**Complete Blood Count**

The CBC is used as a broad screening test to check for such disorders as anemia, infection, and many other diseases. It is actually a panel of tests that examines different parts of the blood and includes the following:

- **White blood cell (WBC) count** is a count of the actual number of white blood cells per volume of blood. Both increases and decreases can be significant.
- **White blood cell differential** looks at the types of white blood cells present. There are five different types of white blood cells, each with its own function in protecting us from infection. The differential classifies a person’s white blood cells into each type:
  - Neutrophils (also known as segs, PMNs, granulocytes, grans),
  - Lymphocytes,
  - Monocytes,
  - Eosinophils,
  - Basophiles.
- **Red blood cell (RBC) count** is a count of the actual number of red blood cells per volume of blood. Both increases and decreases can point to abnormal conditions.
- **Hemoglobin** measures the amount of oxygen-carrying protein in the blood.
- **Hematocrit** measures the percentage of red blood cells in a given volume of whole blood.
- **The platelet count** is the number of platelets in a given volume of blood. Both increases and decreases can point to abnormal conditions of excess bleeding or clotting.
- **Mean platelet volume (MPV)** is a machine-calculated measurement of the average size of your platelets. New platelets are larger, and an increased MPV occurs when increased numbers of platelets are being produced. MPV gives information about platelet production in your bone marrow.
• Mean corpuscular volume (MCV) is a measurement of the average size of your RBCs. The MCV is elevated when your RBCs are larger than normal (macrocytic), for example in anemia caused by vitamin B12 deficiency. When the MCV is decreased, your RBCs are smaller than normal (microcytic) as is seen in iron deficiency anemia or thalassemias.

• Mean corpuscular hemoglobin (MCH) is a calculation of the average amount of oxygen-carrying hemoglobin inside a red blood cell. Macrocytic RBCs are large so tend to have a higher MCH, while microcytic red cells would have a lower value.

• Mean corpuscular hemoglobin concentration (MCHC) is a calculation of the average concentration of hemoglobin inside a red cell. Decreased MCHC values (hypochromia) are seen in conditions where the hemoglobin is abnormally diluted inside the red cells, such as in iron deficiency anemia and in thalassemia. Increased MCHC values (hyperchromia) are seen in conditions where the hemoglobin is abnormally concentrated inside the red cells, such as in burn patients and hereditary spherocytosis, a relatively rare congenital disorder.

• Red cell distribution width (RDW) is a calculation of the variation in the size of your RBCs. In some anemias, such as pernicious anemia, the amount of variation (anisocytosis) in RBC size (along with variation in shape – poikilocytosis) causes an increase in the RDW.

The CBC is a very common test. Many patients will have baseline CBC tests to help determine their general health status. If a patient is having symptoms such as fatigue or weakness or has an infection, inflammation, bruising, or bleeding, then a CBC helps diagnose the cause.

Significant increases in WBCs may help confirm that an infection is present and suggest the need for further testing to identify its cause. Decreases in the number of RBCs (anemia) can be further evaluated by changes in size or shape of the RBCs to help determine if the cause might be decreased production, increased loss, or increased
destruction of RBCs. A platelet count that is low or extremely high may confirm the cause of excessive bleeding or clotting and can also be associated with diseases of the bone marrow such as leukemia.

Many conditions will result in increases or decreases in the cell populations. Some of these conditions may require treatment, while others will resolve on their own. Some diseases, such as cancer (and chemotherapy treatment), can affect bone marrow production of cells, increasing the production of one cell at the expense of others or decreasing overall cell production. Some medications can decrease WBC counts while some vitamin and mineral deficiencies can cause anemia. The CBC test may be ordered on a regular basis to monitor these conditions and drug treatments.

The following table explains what increases or decreases in each of the components of the CBC may mean.

**Expand Table Components of the CBC**

<table>
<thead>
<tr>
<th>Test</th>
<th>Name</th>
<th>Increased/decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>White Blood Cell</td>
<td>May be increased with infections, inflammation, cancer, leukemia; decreased with some medications (such as methotrexate), some autoimmune conditions, some severe infections, bone marrow failure, and congenital marrow aplasia (marrow does not develop normally)</td>
</tr>
<tr>
<td>%</td>
<td>Neutrophil/Band/ Seg / Neutrophil Gran</td>
<td></td>
</tr>
<tr>
<td>Lymphs</td>
<td>Lymphocyte</td>
<td>This is a dynamic population that varies somewhat from day to day depending on what is going on in the</td>
</tr>
<tr>
<td>%</td>
<td>Mono</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Name</td>
<td>Increased/decreased</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>% Eos</td>
<td>Eosinophil</td>
<td>body. Significant increases in particular types are associated with different temporary/acute and/or chronic conditions. An example of this is the increased number of lymphocytes seen with lymphocytic leukemia. For more information, see Blood Smear and WBC.</td>
</tr>
<tr>
<td>% Baso</td>
<td>Basophiles</td>
<td>Decreased with anemia; increased when too many made and with fluid loss due to diarrhea, dehydration, burns</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>Neutrophil/Ban/Seg/Gran</td>
<td></td>
</tr>
<tr>
<td>Lymphs</td>
<td>Lymphocyte</td>
<td></td>
</tr>
<tr>
<td>Mono</td>
<td>Monocyte</td>
<td></td>
</tr>
<tr>
<td>Eos</td>
<td>Eosinophil</td>
<td></td>
</tr>
<tr>
<td>Baso</td>
<td>Basophiles</td>
<td></td>
</tr>
<tr>
<td>RBC</td>
<td>Red Blood Cell</td>
<td>Decreased with anemia; increased when too many made and with fluid loss due to diarrhea, dehydration, burns</td>
</tr>
<tr>
<td>Hgb</td>
<td>Hemoglobin</td>
<td>Mirrors RBC results</td>
</tr>
<tr>
<td>Hct</td>
<td>Hematocrit</td>
<td>Mirrors RBC results</td>
</tr>
<tr>
<td>MCV</td>
<td>Mean Corpuscular Volume</td>
<td>Increased with B12 and Folate deficiency; decreased with iron deficiency and thalasemia</td>
</tr>
<tr>
<td>MCH</td>
<td>Mean Corpuscular Hemoglobin</td>
<td>Mirrors MCV results</td>
</tr>
<tr>
<td>MCHC</td>
<td>Mean Corpuscular Hemoglobin Concentration</td>
<td>May be decreased when MCV is decreased; increases limited to amount of Hgb that will fit inside a RBC</td>
</tr>
<tr>
<td>RDW</td>
<td>RBC Distribution Width</td>
<td>Increased RDW indicates mixed population of RBCs; immature RBCs tend to be larger</td>
</tr>
<tr>
<td>Platelet</td>
<td>Platelet</td>
<td>Decreased or increased with</td>
</tr>
<tr>
<td>Test</td>
<td>Name</td>
<td>Increased/decreased</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>conditions that affect platelet production; decreased when greater numbers used, as</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with bleeding; decreased with some inherited disorders (such as Wiskott-Aldrich,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bernard-Soulier), with Systemic lupus erythematosus, pernicious anemia, hypersplenism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(spleen takes too many out of circulation), leukemia, and chemotherapy</td>
</tr>
<tr>
<td>MPV</td>
<td>Mean Platelet Volume</td>
<td>Vary with platelet production; younger platelets are larger than older ones</td>
</tr>
</tbody>
</table>

While no specific pre-testing restrictions are necessary, it is best to avoid a fatty meal prior to having your blood drawn.

Normal CBC values for babies and children may be different from adults and need to be considered when interpreting data.

Patients who have a keen interest in their own health care frequently want to know what they can do to change their WBCs, RBCs, and platelets. Unlike ‘good’ and ‘bad’ cholesterol, cell populations are not generally affected by lifestyle changes unless the patient has an underlying deficiency (such as vitamin B12 or folate deficiency or iron deficiency). There is no way that a patient can directly raise the number of his WBCs or change the size or shape of his RBCs.

Addressing any underlying diseases or conditions and following a healthy lifestyle will help optimize your body’s cell production and your body will take care of the rest.
Interpreting the ‘Full Blood Count’

The most important components of a Full Blood Count report are, of course, the Haemoglobin, the White Cell Count and Differential and the Platelet Count. However, modern haematology machines that produce the FBC results are able to calculate several other derived parameters that provide more information.

These are the red cell and platelet indices - MCV, MCH, MCHC, RDW and the MPV and PDW. They can help a lot in diagnosis, but I suspect they are under utilised because many doctors are less familiar with them. Some have only recently been routinely added to FBC reports and their significance may not be well known. The RDW is one example.

Interpretation of the RDW

Microscopic examination of a blood film gives an impression of the variation of red cell size, which is reported as ‘anisocytosis’. This is, however, quite subjective and can only be quantified very roughly. Modern automated electronic haematology instruments are all able to assess the volume of red cells very easily and accurately, allowing a precise measure of this variability of red cell volume. This measure is called the ‘Red Cell Volume Distribution Width’ or RDW for short. This is expressed as a Coefficient of Variation (CV) and is defined as follows:

\[
CV = \frac{\text{Standard Deviation of red cell size}}{\text{MCV}}
\]

<table>
<thead>
<tr>
<th>RDW HIGH</th>
<th>MCV LOW</th>
<th>MCV NORMAL</th>
<th>MCV HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Deficiency Hb Disease S/Beta Thalassaemia</td>
<td>Early Iron Deficiency Early</td>
<td>B12/Folate deficiency Immune</td>
<td></td>
</tr>
<tr>
<td><strong>RDW NORMAL</strong></td>
<td>Hb1AC</td>
<td>B12/Folate def</td>
<td>Haemolytic anaemia</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>MAHA</strong></td>
<td>MAHA</td>
<td>MAHA</td>
<td>MAHA</td>
</tr>
<tr>
<td><strong>Severe anaemia of chronic disorders</strong></td>
<td>Severe anaemia of chronic disorders</td>
<td>Severe anaemia of chronic disorders</td>
<td>Severe anaemia of chronic disorders</td>
</tr>
<tr>
<td><strong>B12/Folate def</strong></td>
<td>B12/Folate def</td>
<td>B12/Folate def</td>
<td>B12/Folate def</td>
</tr>
<tr>
<td><strong>Sickle Cell Anaemia</strong></td>
<td>Sickle Cell Anaemia</td>
<td>Sickle Cell Anaemia</td>
<td>Sickle Cell Anaemia</td>
</tr>
<tr>
<td><strong>Sickle/C Disease</strong></td>
<td>Sickle/C Disease</td>
<td>Sickle/C Disease</td>
<td>Sickle/C Disease</td>
</tr>
<tr>
<td><strong>Haemolytic anaemia</strong></td>
<td>Haemolytic anaemia</td>
<td>Haemolytic anaemia</td>
<td>Haemolytic anaemia</td>
</tr>
<tr>
<td><strong>Cold Agglutinins</strong></td>
<td>Cold Agglutinins</td>
<td>Cold Agglutinins</td>
<td>Cold Agglutinins</td>
</tr>
<tr>
<td><strong>Alcoholism</strong></td>
<td>Alcoholism</td>
<td>Alcoholism</td>
<td>Alcoholism</td>
</tr>
</tbody>
</table>

RDW is a numerical measure of anisocytosis. It may be useful in distinguishing certain causes of anaemia, in particular, in distinguishing Iron Deficiency (RDW raised) from Thalassaemia (RDW usually normal) and in distinguishing Megaloblastic Anaemia (RDW usually raised) and other causes of macrocytosis (RDW more likely to be normal).

Note that only raised RDW are of significance and subnormal values do not occur. The RDW is a more sensitive measure of abnormality in microcytic, rather than macrocytic disorders, and is only of help if the haemoglobin is low.
These blood films illustrate the variation in red cell size in normal blood (left picture) and moderate iron deficiency (right picture). While the normal film shows little variation in red cell size, the iron deficient cells shows variations in size (anisocytosis) and shape (poikilocytosis), as well as microcytosis (low average cell size) and hypochromasia (increased central pallor). The anisocytosis in this film is increased as it is post-transfusion and shows some dimorphism.

Platelets are the smallest cell-like structures in the blood and are important for blood clotting and plugging damaged blood vessels. Platelet counts are usually done by laboratory machines that also count other blood elements such as the white and red cells. Normal platelet counts are in the range of 150,000 to 400,000 per microliter, but the normal range for the platelet count varies slightly among different laboratories.

Red blood cells are the most common cell type in blood and people have millions of them in their blood circulation. They are smaller than white blood cells, but larger than platelets.
• **Hemoglobin (Hb).** This is the amount of hemoglobin in a volume of blood. Hemoglobin is the protein molecule within red blood cells that carries oxygen and gives blood its red color. Normal range for hemoglobin is different between the sexes and is approximately 13 to 18 grams per deciliter for men and 12 to 16 for women (international units 8.1 to 11.2 millimoles/liter for men, 7.4 to 9.9 for women).

• **Hematocrit (Hct).** This is the ratio of the volume of red cells to the volume of whole blood. Normal range for hematocrit is different between the sexes and is approximately 45% to 52% for men and 37% to 48% for women. This is usually measured by spinning down a sample of blood in a test tube, which causes the red blood cells to pack at the bottom of the tube.

• **Mean corpuscular volume (MCV)** is the average volume of a red blood cell. This is a calculated value derived from the
hematocrit and red cell count. Normal range may fall between 80 to 100 femtoliters (a fraction of one millionth of a liter).

- **Mean Corpuscular Hemoglobin (MCH)** is the average amount of hemoglobin in the average red cell. This is a calculated value derived from the measurement of hemoglobin and the red cell count. Normal range is 27 to 32 picograms.

- **Mean Corpuscular Hemoglobin Concentration (MCHC)** is the average concentration of hemoglobin in a given volume of red cells. This is a calculated volume derived from the hemoglobin measurement and the hematocrit. Normal range is 32% to 36%.

- **Red Cell Distribution Width (RDW)** is a measurement of the variability of red cell size and shape. Higher numbers indicate greater variation in size. Normal range is 11 to 15.

- **Platelet count.** The number of platelets in a specified volume of blood. Platelets are not complete cells, but actually fragments of cytoplasm (part of a cell without its nucleus or the body of a cell) from a cell found in the bone marrow called a megakaryocyte. Platelets play a vital role in blood clotting. Normal range varies slightly between laboratories but is in the range of 150,000 to 400,000/ cmm (150 to 400 x 10⁹/liter).

- **Mean Platelet Volume (MPV).** The average size of platelets in a volume of blood.

The cells in the CBC (white blood cells, red blood cells, and platelets) have unique functions. Generally speaking, white blood cells are an essential part of the immune system and help the body fight infections. Each different component of the white blood cell (the WBC differential) plays a specific role in the immune system.

Red blood cells are essential in transporting oxygen to all the cells in the body to serve their functions. The hemoglobin molecule in the red blood cell is the vehicle for the transportation of oxygen. Platelets
are a part of the blood clotting system in the body and help in preventing bleeding.

A **high WBC count** (leukocytosis) may signify an infection somewhere in the body or, less commonly, it may signify an underlying malignancy. A low WBC count (leukopenia) may point toward a bone marrow problem or related to some medications, such as chemotherapy. A doctor may order the test to follow the WBC count in order to monitor the response to a treatment for an infection. The components in the differential of the WBC count also have specific functions and if altered, they may provide clues for particular conditions.

A **low red blood cell count** or low hemoglobin may suggest anemia, which can have many causes. Possible causes of high red blood cell count or hemoglobin (erythrocytosis) may include bone marrow disease or low blood oxygen levels (hypoxia).

A **low platelet count** (thrombocytopenia) may be the cause of prolonged bleeding or other medical conditions. Conversely, a high platelet count (thrombocytosis) may point toward a bone marrow problem or severe inflammation.

*Complete Blood Count (CBC) Glossary of Terms*

**Analysis:** A psychology term for processes used to gain understanding of complex emotional or behavioral issues.

**Anemia:** The condition of having less than the normal number of red blood cells or less than the normal quantity of hemoglobin in the blood. The oxygen-carrying capacity of the blood is, therefore, decreased.

**Blood count:** The calculated number of white or red blood cells (WBCs or RBCs) in a cubic millimeter of blood.

**Bone marrow:** The soft blood-forming tissue that fills the cavities of bones and contains fat and immature and mature blood cells, including white blood cells, red blood cells, and platelets. Diseases or drugs that affect the bone marrow can affect the total counts of these cells.
**CBC:** A commonly used abbreviation in medicine that stands for complete blood count, a set values of the cellular (formed elements) of blood. These measurements are generally determined by specially designed machines that analyze the different components of blood in less than a minute.

**Cell:** The basic structural and functional unit in people and all living things. Each cell is a small container of chemicals and water wrapped in a membrane.

**Chemotherapy:**

1. In the original sense, a chemical that binds to and specifically kills microbes or tumor cells. The term chemotherapy was coined in this regard by Paul Ehrlich (1854-1915).
2. In oncology, drug therapy for cancer. Also called ‘chemo’ for short.

**Circulation:** The movement of fluid in a regular or circuitous course. Although the noun ‘circulation’ does not necessarily refer to the circulation of the blood, for all practical purposes today it does. Heart failure is an example of a problem with the circulation.

**Complete blood count:** A set values of the cellular (formed elements) of blood. These measurements are generally determined by specially designed machines that analyze the different components of blood in less than a minute.

**Cytoplasm:** All of the substance of a cell outside of the nucleus. The cytoplasm contains a number of different types of organelles such as the mitochondria.

**Erythrocyte:** A cell that contains hemoglobin and can carry oxygen to the body. Also called a red blood cell (RBC). The reddish color is due to the hemoglobin. Erythrocytes are biconcave in shape, which increases the cell’s surface area and facilitates the diffusion of oxygen and carbon dioxide. This shape is maintained by a cytoskeleton composed of several proteins. Erythrocytes are very flexible and change shape when flowing through capillaries. Immature erythrocytes, called reticulocytes, normally account for 1-2 percent of red cells in the blood.

**Essential:**

1. Something that cannot be done without.
2. Required in the diet, because the body cannot make it. As in an essential amino acid or an essential fatty acid.
3. Idiopathic. As in essential hypertension. ‘Essential’ is a hallowed term meaning "We don't know the cause."

**Hematocrit:** The proportion of the blood that consists of packed red blood cells. The hematocrit is expressed as a percentage by volume. The red cells are packed by centrifugation.

**Hemoglobin:** The oxygen-carrying pigment and predominant protein in the red blood cells. Hemoglobin forms an unstable, reversible bond with oxygen. In its oxygenated state it is called oxyhemoglobin and is bright red. In the reduced state it is called deoxyhemoglobin and is purple-blue.

**Hypoxia:** A subnormal concentration of oxygen. From hyp– (below) + -ox- (oxygen) + –ia. By contrast with normoxia (normal oxygen) and anoxia (the absence or near absence of oxygen).

**Immune:** Protected against infection. The Latin immunis means free, exempt.

**Immune system:** A complex system that is responsible for distinguishing us from everything foreign to us, and for protecting us against infections and foreign substances. The immune system works to seek and kill invaders.

**Indicate:** In medicine, to make a treatment or procedure advisable because of a particular condition or circumstance. For example, certain medications are indicated for the treatment of hypertension during pregnancy while others are contraindicated.

**Infection:** The growth of a parasitic organism within the body. (A parasitic organism is one that lives on or in another organism and draws its nourishment therefrom.) A person with an infection has another organism (a "germ") growing within him, drawing its nourishment from the person.

**Inflammation:** A basic way in which the body reacts to infection, irritation or other injury, the key feature being redness, warmth, swelling and pain. Inflammation is now recognized as a type of nonspecific immune response.

**Laboratory:** A place for doing tests and research procedures and preparing chemicals, etc. Although ‘laboratory’ looks very like the Latin ‘laboratorium’ (a place to labor, a work place), the word ‘laboratory’ came from the Latin ‘elaborare’ (to work out, as a problem, and with great pains), as evidenced by the Old English spelling ‘elaboratory’ designating ‘a place where learned effort was applied to the solution of scientific problems.’
Leukocyte count: A white blood cell (WBC) count.

Leukocytosis: Increase in the number of white blood cells.

Leukopenia: Lower than the normal amount of white blood cells.

Liter: A metric measure of capacity that, by definition, is equal to the volume of a kilogram of water at 4 degrees centigrade and at standard atmospheric pressure of 760 millimeters of mercury.

- Metric equivalents -- There are 1000 cubic centimeters or ten cubic decimeter in 1 liter.
- U.S. equivalent -- A liter is a little more than a quart (1.057 U.S. liquid quarts).

Malignancy: A tumor that is malignant, that is cancerous, that can invade and destroy nearby tissue, and that may spread (metastasize) to other parts of the body.

Marrow: The bone marrow.

MCH: Abbreviation for mean cell hemoglobin, which is the average amount of hemoglobin in the average red cell. The MCH is a calculated value derived from the measurement of hemoglobin and the red cell count. (The hemoglobin value is the amount of hemoglobin in a volume of blood while the red cell count is the number of red blood cells in a volume of blood.) The normal range for the MCH is 27 - 32 picograms. It is a standard part of the complete blood count.

MCHC: Abbreviation for mean cell hemoglobin concentration, which is the average concentration of hemoglobin in a given volume of blood. The MCHC is a calculated value derived from the measurement of hemoglobin and the hematocrit. (The hemoglobin value is the amount of hemoglobin in a volume of blood while the hematocrit is the ratio of the volume of red cells to the volume of whole blood.) The normal range for the MCHC is 32 - 36%. The MCHC is a standard part of the complete blood count.

MCV: Abbreviation for mean cell volume, the average volume of a red blood cell. This is a calculated value derived from the hematocrit and the red cell count (The hematocrit is the ratio of the volume of red cells to the volume of whole blood while the red cell count is the number of red blood cells in a
volume of blood). The normal range for the MVC is 86 - 98 femtoliters. The MCV is a standard part of the complete blood count (CBC).

**Megakaryocyte:** A giant cell in the bone marrow that is the ancestor of blood platelets.

**Microscope:** An optical instrument that augments the power of the eye to see small objects. The name microscope was coined by Johannes Faber (1574-1629) who in 1628 borrowed from the Greek to combined micro-, small with skopein, to view. Although the first microscopes were simple microscopes, most (if not all) optical microscopes today are compound microscopes.

**Molecule:** The smallest unit of a substance that can exist alone and retain the character of that substance.

**Normal range:** By convention, the normal range for whatever (a particular test, condition, symptom, behavior, etc.) is set to cover ninety-five percent (95%) of all values from the general population. Five percent (5%) of results consequently fall outside the normal range. Values that prove normal can therefore sometimes be outside the normal range.

**Nucleus:**

1) In cell biology, the structure that houses the chromosomes.

2) In neuroanatomy, a group of nerve cells.

**Oxygen:** A colorless, odorless and tasteless gas that makes up about 23% of the air we breathe (and at least half the weight of the entire solid crust of the earth) and which combines with most of the other elements to form oxides. Oxygen is essential to human, animal and plant life.

**Platelet:** An irregular, disc-shaped element in the blood that assists in blood clotting. During normal blood clotting, the platelets clump together (aggregate). Although platelets are often classed as blood cells, they are actually fragments of large bone marrow cells called megakaryocytes.

**Platelet count:** The calculated number of platelets in a volume of blood usually expressed as platelets per cubic millimeter (cmm) of whole blood. Platelets are the smallest cell-like structures in the blood and are important for blood clotting and plugging damaged blood vessels. Platelet counts are usually done by laboratory machines that also count other blood elements such as the
white and red cells. They can also be counted by use of a microscope. Normal platelet counts are in the range of 150,000 to 400,000 per microliter (or 150 - 400 x 10^9 per liter). These values many vary slightly between different laboratories.

**Protein:** A large molecule composed of one or more chains of amino acids in a specific order determined by the base sequence of nucleotides in the DNA coding for the protein.

**RBC:** Short for red blood cells, the cells that carry oxygen and carbon dioxide through the blood. This rather remarkable feat is thanks to hemoglobin, the pigment that makes red cells (and blood) look red. The red blood cells are also known as red corpuscles or erythrocytes (literally, red hollow vessels).

**Red blood cell:** The blood cell that carries oxygen. Red cells contain hemoglobin and it is the hemoglobin which permits them to transport oxygen (and carbon dioxide). Hemoglobin, aside from being a transport molecule, is a pigment. It gives the cell its red color (and name).

**Red cell count:** The number of red blood cells (RBCs) in a volume of blood. The normal range varies slightly between laboratories but is generally between 4.2 - 5.9 million cells/cmm. This can also be referred to as the erythrocyte count and can be expressed in international units as 4.2 - 5.9 x 10^{12} cells per liter.

**Red cell distribution width:** A measurement of the variability of red blood cell size. Higher numbers indicate greater variation in size. The normal range for the red cell distribution width (RDW) is 11 - 15. The RDW is a standard part of the complete blood count.

**Red cells:** Short for red blood cells, the oxygen/carbon dioxide carrying cells in blood. Also known acronymically as RBC’s, red corpuscles or erythrocytes (literally, red hollow vessels).

**Syringe:** A device used in medicine to inject fluid into or withdraw fluid from the body. Medical syringes consist of a needle attached to a hollow cylinder that is fitted with a sliding plunger. The downward movement of the plunger injects fluid; upward movement withdraws fluid.

**Vein:** A blood vessel that carries blood low in oxygen content from the body back to the heart. The deoxygenated form of hemoglobin (deoxyhemoglobin)
in venous blood makes it appear dark. Veins are part of the afferent wing of the circulatory system which returns blood to the heart.

**Vital:** Necessary to maintain life.

**WBC:** Commonly used abbreviation for a white blood cell.

**White blood cell:** One of the cells the body makes to help fight infections. There are several types of white blood cells (leukocytes). The two most common types are the lymphocytes and neutrophils (also called polymorphonuclear leukocytes, PMNs, or ‘polys’).

**White blood cell count (leukocyte count):** The number of white blood cells (WBCs) in the blood. The WBC is usually measured as part of the CBC (complete blood count). White blood cells are the infection-fighting cells in the blood and are distinct from the red (oxygen-carrying) blood cells known as erythrocytes. There are different types of white blood cells, including neutrophils (polymorphonuclear leukocytes; PMNs), band cells (slightly immature neutrophils), T-type lymphocytes (T cells), B-type lymphocytes (B cells), monocytes, eosinophils, and basophiles. All the types of white blood cells are reflected in the white blood cell count. The normal range for the white blood cell count varies between laboratories but is usually between 4,300 and 10,800 cells per cubic millimeter of blood. This can also be referred to as the leukocyte count and can be expressed in international units as 4.3 - 10.8 x 10⁹ cells per liter.