

# Understanding Your Blood Tests

## Your Blood Test

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You and your doctor can learn a great deal about your health by testing a sample of your blood. Laboratory tests help in several ways. Sometimes test results will be abnormal before you have any symptoms, and when you have symptoms, laboratory test results help confirm that a problem does exist.

A normal test result is just as significant as an abnormal result. A normal result does not mean that the test was unnecessary. When a result is normal, it not only helps to rule out disease, but it also establishes a baseline for you. Each person has his or her own baseline "normal". A person's own result is the best baseline for monitoring any change that takes place in the future.

What follows is a brief description of the typical tests that may be included in a testing profile. These descriptions will help you to better understand your laboratory test results so that you may have a more meaningful discussion with your doctor. You should not rely on this information for diagnostic treatment. These descriptions are not intended to be a complete listing of all conditions medically relevant to each test. Always consult your doctor regarding your laboratory tests.

## Glucose

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Glucose is the chief source of energy for all living organisms; however, abnormally high or low blood glucose levels may be a sign of disease. For example, high glucose levels after 12 hours of fasting may suggest diabetes. Low blood glucose, on the other hand, may be seen with certain tumors or with liver disease. A low glucose level may also mean that the blood sample was not handled properly after it was drawn.

## Uric Acid

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Uric acid levels are useful in the diagnosis of gout. Gout is a condition that occurs and affects men more than women. Diets high in purines (present in sweetbreads, kidney, and liver) may worsen the condition. Patients with gout may develop

arthritis and or kidney stones. A number of drugs, particularly diuretics and salicylates (aspirin), may also increase uric acid. Uric acid levels may be increased during kidney failure, with certain tumors, and as a response to stress and alcohol.

## **Phosphate**

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Phosphate is closely associated with calcium in bone development and is primarily found in the bones. The remaining phosphate level, which is found in the blood, is very important for muscle and nerve function. Very low levels of phosphate in the blood can be associated with starvation or malnutrition and this can lead to muscle weakness. High levels of phosphate in the blood are usually associated with kidney disease.

## **Calcium**

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Calcium is one of the most important elements in the body. Ninety-nine percent of the calcium in the body is in the bones. The remaining one-percent is in body fluids, such as blood, and is very important for the proper function of nerves, enzymes, muscles, and blood clotting. High levels can be caused by bone disease, excess intake of antacids and milk (this is often seen in people with ulcers), excessive intake of vitamin D, and over activity of the thyroid gland. The parathyroid gland is the main regulator of calcium in the body. Tumors of the parathyroid gland may result in very high calcium levels.

## **Magnesium**

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This element is found primarily inside the cells of the body. Like calcium, the level in the blood is important. A low magnesium level in the blood may indicate severe malnutrition, severe diarrhea, alcoholism, or excessive use of diuretics. A very low level of magnesium in the blood can cause your muscles to tremble.

## **Total Bilirubin**

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Bilirubin is the pigment in the blood that makes your blood plasma or serum yellow. When the bilirubin level in the blood is very high, the whites of your eyes and your skin may become yellow. This is known as jaundice. Bilirubin comes from the breakdown of old red cells in the blood. A high bilirubin level in the blood can be caused by too many red cells being destroyed (hemolysis), by liver disease, or by a blockage of the bile ducts. Fasting can also cause a slight increase in total bilirubin.

## **Direct Bilirubin**

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This is a specific form of bilirubin that is formed in the liver and excreted in the bile. Normally, very little of this form of bilirubin is present in the blood, so even a slightly high level of direct bilirubin indicates a problem with the liver cells.

## **Alkaline Phosphatase**

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Alkaline Phosphatase is found in all body tissues, but the most important sites are bone and liver. Blood levels increase when bones are growing; thus children have higher levels than adults do. High levels may also be seen in bone and liver disease. Certain drugs may cause high levels too.

## **Gamma-Glutamyltransferase (GGT)**

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GGT is primarily found in the liver. Drinking too much alcohol, certain drugs, obstructive liver disease, and bile duct disease can cause high levels of GGT in the blood.

## **Aspartate-Aminotransferase (AST)**

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AST is found mainly in the heart, liver, and muscles. High levels of AST in the blood suggest a problem with the heart, liver, or muscles.

## **Lactate Dehydrogenase (LDH)**

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LDH is found in all tissues in the body; thus a high level in the blood can result from a number of different diseases. Slightly elevated levels in the blood are common and rarely indicate disease. The most common sources of LDH are the heart, liver, muscles, and red blood cells.

## **Blood Urea Nitrogen (BUN)**

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BUN is a waste product derived from protein breakdown in the liver and excreted by the kidneys. When your kidneys are not working well, the level of BUN in the blood will rise. Dehydration and blood loss can also cause a high BUN level. Liver disease, a low protein diet, or too much water intake may cause a low BUN level.

## **Creatinine**

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The blood concentration of creatinine depends upon two things - the amount of muscle you have and the ability of your kidneys to excrete the creatinine. A high level of creatinine in the blood usually indicates deterioration in kidney function.

## **BUN/Creatinine Ratio**

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When BUN and/or creatinine levels are abnormal, the doctor can determine if the high BUN level is caused by a kidney problem or from something like blood loss in the abdomen.

## **Total Protein**

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This is a measure of the total amount of protein in your blood. A low or high total protein does not indicate a specific disease, but it does indicate that some additional tests may be required to determine if there is a problem.

## **Albumin**

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Approximately two-thirds of the total protein circulating in your blood is albumin. This important protein keeps water inside your blood vessels. When your albumin level is too low, water can leak out of your blood vessels into other parts of your body and cause swelling. A low level of albumin in the blood can be caused by malnutrition, too much water in the body, liver disease, kidney disease, severe injury such as burns or major bone fractures, and slow bleeding over a long period of time.

## **Globulin**

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This is the group of proteins in your blood that helps to fight infections. It is actually comprised of about 60 different important proteins. Some of the proteins in the group play an important role in blood clotting. If your globulin level is abnormal, your doctor may want to measure some of the individual proteins that make up this group.

## **Albumin/Globulin Ratio**

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A simple way to tell if the albumin or globulin levels in the blood are abnormal is to compare the level of albumin to the level of globulin in your blood.

## **Sodium**

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This element plays an important role in salt and water balance in your body. The adrenal hormone, aldosterone, and the rate of excretion in urine, regulate the blood sodium level. Too much water intake, heart failure, or kidney failure because of fluid retention can cause a low sodium level in the blood. A low level can also be caused by loss of sodium in diarrhea, fluid, and vomit, or by a deficiency of adrenal hormone. Too much intake of salt or not enough intake of water can cause a high level.

## **Potassium**

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This element is found inside all cells. Its role is to maintain water balance inside the cells and help in the transmission of nerve impulses. The level of potassium in blood is of critical significance. Low levels may be found in patients on diuretics or in patients not receiving enough dietary potassium. A low potassium level can cause

muscle weakness and heart problems. A high level can be found in kidney disease or in overuse of potassium supplements. Some "salt" substitutes contain potassium instead of sodium, and an excessive use of these substitutes can cause dangerously high levels of potassium in the blood. Adrenal hormone disorders can also alter blood potassium level.

## **Chloride**

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Chloride is another element that plays a role in salt and water balance. It is almost never the only element that is low or high. Changes in the chloride level are usually associated with changes in sodium or potassium. Borderline low or high levels of chloride usually have very little significance. When there is too much or too little acid in the blood, chloride is an important clue to the cause of the acid abnormality.

## **Iron**

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The body must have iron to make hemoglobin and to help transfer oxygen to the muscles. If the body is low in iron, all body cells, particularly muscles in adults and brain cells in children, do not function properly. On the other hand, if there is too much iron in the body, this can cause injury to the heart, pancreas, joints, testicles, ovaries, etc. Iron excess is found in the heredity disease called hemochromatosis, which can be found in about 3 out of every 1000 people.

## **Total Iron Binding Capacity (TIBC)**

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Iron is transported in your blood bound to a protein called transferrin. Transferrin transports the iron in your body from the iron storage sites to where it is needed. It also transports the iron when not needed back to the storage sites. A low TIBC suggests malnutrition or iron excess. A high TIBC suggest iron deficiency.

## **Transferrin Percent Saturation**

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This percent is obtained by comparing the iron level to the TIBC level. It is a simple way to compare the amount of iron in the blood to the capacity of the blood to transport iron.

## **Cholesterol**

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Cholesterol is an essential blood fat, but too high a level of this blood fat is associated with a higher risk of heart disease and clogged blood vessels. The total cholesterol level in blood includes LDL (bad cholesterol) and HDL (good cholesterol).

## **HDL Cholesterol**

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High-density lipoprotein (HDL) cholesterol is sometimes described as the “good” cholesterol. One of the important roles of HDL cholesterol in your body is to carry cholesterol away from your arteries to your liver. The more HDL cholesterol you have, the more cholesterol can be carried away and not clog your arteries.

## **Cholesterol/HDL Cholesterol Ratio**

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This number is obtained by comparing the total cholesterol level to the HDL cholesterol level: the higher the number, the greater the risk of coronary heart disease. A high HDL cholesterol level will result in a lower ratio, which means a lower risk. This could be true even if the total cholesterol level may be high.

## **Triglycerides**

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This is a blood fat largely derived from dietary fat absorption, and to a limited extent, related to a higher risk of heart disease. You must not eat for at least 12 hours to obtain an accurate result for this test.

## **High Sensitivity CRP**

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CRP (C-Reactive Protein) is a protein produced in the liver that circulates in the blood. High Sensitivity CRP is a blood test that is able to detect small amounts of CRP. Even low levels of CRP can help indicate your risk for heart disease and help predict risk of a first heart attack up to eight years in advance.

## **T4 Thyroxine**

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T4 controls the rate at which energy is used and released by the body. A low level of T4 (hypothyroidism) may cause tiredness, depression, or weight gain even though your appetite is decreased. A high level of T4 (hyperthyroidism) may cause nervousness, irritability or weight loss.