EXPERIMENT FIVE

BLOOD DRAW

A procedure in which a needle is used to take blood from a vein, usually for laboratory testing. A blood draw may also be done to remove extra red blood cells from the blood, to treat certain blood disorders. Also called phlebotomy and venipuncture

What is a CBC?

A complete blood count, or CBC, is an easy and very common test that screens for certain disorders that can affect your health. A CBC determines if there are any increases or decreases in your blood cell counts. Normal values vary depending on your age and your gender. Your lab report will tell you the normal value range for your age and gender. A CBC can help diagnose a broad range of conditions, from anemia and infection to cancer.

The Three Basic Types Of Blood Cells

Measuring changes in your blood cell levels can help your doctor evaluate your overall health and detect disorders. The test measures the three basic types of blood cells.

Red blood cells

Red blood cells carry oxygen throughout your body and remove carbon dioxide. A CBC measures two components of your red blood cells:

hemoglobin: oxygen-carrying protein

hematocrit: percentage of red blood cells in your blood

Low levels of hemoglobin and hematocrit are often signs of anemia, a condition that occurs when blood is deficient in iron.

Increase in Level

High levels of RBCs might indicate chronic lung disease, liver disease, kidney disease, exposure to carbon monoxide, smoking, excess alcohol consumption etc.

Decrease in Level

Low levels of RBCs might occur due to anemia, certain medications, bleeding, deficiency of certain vitamins etc.

White blood cells

White blood cells help your body fight infection. A CBC measures the number and types of white blood cells in your body. Any abnormal increases or decreases in the number or types of white blood cells could be a sign of infection, inflammation, or cancer.

Increase in Level

It might result from infection, allergies, cancer etc.

Decrease in Level

A low level of WBCs indicates infection, autoimmune disease, deficiency of vitamins etc.

Platelets

Platelets help your blood clot and control bleeding. When a cut stops bleeding, it's because platelets are doing their job. Any changes in platelet levels can put you at risk for excessive bleeding and can be a sign of a serious medical condition.

Increase in Level

Platelet count increases when a person recovers from surgery, anemia, cancer, deficiency of vitamin B12, inflammation, infection.

Decrease in level

Low count of platelets may be due to cancer, anemia, chemotherapy, autoimmune diseases, infections, chronic bleeding.

Purpose of the test

The purpose of a complete blood count is to give your health care provider details about the state of your health. It is an important medical tool because it uses one sample to analyze the complete spectrum of cells found in the blood as well as some of the characteristics of those cells.

Because it provides information about every type of cell in the blood, the CBC can provide information related to a wide variety of medical problems.

The primary uses for the CBC are diagnosis, monitoring, and screening:

- **Diagnosis** is determining the cause of a patient's symptoms. The CBC can identify many different abnormalities in the blood that can be linked to distinct medical problems. For this reason, the CBC is frequently used as a diagnostic test. In many cases, it can confirm or rule out certain conditions and may be used alongside other tests to arrive at a definitive diagnosis.
- **Monitoring** is the process of following a patient's condition over time. A CBC can be used to monitor patients who have previously been diagnosed with blood disorders. It can help see how a

person's condition has responded to treatment, and it may be used to watch for side effects of some medical treatments.

- **Screening** is testing to find health problems before there are any symptoms. In some cases, a doctor may prescribe a CBC as a screening test during routine check-ups.

What does the test measure?

A CBC involves multiple measurements that include the number of blood cells and some of their physical features. A standard CBC includes several elements related to red blood cells, white blood cells, and platelets that are described in the following sections.

Red blood cell measurements

Red blood cells (RBCs) are also called erythrocytes. They carry oxygen from your lungs to the tissues and organs in your body. A CBC test includes several basic measurements of RBCs:

- **RBC count** is the total number of red blood cells in your blood sample.
- **Hemoglobin** measures the amount of this oxygen-carrying protein that is found inside RBCs.
- **Hematocrit** measures the proportion of your total blood volume that consists of red blood cells.

A CBC also provides details about the physical features of red blood cells. These are known as RBC indices. There are several kinds of RBC indices:

- **Mean corpuscular volume (MCV)** is a measurement of the average size of red blood cells.
- **Mean corpuscular hemoglobin (MCH)** is the average amount of hemoglobin inside each red blood cell.
- **Mean corpuscular hemoglobin concentration (MCHC)** is a calculated measurement of how concentrated hemoglobin is within red blood cells.
- **Red cell distribution width (RDW)** is a measurement of the variation in the size of your red blood cells.

White blood cell measurements

White blood cells (WBCs) are also called leukocytes. They are an important part of the body's immune system. A standard CBC measures the WBC count, which is the total number of white blood cells in a sample of blood. A common variation of the CBC is the complete blood count with differential. The white blood cell differential is a breakdown of the amount of each of five different types of WBCs:

- **Neutrophils:** Neutrophils make up the greatest percentage of WBCs and are produced by the bone marrow to fight a diverse array of inflammatory and infectious diseases.

- **Lymphocytes:** Lymphocytes such as B-cells and T-cells are found primarily in the lymph system and fight bacteria and other pathogens in the blood.
- **Monocytes:** Monocytes work in conjunction with neutrophils to combat infections and other illnesses while removing damaged or dead cells.
- **Eosinophils:** Eosinophils are WBCs that are activated in response to allergies and some types of infections.
- **Basophils:** Basophils are involved in early identification of infections as well as wound repair and allergic reactions.

Initial blood testing may include a CBC with differential, or this test may be done after an initial standard CBC was abnormal. Because each white blood cell type has a different function, the CBC with differential can be used to identify abnormal levels of specific WBCs, which may offer clues about an underlying health concern.

Platelet measurements

Platelets, also called thrombocytes, are cell fragments that circulate in blood and play an essential role in blood clotting. When there is an injury and bleeding begins, platelets help stop bleeding by sticking to the injury site and clumping together to form a temporary plug.

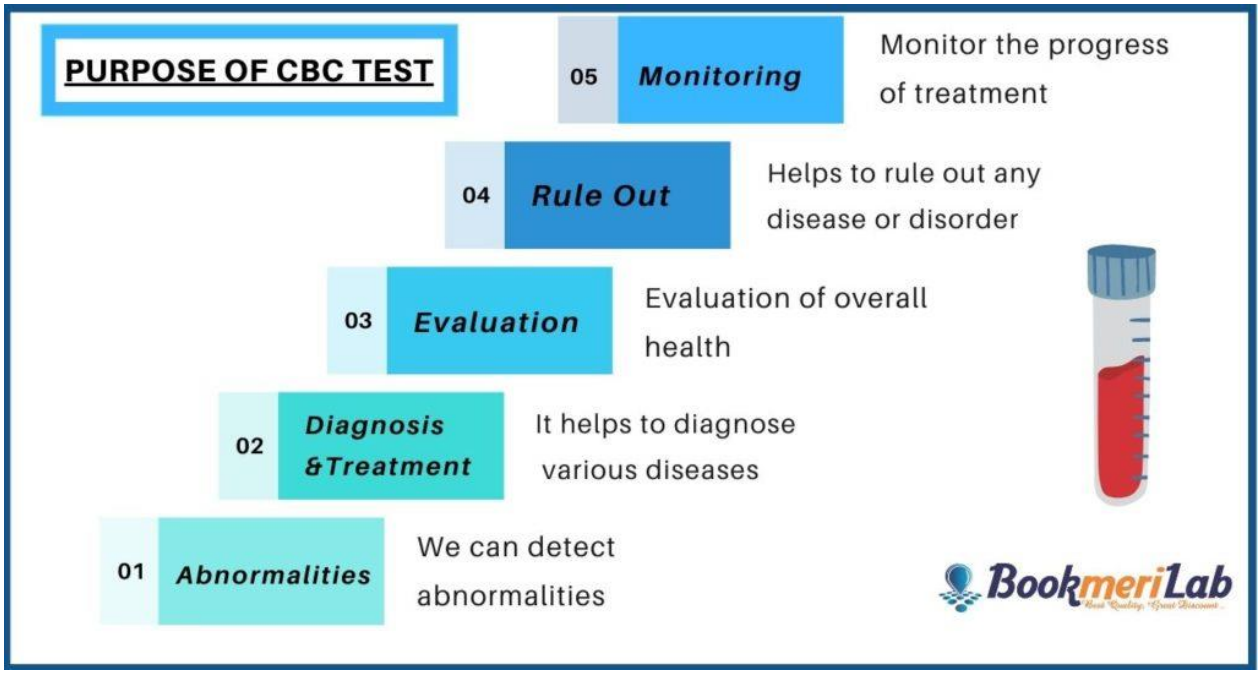
A standard component of the CBC is the platelet count, which is the number of platelets in your blood sample.

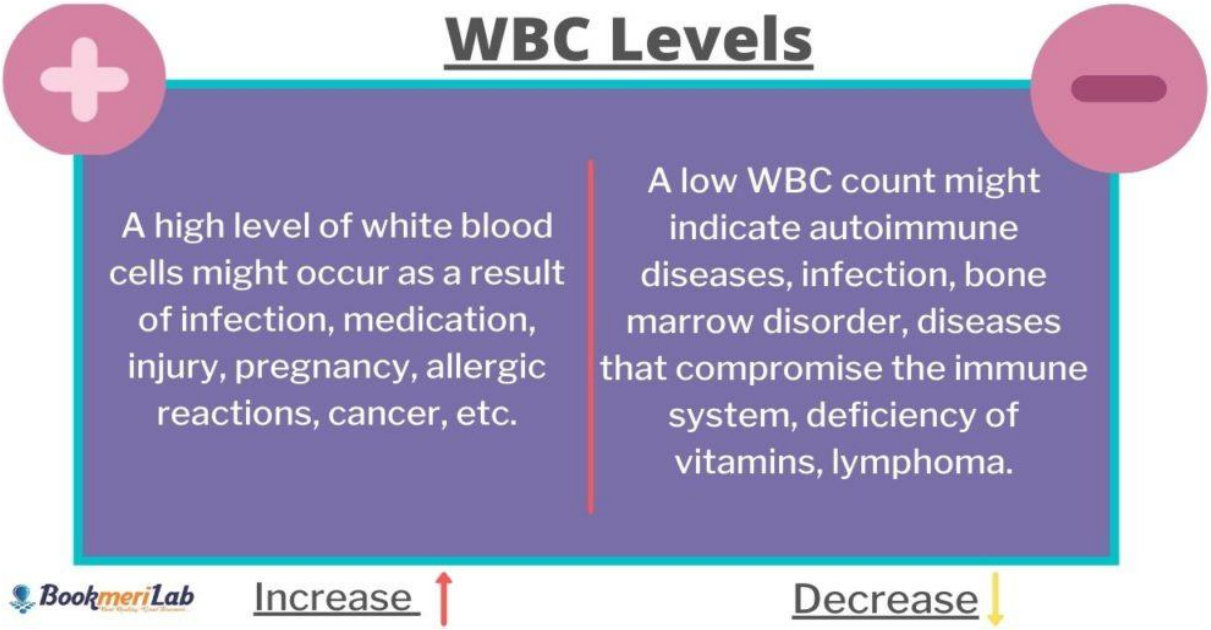
In some cases, your doctor may have the laboratory also measure the mean platelet volume (MPV), which determines the average size of platelets

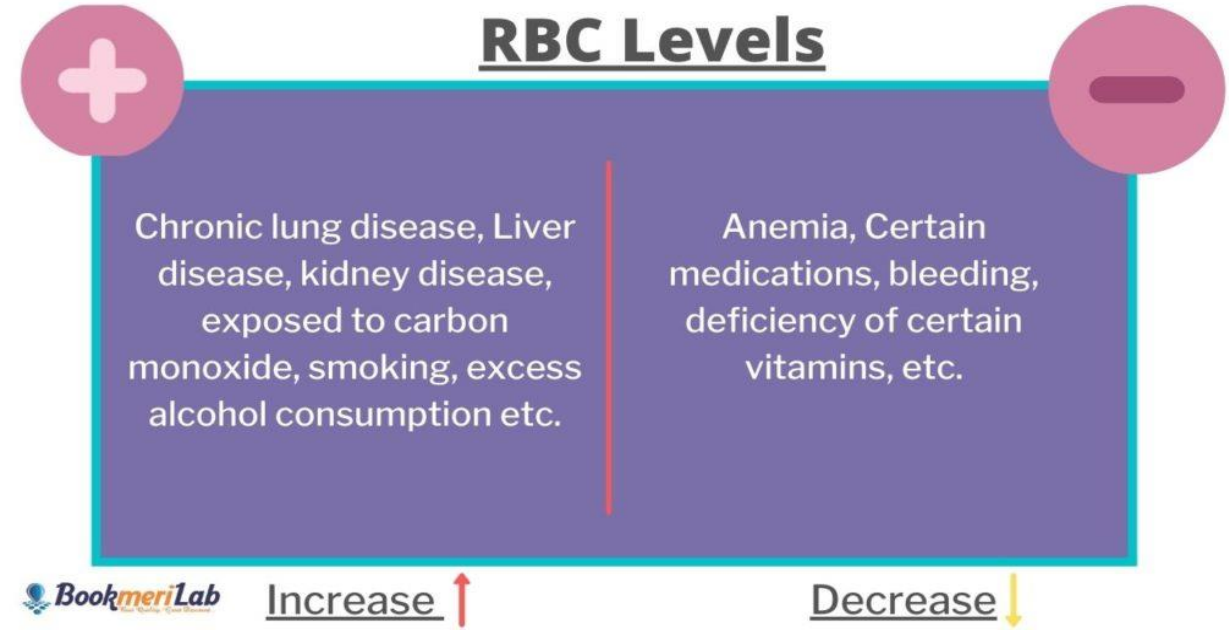
- **Hemoglobin (Hb or Hgb)**. This is the protein in your blood that holds oxygen.
- **Hematocrit (Hct).** This test tells how much of your blood is made up of red blood cells. A low score may be a sign that you don't have enough iron, the mineral that helps your body make red blood cells. A high score could mean you're dehydrated or have another condition.
- **Mean corpuscular volume (MCV).** This is the average size of your red blood cells. If they're bigger than usual, your MCV will be higher. That could happen if you have low vitamin B12 or folate levels. If your red blood cells are smaller, you could have a type of anemia.
- **Platelets.** These help your blood clot.

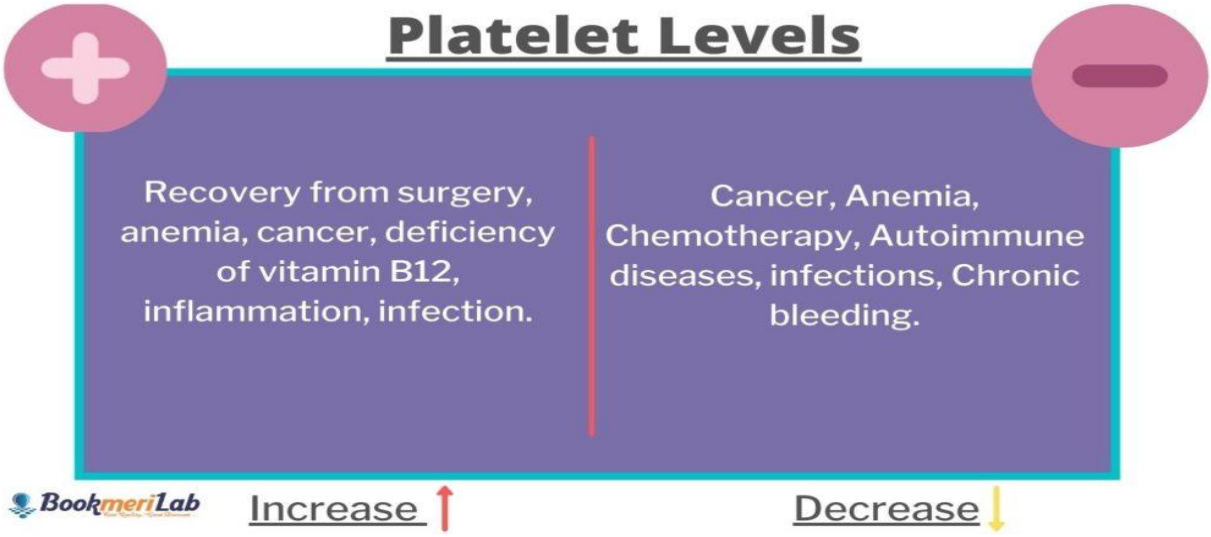
- **Mean corpuscular hemoglobin (MCH).** This test tells how much hemoglobin is in your typical red blood cell.
- **Mean corpuscular hemoglobin concentration (MCHC).** This measures the concentration of hemoglobin in a certain amount of blood.
- **Red cell distribution width (RDW).** This shows how your much your red blood cells vary in size.
- **Reticulocyte count.** This test measures the number of new red blood cells in your body.
- **Mean platelet volume (MPV).** This result gives the average size of the platelets in your blood.

- **Platelet distribution width (PDW).** This shows how much your platelets vary in size.
- **White blood cell differential.** There are five types of white blood cells: basophils, eosinophils, lymphocytes, monocytes, and neutrophils. This test shows how many of each kind you have.






RBC Levels
Chronic lung disease, Liver disease, kidney disease, exposed to carbon monoxide, smoking, excess alcohol consumption etc.
Anemia, Certain medications, bleeding, deficiency of certain vitamins, etc.
BookmeriLab
Increase
Decrease


Platelet Levels
Recovery from surgery, anemia, cancer, deficiency of vitamin B12, inflammation, infection.
Cancer, Anemia, Chemotherapy, Autoimmune diseases, infections, Chronic bleeding.
BookmeriLab
Increase
Decrease

Abbreviation	Test Name	Definition	Associated Disorders
WBC WBC Diff	White blood cells WBC differential Neutrophils Lymphocytes Monocytes Eosinophils Basophils	WBCs fight infection. The 5 different types of WBCs are listed to the left.	Infection, leukemia
RBC	Red blood cells	RBCs (with the help of hemoglobin) carry oxygen throughout the body	↓ Anemia, bleeding, malnutrition, kidney disease ↑ Polycythemia, heart and lung disease, dehydration
Hb or Hgb	Hemoglobin	Protein that carries oxygen	↓ Anemia, bleeding, malnutrition, cirrhosis, cancer ↑ Dehydration, polycythemia
Hct	Hematocrit	Amount of space in the blood that is occupied by RBCs	↓ Anemia, bleeding, malnutrition, cirrhosis, cancer
			↑ Dehydration, polycythemia, hemochromatosis
MCV	Mean corpuscle volume	Average size of the RBCs	Anemia, thalassemia, malnutrition
MCH	Mean corpuscle hemoglobin	Average amount of Hb in each RBC	Anemia, thalassemia, malnutrition
MCHC	Mean corpuscle hemoglobin concentration	Average amount of Hb in the RBCs compared to the average size of the RBCs	Anemia, thalassemia, malnutrition
RDW	Red cell distribution width	Amount of variation in size of the RBCs	Anemia, thalassemia, malnutrition
Plt	Platelet count	Platelets are sticky cells that help to form blood clots	Bleeding and clotting disorders
MPV	Mean platelet volume	Average size of the platelets	Bleeding and clotting disorders