Complete blood picture

1- Hemoglobin

2- Red blood cell count

3- White blood cell count

4- Platelet count

5- Hematocrit

Hemoglobin

Hemoglobin refers to a protein, found in red blood cells, that is responsible for carrying oxygen from the lungs to all other tissues of the body. The pigment in hemoglobin is responsible for the red color of blood. It is composed of 4 polypeptide chains. Each chain contains one heme group, each of which contains one iron ion. The iron is the site of oxygen binding; each iron can bind one O2 molecule thus each hemoglobin molecule is capable of binding a total to four (4) O2 molecules.

Hemoglobin



Hemoglobin carries oxygen throughout the body

Oxygen molecule

Red blood cell

Normal hemoglobin types include:

* Hb A - makes up about 95%-98% of Hb found in adults; contains two alpha (α) protein chains and two beta (β) protein chains
* Hb A2 - makes up about 2%-3% of Hb; has two alpha (α) and two delta (δ) protein chains
* Hb F - makes up to 2% of Hb found in adults; has two alpha (α) and two gamma (γ) protein chains; the primary hemoglobin produced by the fetus during pregnancy; its production usually falls to a low level shortly after birth

Normal hemoglobin levels differ between males and females, ranging from:

•    Newborns: 17-22 gm/dl   
•    One (1) week of age: 15-20 gm/dl   
•    One (1) month of age: 11-15gm/dl   
•    Children: 11-13 gm/dl   
•    Adult males: 12-18 gm/dl   
•    Adult women: 11-16 gm/dl   
•    Men after middle age: 12.4-14.9 gm/dl   
•    Women after middle age: 11.7-13.8 gm/dl

Anemia: Mean decreased in Hb concentration

Hemoglobin is decreased in:

* Digestive inflammation (parasites, colitis, hemorrhoids)
* Adrenal cortical hypofunction
* Hereditary anemia
* Hemodilution (pregnancy, edema)
* Blood loss (lung, gastrointestinal/hemorrhoids, hemorrhage)
* Deficiency (protein malnutrition, iron, copper, folic acid, B12)
* Chronic disease (liver, kidney, rheumatoid arthritis, etc.)
* Bone marrow insufficiency (infiltration with tumor or tuberculosis)

Polycythemia: is a condition that results in an increased level of [hemoglobin](http://www.medicinenet.com/script/main/art.asp?articlekey=8059), circulating [red blood cells](http://www.medicinenet.com/script/main/art.asp?articlekey=5260) in the bloodstream, and [hematocrit](http://www.medicinenet.com/script/main/art.asp?articlekey=8060) above the normal limits.

Hemoglobin is increased in:

* Dehydration (prolonged or severe diarrhea)
* severe asthma
* Macrocytosis (deficiency of B6, B12, folic acid, or hypothyroid)
* Adrenal cortex overactivity.
* Polycythemia Vera.
* High altitude adaptation
* Splenic hypofunction
* Testosterone supplementation

Red blood cell counts

A red blood cell (RBC) count is a useful blood test that can provide information about how many red blood cells are in a person's blood. And used to evaluate any type of decrease in red blood cells (anemia) or increase in red blood cells [(polycythemia)](http://www.labtestsonline.org.au/glossary/polycythemia) as measured per liter of blood. These changes must be interpreted in conjunction with other parameters, such as [hemoglobin](http://www.labtestsonline.org.au/understanding/analytes/hemoglobin), [hematocrit](http://www.labtestsonline.org.au/understanding/analytes/hematocrit) and/or [RBC indices](http://www.labtestsonline.org.au/understanding/analytes/rbc-indices).

Decreased RBC

* Iron deficiency
* Vitamin B6, B12, and/or Folic Acid deficiency
* Chronic Disease (Liver dysfunction, kidney dysfunction)
* Hereditary anemia(s).
* Free radical pathology.
* Toxic metals.
* Catabolic Metabolism

Increased RBC

* Emphysema
* Respiratory distress
* Living at a high altitude
* Cystic fibrosis
* Adrenal cortical hyperfunction
* Polycythemia Vera
* Anabolic Metabolism (testosterone use)

The normal RBC count:

* Women: 4.2 to 5.4 million/µL
* Men: 4.7 to 6.1 million/µL
* Children: 4.6 to 4.8 million/µL

White blood cell count

The white blood cell count (WBC) is used as part of a full [complete blood count (CBC)](http://labtestsonline.org/understanding/analytes/cbc/) to diagnose an [infection](http://labtestsonline.org/glossary/infection/) or [inflammatory process](http://labtestsonline.org/glossary/inflammation/); it also may be used to determine the presence of other diseases that affect WBCs such as [allergies](http://labtestsonline.org/understanding/conditions/allergies/), [leukemia](http://labtestsonline.org/understanding/conditions/leukemia/) or immune disorders.

Leukocytosis is a high white blood cell count may result from a number of conditions and diseases include:

* [Infections](http://labtestsonline.org/glossary/infection/), most commonly caused by [bacteria](http://labtestsonline.org/glossary/bacterium/) and [viruses](http://labtestsonline.org/glossary/virus/), less commonly by [fungi](http://labtestsonline.org/glossary/fungus/) or [parasites](http://labtestsonline.org/glossary/parasite/).
* [Inflammation](http://labtestsonline.org/glossary/inflammation/) or inflammatory conditions such as [rheumatoid arthritis](http://labtestsonline.org/understanding/conditions/rheumatoid/), [vasculitis](http://labtestsonline.org/understanding/conditions/vasculitis/) or [inflammatory bowel disease](http://labtestsonline.org/understanding/conditions/inflammatory-bowel/)
* [Leukemia](http://labtestsonline.org/understanding/conditions/leukemia/), [myeloproliferative disorders](http://labtestsonline.org/understanding/conditions/myelopro-disorders/)
* Conditions that result in tissue death (necrosis) such as trauma, burns, or surgery
* Allergic responses (e.g., [allergies](http://labtestsonline.org/understanding/conditions/allergies/), [asthma](http://labtestsonline.org/understanding/conditions/asthma/))
* Intense exercise
* Severe emotional or physical stress
* Pregnancy in the final month and labor may be associated with increased WBC levels.

Leukopenia: a low white blood cell count may result from conditions such as:

* Bone marrow damage (toxin, chemotherapy, drugs)
* [Bone marrow disorders](http://labtestsonline.org/understanding/conditions/bone-marrow-disorders/)" the bone marrow does not produce sufficient WBCs" (myelodysplastic syndrome [or folate deficiency](http://labtestsonline.org/understanding/conditions/vitaminb12/))
* [Lymphoma](http://labtestsonline.org/understanding/conditions/lymphoma/) or other cancer that has spread (metastasized) to the bone marrow
* [Autoimmune disorders](http://labtestsonline.org/understanding/conditions/autoimmune/)
* Overwhelming infections ([sepsis](http://labtestsonline.org/understanding/conditions/sepsis/))
* Diseases of the immune system, such as [HIV](http://labtestsonline.org/understanding/conditions/hiv/), which destroy T lymphocytes

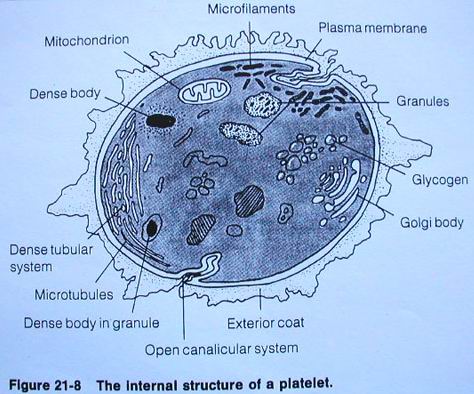
Normal value

4000 – 11000 cell/cmm  **or**

4 × 109 – 11 × 109 cells/L

Platelet Count

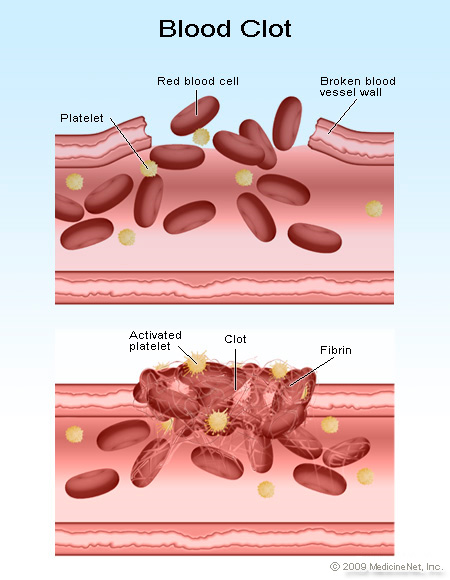
A platelet count is used to detect a low or high number of platelets in the blood. The test is included in a [complete blood picture (CBP)](http://labtestsonline.org/understanding/analytes/cbc/), used to screen for or diagnose various diseases and conditions that affect the number of platelets in the blood ([bleeding disorder](http://labtestsonline.org/understanding/conditions/bleeding-disorders/), [bone marrow disease](http://labtestsonline.org/understanding/conditions/bone-marrow-disorders/), or [excessive clotting disorder](http://labtestsonline.org/understanding/conditions/hypercoagulable-disorders/)).



Structure of platelet

Function of Platelets

Platelets are colorless, irregularly shaped bodies that are present in the blood. They are produced in the bone marrow and removed by the spleen when they are damaged or old. The main function of the platelets is prevent excessive bleeding by combination with calcium, vitamin K and a protein known as fibrinogen form clots to stop bleeding.



Thrombocytopenia

Is a blood disorder characterized by an abnormally low number of circulating [platelets](http://www.answers.com/topic/platelet) (thrombocytes) in the [bloodstream](http://www.answers.com/topic/bloodstream).

Thrombocytopenia occurs when any of the following abnormal conditions exist:

* Decreased production of platelets by the bone marrow (Megaloblastic anemia, acute leukemia, aplastic anemia)
* Increased destruction of circulating platelets (Platelet aggregation or large platelets, Autoimmune diseases, Rubella, Coagulation disorders).
* Increased trapping of platelets by the spleen
* Platelet loss from hemorrhage

Thrombocytosis

Thrombocytosis or thrombocythemia is the presence of high [platelet](http://en.wikipedia.org/wiki/Platelet) counts in the [blood](http://en.wikipedia.org/wiki/Blood), and can be either primary or reactive.

Increase platelet counts can be due to

* Essential "primary" Thrombocytosis ([myeloproliferative disease](http://en.wikipedia.org/wiki/Myeloproliferative_disease" \o "Myeloproliferative disease), [chronic myelogenous leukemia](http://en.wikipedia.org/wiki/Chronic_myelogenous_leukemia), [polycythemia vera](http://en.wikipedia.org/wiki/Polycythemia_vera), [myelofibrosis](http://en.wikipedia.org/wiki/Idiopathic_myelofibrosis)).
* Reactive "secondary" Thrombocytosis (Inflammation, Surgery1 , [Hyposplenism](http://en.wikipedia.org/wiki/Hyposplenism)2, [Splenectomy](http://en.wikipedia.org/wiki/Splenectomy), [Asplenia](http://en.wikipedia.org/wiki/Asplenia)3, [Iron deficiency anemia](http://en.wikipedia.org/wiki/Iron_deficiency_anemia) or [hemorrhage](http://en.wikipedia.org/wiki/Hemorrhage)).

Normal values

150,000 - 400,000 platelets /µl

1- Surgerywhich leads to an inflammatory state

2- In [Hyposplenism](http://en.wikipedia.org/wiki/Hyposplenism)decreased breakdown of Platelet due to decreased function of the [spleen](http://en.wikipedia.org/wiki/Spleen)

3- [Asplenia](http://en.wikipedia.org/wiki/Asplenia)is absence of normal spleen function