Celiac disease

In liver disease would possibly see elevated ALT, AST and or LDH. If due to malnutrition cholesterol levels would be low or low normal

BUN/Creatinine Ratio

6-25 (optimal is 10-16)

Both BUN and creatinine are filtered by the kidney and excreted in urine. For this reason, BUN and creatinine are used together to measure kidney function.

If kidney function begins to decline, BUN and creatinine rise. A normal creatinine depends on muscle mass and age.

Increased in:

Congestive heart failure

Renal disease

Dehydration

Hypotension

Shock

Intestinal bleeding

Decreased in:

Malnutrition

Low protein diets

C-Reactive Protein (Hs-CRP)

According to the American Heart Association:

Low risk of developing cardiovascular disease if your hs-CRP level is lower than 1.0mg/L

Average risk of developing cardiovascular disease if your levels are between 1.0 and 3.0 mg/L

High risk for cardiovascular disease if your hs-CRP level is higher than 3.0 mg/L

C-reactive protein is a substance present in tissue destruction and inflammation. Produced primarily in the liver during acute inflammatory process. It rises rapidly, but non-specifically in response to injury and inflammation. More sensitive than ESR or sed rate.

Elevated levels above 3, are associated with an increased the risk of heart and or stroke. Physicians Health Study, a clinical trial involving 18,000 apparently healthy doctors, found that elevated levels of CRP were associated with a threefold increase in the risk of heart attack.

Women with the highest CRP levels were more than four times as likely to have died from coronary disease, or to have suffered a nonfatal heart attack or stroke compared to those with the lowest levels.

Increased in:

- Myocardial infarction (heart disease).
- Viral or bacterial infection
- Coronary artery inflammation/atherosclerosis
- Rheumatoid arthritis

Calcium

9.0-10.0 mg/dL

Calcium is the most common mineral in the body and one of the most important. The body needs it to build and fix bones and teeth, help nerves work, make muscles squeeze together, help blood clot, and help the heart to work. Almost all of the calcium in the body is stored in bone. The rest is found in the blood.

Normally the level of calcium in the blood is carefully controlled. When blood calcium levels get low (hypocalcaemia), the bones release calcium to bring it back to a good blood level. When blood calcium levels get high (hypercalcemia), the extra calcium is stored in the bones or passed out of the body in urine and stool.

Increased in:

- Hyperparathyroidism (repeat serum calcium and if elevated again, perform PTH to confirm)
- Cancer
- Increased vitamin D levels
- Sarcoidosis

Please know calcium shouldn't be elevated. When it is repeat the test and if after 3 times it is elevated then do a PTH test.

I've caught numerous patients, (referred them for benign parathyroid tumor removal) over the years that had gone years with high normal or even slightly elevated levels but had never been worked up or referred for a scan. My resource for all things parathyroid is Dr. Norman's site www.parathyroid.com
From parathyroid.com

Adults do not have persistent calcium levels above 10.1.

Many people (about 20% of all patients with hyperparathyroidism) will have parathyroid disease when they have high calcium and NORMAL PTH levels
High calcium and ANY PTH LEVEL that is not very low means you have hyperparathyroidism.

Decreased in:

Parathyroid hypo function
Digestive dysfunction-hypochlorhydria
Vitamin D deficiency
Protein malnutrition
Osteoporosis

Cholesterol

150-200 mg/dL

Increased in:

Hypothyroidism
Insulin resistance/diabetes
Numerous pathologies

Decreased in:

Statin use
Malnutrition
Low cholesterol levels, those below 150 are associated with increased death from all causes. Men with low cholesterol levels have an increased risk of depression.

HDL

50-60 mg/dL

Decreased in:

Insulin resistance
Inflammation

LDL

<100 mg/dL

Increased in:

Insulin resistance

Triglycerides

75-100 mg/dL

Increased in:

Non-fasting blood draws

Insulin resistance/diabetes

Hypothyroidism

If triglycerides are elevated above total cholesterol levels, the insulin resistance should be suspected.

Decreased in:

Malnutrition or malabsorption

Hyperthyroidism

Complete Blood Count (CBC):

The CBC test usually includes a red blood cell (RBC) count, a white blood cell (WBC) count, hemoglobin, hematocrit, indices mean corpuscular volume.

Chloride

100-106 mmol/L

Chloride is a type of electrolyte. It works with other electrolytes such as potassium, sodium, and carbon dioxide (CO₂) to help keep the proper balance of body fluids and maintain the body's acid-base balance.

Drugs that may increase serum chloride measurements include:

- Acetazolamide
- Ammonium chloride
- Androgens
- Cortisone
- Estrogen
- Guanethidine
- Methyldopa
- Non-steroidal anti-inflammatory drugs (NSAIDs)

Drugs that may lower serum chloride measurements include:

- Aldosterone
- Bicarbonate-containing compounds
- Loop diuretics
- Thiazide diuretics
- Triamterene

Increased in:

Dehydration

Renal dysfunction

Decreased in:

Hypochlorhydria

CO/2

21-33 mmol/L (optimal 26-31)

In the body, most of the CO₂ is in the form of a substance called bicarbonate (HCO₃⁻). Therefore, the CO₂ blood test is really a measure of your blood bicarbonate level. The CO₂ test is most often done as part of an electrolyte or basic metabolic panel. Changes in your CO₂ level may suggest that you are losing or retaining fluid, which causes an imbalance in your body's electrolytes. CO₂ levels in the blood are influenced by kidney and lung function. The kidneys are mainly responsible for maintaining the normal bicarbonate levels.

Increased in:

Metabolic alkalosis
Vomiting

Decreased in:

B1 deficiency
Diabetes
Metabolic acidosis

Creatinine

0.7-1.1

Creatinine is a waste product usually eliminated by the kidneys.

Increased in:

Possible kidney disease
Urinary obstruction
BPH

Suspect renal disease if creatinine, BUN, and phosphorous are all elevated. In dehydration HCT, Hemoglobin, and RBCs are usually slightly elevated.

Decreased in:

Muscular dystrophy
Geriatric patients
Children
Muscle wasting diseases

Creatinine Clearance

The creatinine clearance test compares the level of creatinine in urine with the creatinine level in the blood. (Creatinine is a breakdown product of creatine, which is an important part of muscle.) The test helps provide information on kidney function.

Abnormal results (lower than normal creatinine clearance) may indicate:

Acute tubular necrosis
Bladder outlet obstruction
Congestive heart failure
Dehydration
End-stage kidney disease
Glomerulonephritis

Kidney failure

Renal ischemia (too little blood flow to the kidneys)

Renal outflow obstruction (usually must affect both kidneys to reduce the creatinine clearance)

Shock

Eosinophils

0-3%

Increased in:

Parasitic infections

Allergies

Numerous pathologies

Erythrocyte Sedimentation Rate (ESR)

Adults (Westergren method):

Men under 50 years old: less than 15 mm/hr

Men over 50 years old: less than 20 mm/hr

Women under 50 years old: less than 20 mm/hr

Women over 50 years old: less than 30 mm/hr

Children (Westergren method):

Newborn: 0 to 2 mm/hr

Newborn to puberty: 3 to 13 mm/hr

This test is used to detect inflammatory conditions. It is relatively nonspecific and is used as a screening tool. If levels are abnormal, further testing might be needed.

Increased in heavy metal poisoning, all collagen diseases (autoimmune arthritis), some cancers, gout,

infections, and other inflammatory diseases. May be decreased in sickle-cell anemia and congestive heart failure.

Ferritin

Male: 12-300 ng/mL

Female: 12-150 ng/mL

Optimal is above 50

Ferritin is a protein found inside cells that stores iron so your body can use it later.

A ferritin test indirectly measures the amount of iron in your blood.

The amount of ferritin in your blood (serum ferritin level) is directly related to the amount of iron stored in your body. Ideal levels are above 50.

Increased in:

Iron overload-hemochromatosis

Inflammatory disease

HIV

Hepatitis

Decreased in:

Iron deficiency anemia

Fibrinogen

200 - 400 mg/dL

Fibrinogen is formed in the liver. In the presence of thrombin, it is converted to fibrin as part of the clotting mechanism.

Increased in:

Kidney disease

High levels of fibrinogen predispose a person to coronary and cerebral artery disease, even when other known risk factors such as cholesterol are low. Fibrinogen elevation in cigarette smokers, for example, has been identified as a primary mechanism causing heart disease and stroke. Cigarette smoking increases cardiovascular disease risk, and it also raises fibrinogen levels in the blood.

Decreased in:

Liver disease

Gamma-glutamyl transpeptidase (GGT)

10-26 U/L

Gamma-glutamyl transpeptidase (GGT) is a test to measure the amount of the enzyme GGT in the blood. This test is used to detect diseases of the liver or bile ducts. It is also done with other tests (such as the ALT, ALP, and bilirubin tests) to tell the difference between liver or bile duct disorders and bone disease.

It may also be done to screen for or monitor alcohol abuse.

Drugs that can increase GGT levels include:

Alcohol

Phenytoin

Phenobarbital

Drugs that can decrease GGT levels include:

Birth control pills

Clofibrate

Increased in:

Biliary obstruction

Alcoholism

Bile duct and or gall bladder inflammation

Pancreatitis

Elevated GGTP below 150 with elevated triglycerides suspect fatty liver.

If WBCs are also elevated then suspect hepatitis.

If AST level is twice that of ALT, then suspect alcohol cirrhosis.

Decreased in:

Vitamin B6 deficiency below 10

Globulin

2.4-2.8 G/100ml

Globulin is a generic term used to describe a set of sixty proteins including the antibodies or gamma globulins and protein-carbohydrate compounds known as glycoprotein. There are four basic groups of globulin proteins known as the alpha-1, alpha-2, beta and gamma proteins. These are used to help transport proteins through the lipoproteins and assisting the blood in clotting. They also act as plasma cells, which indicate whether there is an antibody deficiency in the blood stream. The liver produces much of the alpha and beta globulins used for this purpose. The level of these proteins is measured against the levels of albumin, the other major type of protein in the bloodstream. A specific ratio must be met in order to maintain healthy circulatory function. Ratios of globulin compared to albumin can be low or high, and each presents its own dangers.

Increased in:

Hypochlorhydria
Liver dysfunction/hepatic infections
Neoplasm

Decreased in:

Digestive disorders
Suspect hypochlorhydria when globulin levels are out of range.

Glomerular Filtration Rate (eGFR)

Glomerular filtration rate (GFR) is a test used to check how well the kidneys are working. Specifically, it estimates how much blood passes through the tiny filters in the kidneys, called glomeruli, each minute.

Levels below 60 mL/min/1.73 m² for 3 or more months are a sign of chronic kidney disease. A GFR result below 15 mL/min/1.73 m² is a sign of kidney failure and requires immediate medical attention.

Glucose

85-100 mg/dL

Glucose (blood sugar) can be measured by either a blood or a urine test. This test is usually conducted after a period of fasting, (MAKE SURE patient was fasting) since blood levels are naturally affected by eating.

Increased in:

Diabetes
Cushing's disease.

Elevated glucose with elevated triglycerides (especially if triglycerides are equal to or more than total cholesterol), uric acid, total cholesterol, LDL, and depressed HDL signals insulin resistance.

Decreased in:

Hypoglycemia
Addison's disease

In insulin resistance you'll often see elevated triglyceride levels that are equal to, or greater than, total cholesterol, depressed HDL, and elevated LDL levels. In liver disease check for elevated ALT, AST, and depressed albumin levels.

HDL

50-60 mg/dL

Decreased in:

Insulin resistance
Inflammation

Hemoglobin:

Normal range is female: 12-15 g./dl.; male: 13-16 g./dl.

Hemoglobin is the oxygen-carrying portion of RBCs.

Increased in polycythemia, emphysema, asthma and dehydration.

Decreased in iron anemia, internal bleeding and late pregnancy.

Hematocrit:

Females 37-44 Males 40-48

This is a measure of the volume of settled RBCs per 100 ml. of blood.

Increased in polycythemia, emphysema, asthma and dehydration.

Decreased in iron anemia, internal bleeding and late pregnancy.

Hemoglobin A1c

An HbA1c of 5.6% or less is normal.

The following are the results when the HbA1c is being used to diagnose diabetes:

- Normal: Less than 5.7%
- Pre-diabetes: 5.7% to 6.4%
- Diabetes: 6.5% or higher

HbA1c is a lab test that shows the average level of blood sugar (glucose) over the previous 3 months.

Increased in:

Diabetes

Decreased in:

Chronic blood loss
Hemolytic anemia

Homocysteine

Homocysteine is a building block for the production of proteins in the body. However, elevated levels of it are associated with premature vascular disease. Studies have shown that increased homocysteine levels can dramatically increase your risk of heart disease, stroke, and peripheral vascular disease, and clotting disorders. A healthy homocysteine level is less than 7 and ideally less than 6.5.

Iron

85-130 ug/dL

Increased in:

Hemochromatosis
Hepatic dysfunction

Decreased in:

Chronic blood loss
Iron deficiency anemia
Menses
Cancer
Hepatic dysfunction
Crohn's disease

Lactic Acid Dehydrogenase LDH

140-180 U/L

Increased in:

36-55 hours after myocardial infarction
Liver disease
Tissues damage/breakdown-liver, heart, skeletal muscle, adrenal, lung, kidney, pancreas, and blood cells
Megoblastic and hemolytic anemias
Sickle cell anemia
Malignant neoplasms

Decreased in:

Reactive hypoglycemia

LDL

<100 mg/dL

Increased in:

Insulin resistance

Magnesium

2.0-2.5 mg/dL

Increased in:

Hypothyroid
Antacids with magnesium
Addison's disease
Renal impairment
Severe diabetic acidosis

Decreased in:

Malabsorption
Numerous pathologies
Magnesium intake deficiency

MCV

85-92 cu microns

MCV indicates the volume in cubic microns occupied by an average single red blood cell.

A MCV increase along with an increase or decrease in the MCH is a sign of B12, B6, and or folic acid anemia.

MCV is calculated by dividing the hematocrit result by the RBC count.

If this pattern shows up then good idea to test for elevated homocysteine levels.

Increased in:

Macrocytic anemia (B12, folic acid deficiency)
Dehydration

Decreased in:

Microcytic anemia (iron anemia)
Internal bleeding
Intestinal parasites
Depressed levels MCV, MCH, and or MCHC are typically found with microcytic anemia. In iron deficiencies ferritin will be depressed and transferrin will be elevated.

MCH

27-32

Mean Corpuscular Hemoglobin is a test for the average weight of hemoglobin that is present inside a red blood cell. The main responsibility of hemoglobin is to carry oxygen to the blood. It is composed of a group of amino acids that contain iron atoms, which gives the red color to hemoglobin. MCH, MCV and MCHC are three main red blood cell indices that help in measuring the average size and hemoglobin composition of the red blood cells.

Increased MCH:

Macrocytic iron deficiency (B12/Folic acid)
dehydration.

A high MCH results in too much hemoglobin present, which causes insufficient supply of oxygen to the blood.

Decreased MCH:

Microcytic anemia (iron)

Internal bleeding

Toxic effects of heavy metal poisoning, lead, aluminum, etc.

Vitamin B6 anemia

MCHC indicates the hemoglobin concentration per unit volume (100ml) of packed cells.

Increased in:

Macrocytic anemia (B12/folic acid)

Dehydration

Decreased in:

Vitamin B6 anemia

Internal bleeding

Heavy metal toxicity

Monocytes are active in chronic infections and Hodgkin's disease. In inflammatory reactions neutrophils are prominent for about 3 days then they break up and the monocytes remain active (phagocytic). Monocytes are often increased during the recovery phase of an infection.

Increased in:

Viral infections (mononucleosis)

Phosphorous

3.5-4.0 mg/dL

Phosphorus is a mineral that makes up 1% of a person's total body weight. It is present in every cell of the body and plays a vital role in ATP function. Most of the phosphorus in the body is found in the bones and teeth. Parathyroid hormone (PTH) and the kidneys are important in regulating serum phosphorous levels. PTH is mostly responsible for increased serum calcium and decreased phosphorous levels.

Increased in:

Parathyroid hypo function

Acute and chronic renal dysfunction

Sarcoidosis

Decreased in:

Parathyroid hyperfunction

Digestive disturbances-hypochlorhydria

Vitamin D deficiency

Platelet count

Blood platelets strengthen the resistance of the vessel walls against trauma and are the initial factor in coagulation (clotting). Increased levels are from faulty stem cells in the bone marrow that make too many platelets. What causes this to happen usually isn't known. When this process occurs without other blood cell disorders, it's called essential thrombocythemia.

Increased in:

Trauma
Inflammatory arthritis including rheumatoid
Arteriosclerosis
Anemia
Blood loss
Polycythemia.

Decreased in:

Thrombocytopenia
Severe burns.

Potassium

Potassium (K+) helps nerves and muscles communicate. It also helps move nutrients into cells and waste products out of cells.
Potassium levels in the body are mainly controlled by the hormone aldosterone.

Drugs that can increase potassium measurements include:

Aminocaproic acid
Angiotensin receptor blockers
Antineoplastic drugs
ACE inhibitors
Certain diuretics, called potassium-sparing diuretics
Epinephrine
Heparin
Histamine
Isoniazid
Mannitol
Succinylcholine

Drugs that can decrease potassium measurements include:

Acetazolamide
Aminosalicylic acid
Amphotericin B
Carbenicillin
Cisplatin
Certain diuretics
Gentamicin
Insulin
Laxatives

Nafcillin
Penicillin G
Phenothiazines
Salicylates
Sodium polystyrene sulfonate

Increased in:

Adrenal cortical hypofunction
Renal dysfunction

Decreased in:

Diarrhea
Adrenal hyperfunction

Hyperkalemia:

Nausea
Vomiting
Colic
Diarrhea

Hypokalemia:

Paralysis
General weakness

RBC Count

Females 3.9-4.5 ml/MCL

Males 4.1-5.6 ml/MCL

The amount of RBCs per cubic millimeter is used to assess the degree or presence of anemia.

Increased:

Polycythemia a blood disorder in which your bone marrow makes too many red blood cells.
Respiratory distress (COPD)
High altitude

Decreased:

Iron anemia
Folic acid, B12 and or B6 deficiency
Liver and renal dysfunction
Hemorrhage

Sodium

135-140 mmol/L

Increased in:

Dehydration

Diabetes
Cushing's disease

Decreased in:

Addison's disease
Hypothyroid
Numerous pathologies

Thyroid Stimulating Hormone (TSH)

Normal range .4-4.5 microunits/mL

Functional range 1.5-3.0 microunits/mL

Increased in:

Primary hypothyroidism
Elevated TSH with normal T3 and or T4 confirms hypothyroidism.

Decreased in:

Hyperthyroidism
Primary pituitary hypofunction

Total Thyroxine (T4)

5-12 mcg/dL

Increased in:

Hyperthyroidism
Hepatitis

Decreased in:

Primary hypothyroidism
Secondary Hypothyroidism due to hypopituitary
T3 therapy

Free T4

.8-2.4 ng/dL

1.0-1.5 ng/dL

Total Triiodothyronine (T3)

60-181 ng/dL

Free T3

230-4.0 pg/dL

T3 Uptake

28-38%

TIBC

250-350 ug/dL

Total iron binding capacity

Transferrin is responsible for up to 70 percent of the iron binding capacity of serum. TIBC is the measurement of all proteins available for binding iron.

Increased in:

Iron anemia

Decreased in:

Inflammatory diseases

Cirrhosis

TIBC will be elevated in iron deficiency disorders. Usually TIBC will be elevated before anemia shows up.

WBC differential:

Basophils release heparin to prevent clotting in inflammation.

Increased in:

Polycythemia

Intestinal parasites

Tissue inflammation

Decreased in:

Acute allergic reactions

Hyperthyroidism

Eosinophils

Increased in:

Intestinal parasites

Food and environmental allergies

Asthma

Emphysema

Lymphocytes

25-40%

Particularly active in fighting off viruses

Increased in:

Acute or active viral infections

Inflammation

Bacterial infection (less likely)

Lymphocytic leukemia

Multiple myeloma.

Decreased in:

Bacterial infections

Viral infections (less likely)

Hodgkin's disease

Monocytes

0-7%

Increased in:

Chronic infections-bacterial, fungal, viral, parasitic
Hodgkin's disease.

Decreased in:

HIV
Overwhelming infections
Leukemia

In inflammatory reactions neutrophils are prominent for about 3 days then they break up and the monocytes, precursors for macrophages, remain active (phagocytic). Monocytes are often increased during the recovery phase of an infection.

Increased in:

Viral infections (mononucleosis)

Neutrophils

0-60%

Increased in:

Acute bacterial infections
Inflammation
Viral infections (less likely)

Decreased in:

Chronic viral infections
Bacteria infections (less likely)
Inflammation
Immune disorders

Total Protein

Increased in:

Digestive dysfunction
Dehydration

Decreased in:

Protein malnutrition
Digestive inflammation-leaky gut

Triglycerides

75-100 mg/dL

Increased in:

Non-fasting blood draws

Insulin resistance/diabetes

Hypothyroidism

If triglycerides are elevated above total cholesterol levels, the insulin resistance should be suspected.

Decreased in:

Malnutrition or malabsorption

Hyperthyroidism

Uric Acid

Uric acid is the principle end product of purine, nucleic acid and nucleoprotein metabolism.

Increased in:

Gout

Rheumatoid arthritis

Decreased in:

Molybdenum deficiency

Vitamin D

30-100 ng/ml

Optimal-50-65 ng/ml

25-hydroxy vitamin D (25-OH)

Vitamin D regulates immune function and inflammatory processes among other things-see resource section for more on vitamin D. Optimal levels are 50 or above.

Increased in:

Vitamin D toxicity

Decreased in:

Rickets-osteomalacia in adults

Osteopenia

Osteoporosis

Hypertension

Cardiovascular disease

Cancers of the breast, prostate, and colon

Musculoskeletal pain

Inflammation

Depression

Metabolic syndrome

Low immune function

WBC Count

5.0-8.0 thous/MCL

The WBCs are the main defense against invading microorganisms. WBCs destroy most bacteria. Normal range: 5,000 to 10,000 cubic units. **Increased in various infections, certain blood disorders, and emotional distress.**

Decreased in overwhelming infections.

Leukocytes (white blood cells) are divided into two main groups-the granulocytes and the non-granulocytes.

Granulocytes:

Polymorphonuclear neutrophils (segmented and bands)

Eosinophils

0-3%

Increased in:

Parasitic infections
Allergies
Numerous pathologies

Basophils - 0-1%

Increased in:

Numerous pathologies

Non-Granulocytes:

Lymphocytes

25-40%

Increased in:

Inflammation
Viral infection (most likely)
Bacterial infection (less likely)
Immune dysfunction
Numerous pathologies

Decreased in:

Inflammation
Bacterial infection (most likely)
Viral infection (less likely)
Immune disorder
Numerous pathologies
Steroids

Monocytes

0-7%

Increased in:

Inflammation
Numerous pathologies

Decreased in:

Overwhelming infections
HIV
Leukemia or serious immune disorder
Steroids

Increased WBCs:

above 8.0 acute infection

Acute viral or bacterial infection
Steroids
Thyroid storm
Intestinal parasites
Some cancers
Infectious mononucleosis
Adrenal dysfunction

Decreased WBCs

Chronic infections below 5.0
Autoimmune disorders including Rheumatoid arthritis
Iron deficiency
Chronic intestinal parasites
B12, B6, and or folic acid deficiency anemia