



# Metabolic Panels

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## **METABOLIC PANEL**

The metabolic panel is a group of tests that measures several substances in your blood. It is one of the most commonly ordered lab tests.

The metabolic panel gives your healthcare provider important information about the current status of your body's metabolism (hence the name metabolic panel). The metabolic panel provides information on your blood sugar (glucose) level, the balance of electrolytes and fluids, and the health of your kidneys and liver. Abnormal results, and especially combinations of abnormal results, can indicate a problem that needs to be addressed and may require additional testing.

Every laboratory has its own reference range or [normal values](#) for the results of each test. Most lab reports show the normal range and highlight any test results outside the normal range.

## **BASIC METABOLIC PANEL (BMP)**

The basic metabolic panel (BMP) includes the following tests:

- Glucose
- Calcium
- Electrolytes: sodium, potassium, bicarbonate (total CO<sub>2</sub>), chloride
- Kidney function tests: blood urea nitrogen (BUN), creatinine

**Calcium:** one of the most important minerals in the body. It is essential for the proper functioning of muscles, nerves, the heart, blood clotting, and in the formation of bones. The most common cause of low calcium for people with HIV is low protein levels due to malnutrition or [wasting](#). Abnormal calcium levels can indicate digestive problems.

**Glucose (sugar):** the primary energy source for the body's cells. A steady supply must be available for use, and a relatively stable level of glucose must be maintained in the blood, which is broken down in the cells to provide energy. [Read more about blood glucose tests.](#)

**Electrolytes:** minerals found in body tissues and blood in the form of dissolved salts. Electrolytes help move nutrients into the body's cells and remove wastes out of cells. They help maintain a healthy water balance and help stabilize the body's acid/base (pH) level.

- **Sodium:** vital to normal body function, including nerve and muscle function. Levels indicate the

balance of salt and water the functioning of the kidneys and adrenal glands. Abnormal sodium levels often indicate that blood volume is too low (due to dehydration) or too high. They can also occur when the heart is not pumping blood normally or when the kidneys are not working properly.

- **Potassium:** vital to cell metabolism and muscle function, helping to transmit messages between nerves and muscles. Potassium affects several major organs including the heart. Potassium levels rise in kidney failure and may be abnormal due to vomiting or diarrhea.
- **Bicarbonate or CO<sub>2</sub>:** helps to maintain the body's acid-base balance (pH). A normal CO<sub>2</sub> level keeps the blood acidity at the correct level. A high level might be caused by high levels of lactic acid in the blood.
- **Chloride:** helps to regulate the amount of fluid in the body and maintain acid-base balance. Levels often go up and down along with sodium levels. This is because sodium chloride, or common salt, is a major component of blood.

### **Kidney function tests:**

- **Blood Urea Nitrogen (BUN):** waste product filtered out of the blood by the kidneys. As kidney function decreases, BUN level rises. High BUN levels can be due to a high-protein diet, dehydration, or kidney or heart failure.
- **Creatinine:** waste product produced in the muscles. Creatinine is filtered out of the blood by the kidneys so blood levels are a good indication of how well the kidneys are working. High levels are usually due to kidney problems. Doctors use the creatinine level as the most direct sign of how well the kidneys are removing waste products from the body.

[Read more about HIV and kidney disease.](#)

### **COMPLETE METABOLIC PANEL (CMP)**

The complete metabolic panel (CMP) includes the following tests:

- All of the tests included in the BMP (see above)
- Proteins: albumin, total protein
- Liver functions tests: alkaline phosphatase (ALP), alanine amino transferase (ALT), aspartate amino transferase (AST), bilirubin

### **Proteins:**

- **Albumin:** a small protein made by the liver. It is the major protein in blood and makes up about 60% of the total protein in the blood. It maintains water balance in the cells, carries nutrients to the cells, and removes waste products. Low albumin is generally a sign of nutrition problems. Because albumin carries so many substances in the blood, low albumin levels can lead to inaccurate low results for other laboratory tests, especially calcium and testosterone.
- **Total protein:** measures albumin as well as all other proteins in blood. Proteins are important building blocks of all cells and tissues and are essential for body growth, development, and health.

**Liver functions tests:** measure the levels of enzymes found in the liver, heart, and muscles. Enzymes are proteins that cause or increase chemical reactions in living organisms. High enzyme levels can indicate liver damage caused by medications, alcohol, [hepatitis](#), or [substance use](#). Different patterns of these enzymes, when some are elevated and others are normal, can help your healthcare provider identify specific health problems.

- **Alkaline phosphatase (ALP):** enzyme found in bone, the liver, and other tissues. Elevated levels of ALP in the blood are most commonly caused by liver disease or bone disorders.
- **Alanine amino transferase (ALT):** enzyme found mostly in the cells of the liver and kidneys. ALT is a useful test for detecting liver damage and disease.
- **Aspartate amino transferase (AST):** enzyme found in the heart and liver. AST is used with ALT to detect liver damage and disease.
- **Bilirubin:** an orange-yellow pigment primarily produced by the normal breakdown of red blood cells (RBCs). Bilirubin is ultimately processed by the liver so that it can be removed from the body. High levels can indicate liver disease but might also be caused by the antiviral drugs indinavir (Crixivan) and [atazanavir \(Reyataz\)](#).

## **OTHER BLOOD CHEMISTRY TESTS**

**Uric Acid:** comes from the breakdown of DNA (genetic material in the cells). It is normally removed by the kidneys. High levels of uric acid are fairly common. Very high levels can occur when the kidneys are unable to remove uric acid from the blood or by leukemia or lymphoma.

**Globulin (also called immunoglobulin):** measures the protein in antibodies produced by the immune system. HIV infection causes an abnormally high level of globulin. Levels are usually reported for five types of globulin: IgG, IgA, IgD, IgE, and IgM.

**Erythrocyte Sedimentation Rate (ESR):** also called sed rate, measures how quickly red blood cells settle in a tube of blood. A high ESR indicates some type of inflammation. However, the ESR does not indicate whether the [inflammation](#) is long-term, like arthritis, or is due to the body fighting an infection.

**C-Reactive Protein (CRP):** another general test of inflammation. CRP rises and falls faster than the ESR. High levels of CRP may be a sign of increased risk of heart attack.

## **MORE INFORMATION**

### [Normal Laboratory Values](#)

Lab Tests Online: [Basic Metabolic Panel \(BMP\)](#)

Lab Tests Online: [Comprehensive Metabolic Panel \(CMP\)](#)

MedlinePlus: [Basic Metabolic Panel \(BMP\)](#)

MedlinePlus: [Comprehensive Metabolic Panel \(CMP\)](#)

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