

Understanding Blood Tests

Your heart pumps the blood in your body through a system of blood vessels. Blood delivers oxygen and nutrients to all parts of the body. It also carries away waste products. Blood is made up of red blood cells, white blood cells, platelets and a clear fluid called plasma. There are also other parts in the blood such as electrolytes, proteins, fats, sugar, and hormones.

Your doctor can check for certain diseases and conditions by doing **blood tests**. A small sample of blood is taken and sent to the lab. The test results help your doctor:

- Check your general health
- See how well your body organs are working
- Find health problems, diseases and disorders
- Watch the body's response to medicines and treatments

Common blood tests include a **Complete Blood Count (CBC) with differential**, and a **Comprehensive Metabolic Panel (CMP)**.

Note: Some health problems may require ongoing monitoring or repeat testing. It is important to know that normal range values can vary from laboratory to laboratory. Talk with your doctor if you have questions about your test results.

Complete Blood Count (CBC)

A **CBC** shows the number of white and red blood cells, hematocrit, hemoglobin and platelets in your blood. This test helps your doctor look for signs of anemia, infection, bleeding problems or certain diseases and disorders.

This handout is for informational purposes only. Talk with your doctor or health care team if you have any questions about your care.

- **White Blood Cells (WBC)**

- ▶ Normal range (Total WBC): 3.73 – 10.10 K/uL for men
- ▶ Normal range (Total WBC): 3.99 – 11.19 K/uL for women

White blood cells fight infection and destroy bacteria and germs that enter the body. They are also called leukocytes. A **high** number of WBCs can be a sign of infection. A **low** number of WBCs can be caused by certain medicines, cancer treatments or diseases.

A CBC with differential, sometimes known as the “**diff**”, shows the amount (percentage) of each type of white blood cell in your blood. Each type has a different job in helping the body fight infection.

- **Red Blood Cells (RBC)**

Normal ranges are different for men and women

- ▶ Normal range: 4.38 – 5.83 M/uL for men
- ▶ Normal range: 3.91 – 5.04 M/uL for women

Red blood cells carry oxygen to the body’s tissues. A **high** count can be a sign of heart, kidney or lung problems. It can also be caused by dehydration (not drinking enough water). A **low** count can be caused by bleeding, anemia, certain medicines, nutrition problems or other diseases.

- **Hemoglobin (Hgb)**

Normal ranges are different for men and women

- ▶ Normal range: 13.4 – 16.8 g/dL for men
- ▶ Normal range: 11.4 – 15.2 g/dL for women

Hemoglobin is a protein found in the RBCs that gives blood its red color. Hemoglobin picks up oxygen in the lungs and carries it to the body’s tissues. Hemoglobin also carries away carbon dioxide waste. A **high** hemoglobin may be a sign of heart or lung disease. A **low** hemoglobin can be caused by bleeding, anemia, certain medicines, nutrition problems or other diseases.

- **Hematocrit (Hct)**

Normal ranges are different for men and women

- ▶ Normal range: 39.6% – 48.8% for men
- ▶ Normal range: 34.9 – 44.3% for women

The hematocrit shows how much of your blood is made up of red blood cells. Test results are given as a percentage. A **high** hematocrit may be a sign of dehydration, heart or lung conditions. A **low** hematocrit can be caused by bleeding, anemia, certain medicines, nutrition problems or other diseases.

- **Platelets (Plts)**

- ▶ Normal range: 146 – 337 K/uL

Platelets help stop bleeding by forming blood clots. A **high** platelet count may be caused by types of anemia, cancers or diseases. A **low** platelet count can be caused by certain medicines, cancer treatments, bleeding disorders or other diseases.

Comprehensive Metabolic Panel (CMP)

A **CMP** is a group of blood tests that check your body's balance of electrolytes, blood sugar, proteins and how well the liver and kidneys are working.

- **Sodium (Na)**

- ▶ Normal range: 133 – 143 mmol/L

Sodium is an electrolyte that helps keep water balanced in your body. It also helps your muscles and nerves work properly. A **high** level can be a sign of dehydration. A **low** level may be caused by kidney problems, vomiting, diarrhea, or sweating too much. Medicines such as diuretics (water pills) can also lower sodium level.

- **Potassium (K)**

- ▶ Normal range: 3.5 – 5.0 mmol/L

Potassium is an electrolyte that helps your heart, muscles and nerves work properly. A very high or very low level of potassium can be harmful (serious). A **high** level may be a sign of kidney problems. A **low** level may be caused by a loss of fluids due to vomiting or diarrhea, and medicines such as diuretics (water pills).

- **Total Carbon Dioxide – (CO₂)**

- ▶ Normal range: 22 – 30 mmol/L

Carbon dioxide is a waste product in the blood. The kidneys and lungs work to control the amount of waste products in your body. A **high** level may be caused by breathing problems, lung disease or other health problems. A **low** level may be caused by diarrhea, kidney disease or other health problems.

- **Chloride (Cl)**

- ▶ Normal range: 98 – 108 mmol/L

Chloride is an electrolyte found in the body. It works together with other electrolytes to keep your body's cells and fluid in balance. A **high** level may be a sign of kidney problems. A **low** level can be caused by vomiting, diarrhea or dehydration.

- **Blood Urea Nitrogen (BUN)**

- ▶ Normal range: 7 – 22 mg/dL

This test is done to check how well your kidneys are working. Urea nitrogen is a waste product from the breakdown of proteins. If the kidneys are not working well, the BUN level will increase. A **high** level may be from kidney problems, dehydration or other health problems. A **low** level can be from a diet low in protein, or problems with your liver.

- **Creatinine (CR)**

Normal ranges are different for men and women

- ▶ Normal range: 0.7 – 1.3 mg/dL for men
- ▶ Normal range: 0.5 – 1.2 mg/dL for women

Creatinine is a waste product from the normal breakdown of muscle tissue in the body. It is checked to see how well your kidneys are working. A **high** level can be a sign of kidney problems. A **low** level may be due to reduced muscle mass caused by health problems or normal aging.

- **Glucose (Gluc)**

- ▶ Normal range: 70 – 99 mg/dL

Blood glucose is also known as “**blood sugar**”. Glucose comes from the different foods we eat and gives the body energy. Testing glucose levels can help your doctor check for diabetes. A **high** level can be caused by diabetes, stress, infection or illness. A **low** level may be from health problems or a poor diet. Some medicines can also cause a change in blood sugar levels.

- **Calcium (Ca)**

- ▶ Normal range: 8.6 – 10.5 mg/dL

Calcium is a mineral needed for healthy bones and teeth. Calcium is also important for blood clotting and helping the heart, nerves and muscles work properly. Problems with your kidneys, parathyroid or some bone diseases may cause a **high** calcium level. A **low** level may be caused from certain medicines, a lack of nutrients in your diet or kidney problems.

- **Proteins**

Proteins are made in the liver and are important to keep body tissues and organs healthy. Protein tests check for the amount of protein in the blood.

- ▶ **Albumin (Alb)**

- Normal range: 3.5 – 5.0 g/dL

Albumin is one of the main proteins in the blood. It keeps the fluid in body tissues at a normal level. The amount of protein in the foods you eat may affect your albumin level. A **high** level may be caused by dehydration. A **low** level may be a sign of not eating enough protein, difficulty with digesting proteins and liver or kidney problems.

- ▶ **Total Protein**

- Normal range: 6.4 – 8.3 g/dL

A total protein is done to check for nutrition problems and how well your liver and kidneys are working. A **high** level can be caused by long lasting inflammation or infections. A **low** level may be a sign of poor nutrition and/or liver or kidney problems.

- **Liver Tests**

There is a group of tests your doctor can do to check how well your liver is working. **High levels** may be a sign of liver problems caused by certain medicines or blood diseases and disorders.

- ▶ **Alkaline Phosphatase (ALP)**

- Normal range: 32 -126 U/L

- ▶ **Aspartate Aminotransferase (AST)**

- Normal range: 14 - 40 U/L

- ▶ **Alanine Aminotransferase (ALT)**

Normal ranges are different for men and women

- Normal range: 9- 48 U/L for women
 - Normal range: 10 - 52 U/L for men

- **Total Bilirubin**

- ▶ Normal adult range: 0.3 - 1.5 mg/dL

A bilirubin test is done to check how well the liver is working. Bilirubin is a waste product in the blood. It is made from the breakdown of old red blood cells. When the liver is not working, bilirubin builds up in the blood. This causes your skin and whites of your eyes to turn yellow (**jaundice**). This condition can happen from damage to the liver.