My Drift

Title: Blood Disorders
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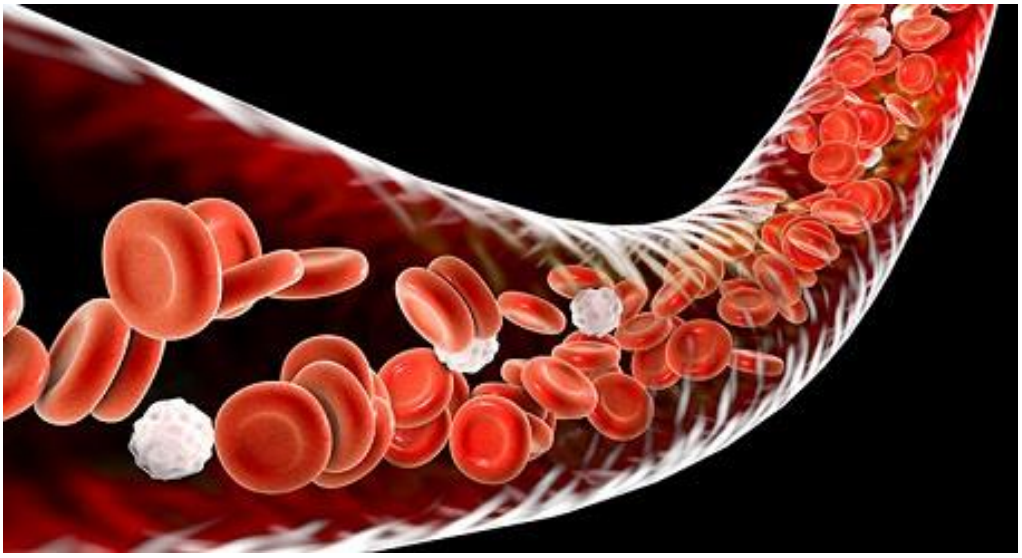
Date: 23 Jul 2022
Article Number: (395-2022-16)



In this article, we are going to learn about the primary components of blood, the organs that produce them, and the disorders/diseases associated with each:

Components

- **White blood cells**
- **Red blood cells**
- **Platelets**

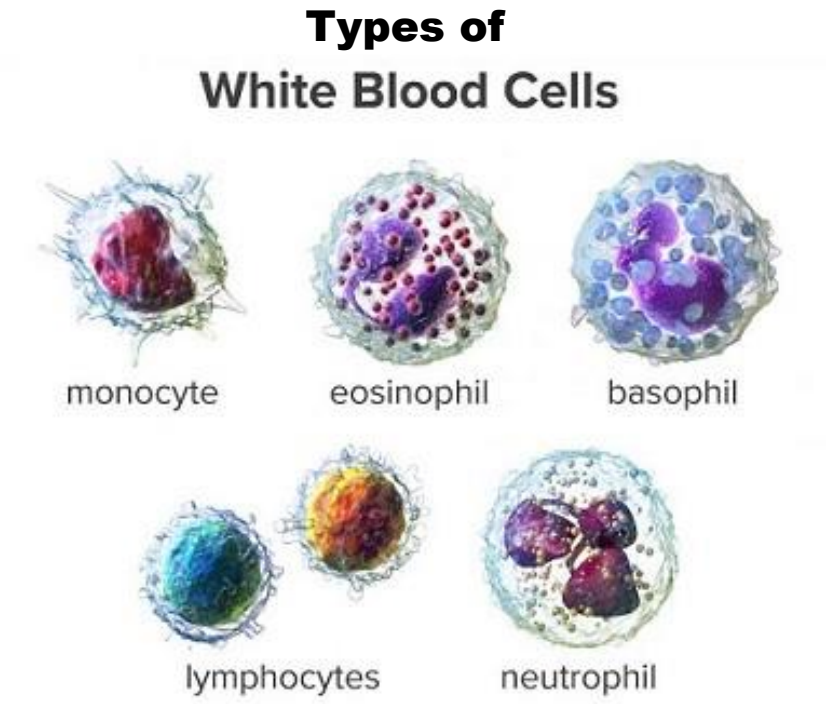
Organs

- **Bone marrow**
- **Spleen**

Types and Function of White Blood Cells (WBCs)

White blood cells are a part of the immune system. They help fight infection and defend the body against other foreign materials.

Different types of white blood cells have different jobs. Some are involved in recognizing intruders. Some kill harmful bacteria. Others make antibodies to protect your body against exposure to bacteria and viruses.



The different types of white blood cells and their various functions

White blood cells are also known as leukocytes. They are the body's defense against infections. There are several different types with different purposes.

Some of the cells are part of our innate immune system, meaning they know from birth to attack foreigners. Others are part of our humoral or learned immune system. Humoral immune cells manufacture antibodies after exposure to a germ. This way, the body can be prepared for another attack by that germ.

Neutrophils

Neutrophils make up roughly half of the white blood cell population. They are usually the first cells of the immune system to respond to invaders such as bacteria or viruses.

As first responders, they also send out signals alerting other cells in the immune system to come to the scene.

Neutrophils are the main cells found in pus. Once released from the bone marrow, these cells live for only around eight hours. Your body produces roughly 100 billion of these cells every day.

Eosinophils

Eosinophils also play a role in fighting off bacteria. They are very important in responding to parasitic infections (such as worms) as well.

They are perhaps best known for their role in triggering allergy symptoms. Eosinophils can go overboard in mounting an immune response against something harmless. For example, eosinophils can mistake pollen for a foreign invader.

Eosinophils account for no more than 5% of the white blood cells in your bloodstream. However, there are high concentrations of eosinophils in the digestive tract.

Basophils

Basophils account for only around 1% of white blood cells. These cells are perhaps best known for their role in asthma. However, they are important in mounting a non-specific immune response to pathogens, organisms that can cause disease.

When stimulated, these cells release histamine, among other chemicals. This can result in inflammation and narrowing of the airways.

Lymphocytes (B and T)

Lymphocytes are also essential in the immune system. They come in two forms: B cells and T cells. Unlike other white blood cells that provide non-specific immunity, B and T cells have specific purposes.

B lymphocytes (B cells) are responsible for humoral immunity, which is the immune response that involves antibodies. B cells produce the antibodies that "remember" an infection. They stand ready in case your body is exposed to that pathogen again.

T lymphocytes (T cells) recognize specific foreign invaders and are responsible for directly killing them. "Memory" T cells also remember an invader after an infection and respond quickly if it is seen again.

B lymphocytes play a key role in the effectiveness of many current vaccines. In some cases, such as tuberculosis and pertussis vaccines, T lymphocytes are the main players.

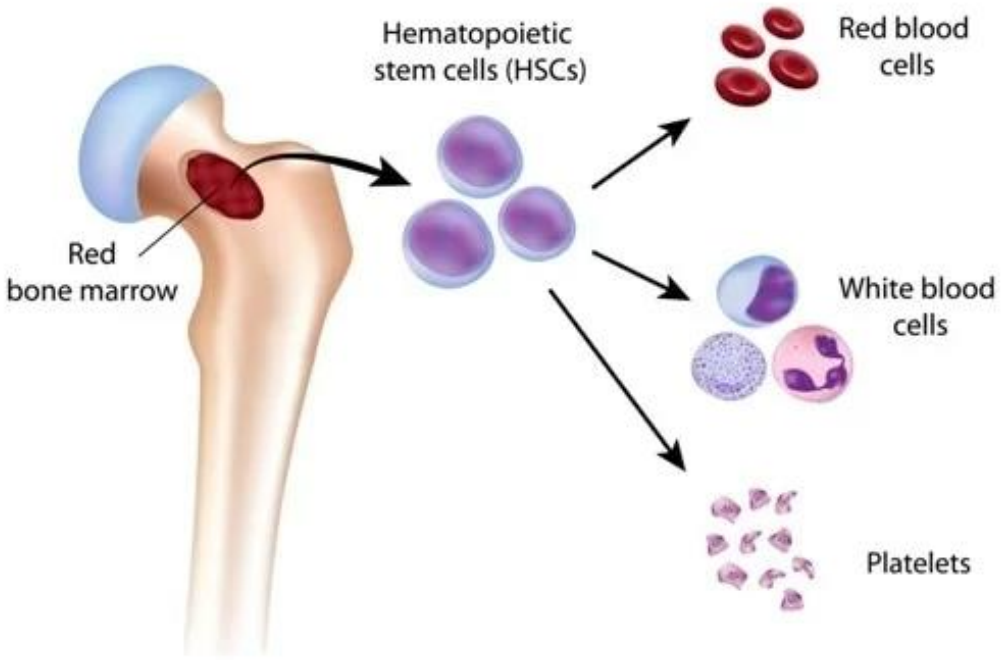
Monocytes

Monocytes are the garbage trucks of the immune system. Around 5% to 12% of white blood cells in your bloodstream are monocytes. Their most important function is to clean up dead cells in the body.

Recap

Leukocytes, better known as white blood cells, take on different forms that perform different roles in the immune system. These include:

- **Neutrophils are the first responder of immune cells.**
- **Basophils release histamine to mount a non-specific immune response.**
- **Eosinophils fight bacteria and parasites but also provoke allergy symptoms.**
- **Lymphocytes are B and T cells that defend against specific invaders.**
- **Monocytes clean up dead cells.**



How White Blood Cells are Formed

White blood cells begin in the bone marrow in a process called hematopoiesis (Reference above picture). All blood cells descend from a common hematopoietic stem cell (HSC). This is also called a "pluripotent" stem cell. These stem cells differentiate—or specialize—in different stages.

The HSC cell first separates into either a lymphoid or myeloid stem cell.

The lymphoid stem cell gives rise to the lymphoid cell line. This is the family of cells that produces B cells and T cells.

The myeloid stem cells give rise to cells called myeloblasts. These further evolve into macrophages, monocytes, neutrophils, basophils, and eosinophils. Myeloblasts can also turn into red blood cells and platelets.

Lab Values

The normal white blood cell count in a healthy adult is between 4,000 and 11,000 white blood cells per microliter (µl or mcL) or cubic millimeter (mm3) of blood.

High White Blood Cell Counts Disorders/Diseases

Infections usually cause an elevated white blood cell count, but there are also other possible causes. WBC counts can be increased by overproduction. In other words, the body may release white blood cells early from the bone marrow.

Causes of an increased white blood cell count include:

- **Infection**
- **Medications, such as corticosteroids**
- **Bone marrow or immune disorder**
- **Trauma**
- **Asthma and allergies**
- **Inflammations**
- **Injury or surgery**
- **Stress (physical or emotional)**
- **Genetic or hereditary conditions**
- **Pregnancy**
- **Smoking**
- **Obesity**
- **Excessive exercise**
- **Cancers such as leukemias, lymphomas, and myelomas**

In severe infections, immature white blood cells called blasts may be present. Blasts often appear when the body attempts to get white blood cells on the scene quickly.

Low White Blood Cell Counts Disorders/Diseases

Conditions that may result in a low white blood cell count include:

- **Severe infections**
- **Medications and cancer treatments, such as some antibiotics, chemotherapy, and radiation therapy**
- **Bone marrow damage, cancers, and disorders such as aplastic anemia and multiple myeloma**
- **Infectious diseases, including human immunodeficiency virus (HIV)**
- **Autoimmune diseases such as lupus**
- **Splenic "sequestration," where white blood cells are accumulated in the spleen**

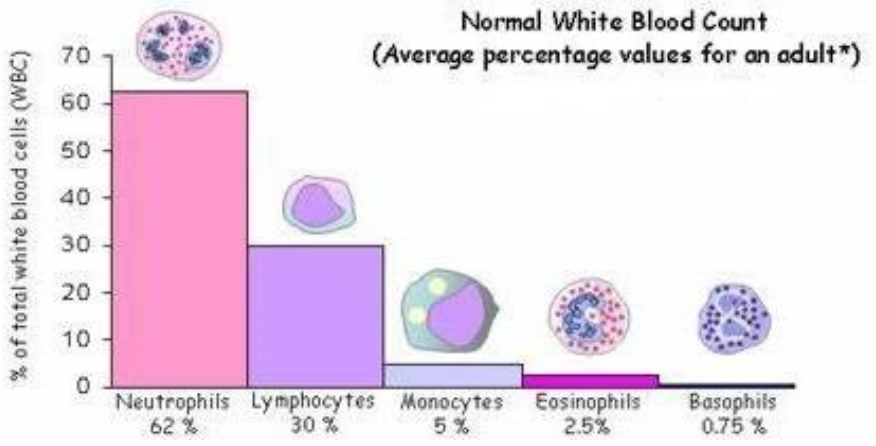
White blood cells are made in the bone marrow and circulate throughout the body. Diseases, toxins, medications, or medical treatments that harm the bone marrow can prevent enough white blood cells from being produced. Some medical conditions can also cause the destruction of white blood cells.

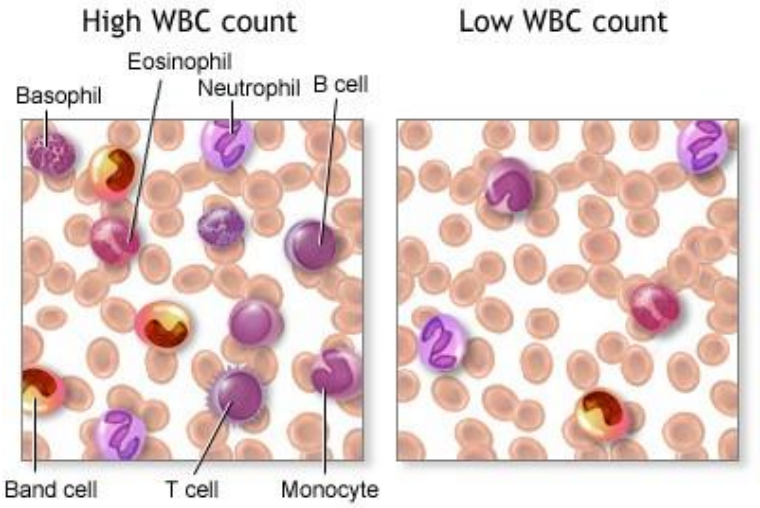
Usually, having low white blood cells is a sign of chronic disease. But sometimes medications or infections can temporarily cause this problem due to the destruction of white blood cells. This should resolve once the infection clears up or the medication is discontinued.

On its own, a low WBC count doesn't have symptoms. But a low count will often lead to an infection, because not enough white cells are present to fight off the invader.

Summary

White blood cells are an important part of our immune system. Different types of white blood cells perform different functions in the body. Overall, white blood cells help to protect us against bacteria, viruses, and parasites.





A high white blood cell count is usually a sign of an infection or illness. A low white blood cell count can indicate another type of problem or can leave you vulnerable to serious infections.

Red Blood Cells

Function and Indices of Red Blood Cells (RBCs)

The primary function of red blood cells (erythrocytes) is to distribute oxygen throughout your body.

The red blood cell count (RBC) is the number of red blood cells that are found in your blood. It is measured in millions of cells per microliter (mcL). A normal adult RBC count is 4.00 – 6.20 million/mcL.

Low Red Blood Cell Count

A low red blood cell count is referred to as anemia. There are many different causes of anemia, of which iron deficiency is only one. Red blood cell indices are very helpful in distinguishing these different causes.

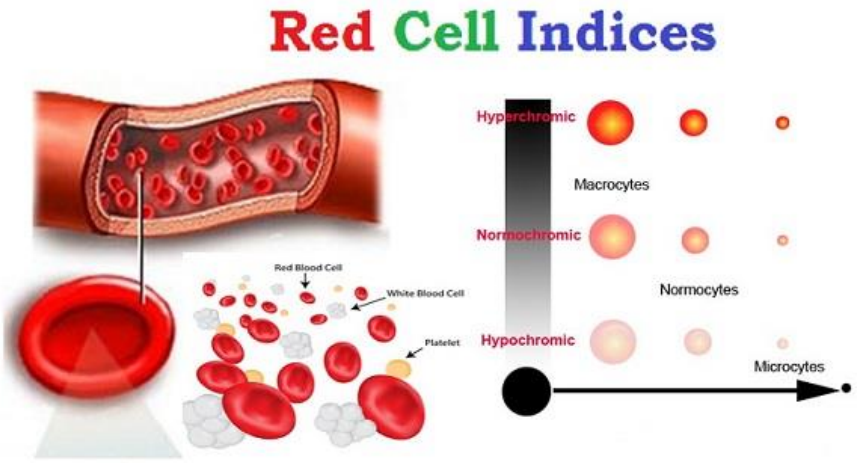
High or Elevated Red Blood Cell Count

An elevated red blood cell count is called erythrocytosis or polycythemia.

Causes may include:

- **Dehydration, in which the RBC count isn't actually high, but appears that way due to less fluid volume in the blood**
- **A need for greater oxygen-carrying capacity of the blood, such as living at high altitudes**
- **Chronic obstructive pulmonary disease (COPD)**
- **Heart failure**
- **Increased production of red cells in the bone marrow due to conditions such as polycythemia vera**

While looking at the total RBC count can tell you if your number of red blood cells is low, normal, or high, it doesn't tell you why the count is abnormal. Hence the need for further evaluation of these cells. Even if the RBC count is normal, looking at the RBC indices can sometimes give important clues in diagnosing medical conditions.



Red Blood Cell Indices

Along with the total RBC count, the RBC indices provide information about the size and quality of your red blood cells. This can be used to diagnose the cause and severity of anemia and provide vital clues about other health conditions you may have.

The RBC indices are comprised of four different components known as the mean corpuscular hemoglobin concentration (MCHC), the mean corpuscular volume (MCV), the mean corpuscular hemoglobin (MCH), and the red cell distribution width (RDW).

Mean Corpuscular Hemoglobin Concentration (MCHC)

The mean corpuscular hemoglobin concentration (MCHC) is the average concentration of hemoglobin in red blood cells.

Hemoglobin is the iron-carrying protein in red blood cells. Its function is to carry oxygen. It is also the element that gives red blood cells their color. Any alternation in concentration can cause the cells to appear more or less red.

The MCHC basically tells you whether a person's red blood cells have more or less hemoglobin than what would be expected. A normal range for MCHC is between 32.0 and 36.0 grams per deciliter in adults.

High MCHC

When the MCHC is high, the red cells are referred to as being hyperchromic. Possible causes of a high MCHC include:

- **Autoimmune hemolytic anemia, is a condition in which the body's immune system attacks its own red blood cells**
- **Hereditary spherocytosis, a genetic condition characterized by anemia and gallstones**

Low MCHC

When the MCHC is low, the cells are referred to as being hypochromic. Iron deficiency anemia is a possible cause. Any number of conditions can cause iron deficiency anemia, including pregnancy, blood loss, poor iron absorption in the gut, and poor nutritional intake of iron.

Mean Corpuscular Volume (MCV)

Mean corpuscular volume (MCV) measures the average red blood cell volume, meaning the actual size of the cells themselves. A normal range for MCV is between 79.4 and 98.4 femtoliters per cell.

Low MCV

A low MCV indicates that the red blood cells are small, or microcytic. Possible causes include:

- **Iron deficiency**
- **Lead poisoning**
- **Thalassemia (genetic disorder characterized by abnormal hemoglobin)**

High MCV

A high MCV implies the red blood cells are larger than normal, or macrocytic. Causes of macrocytic anemia include:

- **Vitamin B12 deficiency**
- **Folate deficiency**
- **Liver disease**
- **Alcoholism**
- **Hypothyroidism**
- **Medications such as chemotherapy and retroviral therapies for HIV**

Normal MCV

It's important to note that a person can have anemia and have a normal MCV.

Mean Corpuscular Hemoglobin (MCH)

Mean corpuscular hemoglobin (MCH) is the average amount of hemoglobin per red blood cell in a sample of blood. A normal range for MCH is between 26.0 and 34.0 picograms per cell.

The MCH value directly parallels the MCV value, and some healthcare providers find that the test is redundant. As such, if the size of the red blood cells is large (as measured by the MCV), the amount of hemoglobin per red blood cell will be high (as measured by the MCH), and vice versa.

Red Cell Distribution Width (RDW)

Red cell distribution width (RDW) is a test that reflects variability in the size of the red blood cells (and is proportionate to the standard deviation of the MCV). A normal RDW would mean that the red blood cells are all similar in size, whereas a higher RDW means that there is more variability in the size of the red blood cells.

Some healthcare providers believe that RDW is one of the most helpful red cell indices in making diagnoses. Aside from its role in helping to diagnose anemia, an elevated RDW may predict the presence of coronary artery disease in people with high blood pressure.

A high RDW also provides clues to an early nutritional deficiency which may not be noted with the other tests alone. Finally, it is a good test for determining if further testing is needed, such as a peripheral blood smear.

A normal range for RDW is 11.6% to 14.4%.

Summary

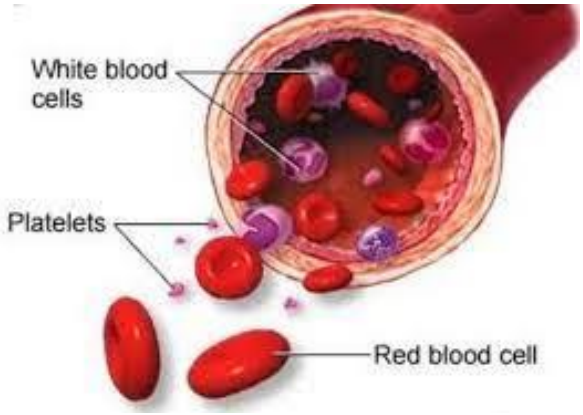
A complete blood count (CBC) is a standard blood test and includes the red blood cell count in addition to white blood cell count and platelets. The red blood cell count can tell healthcare providers about the number of red blood cells you have but says little about the reason for any abnormalities.

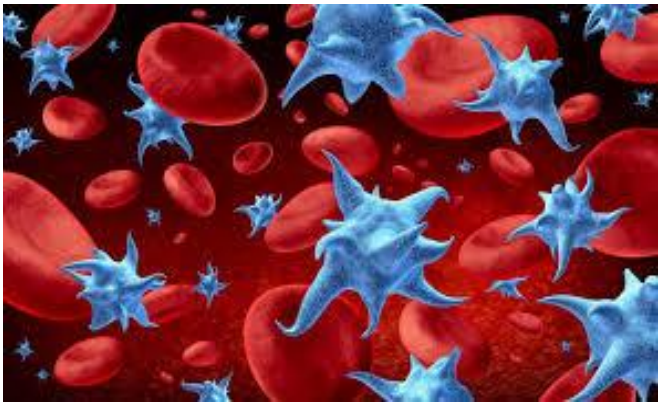
Red blood cell count (RBC) indices, by looking at the characteristics of red blood cells, are helpful in not only figuring out the cause of anemia but in diagnosing medical conditions even when the red blood cell count is normal.

The combination of these indices also gives important clues in narrowing down anemia. The examples given above are only a few of the possible causes and determining the precise cause of anemia is sometimes very challenging.

The Function of Blood Platelets

Platelets, also known as thrombocytes, are special blood cells. These cells control blood clotting to heal a wound and stop the bleeding.





Platelets are those funny shaped things in your blood

Some people have a low platelet count, which puts them at risk for uncontrolled bleeding. In other cases, you may have too many platelets in your blood. That leads to a possibly life-threatening condition related to abnormal clotting.

This article explains how platelets work in the body and how your healthcare provider can measure your platelet count to determine if you have too few or too many. It also covers possible disorders related to platelet counts.

What Platelets Do

Platelets are one of three types of blood cells. (Red blood cells and white blood cells are the other types). Platelets form in the bone marrow from cells known as megakaryocytes.

When a blood vessel tears, platelets come together to form a clot, plugging the tear to stop bleeding. This is a multistep process that includes:

Adhesion: This is the first step in which platelets rush to the site that's bleeding. For example, if you cut your finger and rupture a blood vessel, it will bleed. To stop the blood flow, platelets within that broken vessel start attaching to the site of the injury. They then send out chemical signals for more help.

Aggregation: In the next step, more platelets answer the call and begin to connect to each other to form a clot.

Coagulation: As platelets build up at the site of the wound, they seal up the blood vessel in what's called a coagulation cascade. A structural protein known as fibrin joins the platelets to knit the clot together. Fibrin is what forms the scab on a cut.

Aspirin and some nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit normal platelet function, which is why you may be asked to stop using them for a period of time before a surgery or procedure.

Platelet Count (PLT)

Just as it sounds, this is the actual number of platelets you have (per microliter of blood). Your range can vary from low to high (elevated):

Low range:	**Less than 150,000 platelets per microliter**
Normal range:	**150,000–450,000 platelets per microliter**
Elevated range:	**More than 450,000 platelets per microliter**

A platelet count that is too low can cause uncontrolled bleeding, while a count that is too high can put you at risk for excessive blood clots.

It's important for your doctor to know your platelet count before and after surgery. These numbers are used to predict the risk of bleeding and clotting problems. It's also important to track the count if you're undergoing chemotherapy and radiation therapy because these treatments can interfere with platelet production in the bone marrow.

Mean Platelet Volume (MPV)

The mean platelet volume (MPV) is a measure of the average size of your platelets. Younger platelets are larger than older ones, so an elevated number means you're producing and releasing them rapidly. A low number means there's a slowdown in production in the bone marrow.

Platelets live in the bloodstream for about 8 to 10 days.

Platelet Distribution Width (PDW)

PDW measure the variations in size among the platelets. This measurement can reveal conditions that affect the platelets.

Platelet Function Tests

Platelet function tests are a series of exams that determine if platelets are effectively forming clots. Among the things these tests look at are:

- **The time it takes for a clot to close a wound**
- **How strong a blood clot is**
- **How well platelets aggregate or clump together**
- **How long it takes for bleeding to stop**

These tests are usually done if there are symptoms or risk of excessive bleeding or if a doctor needs to monitor antiplatelet medications.

Recap

Platelets come together at the site of a bleeding wound, and through a multistep process, they form a clot that stops the blood flow. If you seem to have a problem forming clots or are clotting too much, your doctor will run a complete blood count to see if you have too many or too few platelets. Other tests can check whether the platelets are working as they should.

Causes of Low Platelet Count

If the body doesn't have enough platelets circulating in the blood, you may develop a condition called thrombocytopenia. This occurs when your bone marrow makes too few platelets, which means you're at greater risk for bruising and prolonged bleeding that takes a long time to slow down. You may need medical treatment for this condition.

The following are some factors may contribute to low platelet count:

Chemotherapy or radiation therapy: These treatments suppress or kill off the blood-producing cells in your bone marrow, leading to low platelet production.

Viral infections: Hepatitis C or human immunodeficiency virus (HIV) infections may attack bone marrow, affecting thrombocyte production.

Autoimmune conditions: Platelets may be affected by conditions such as lupus (an autoimmune disease that affects many different tissues and organs) or immune thrombocytopenic purpura (ITP, a condition of low platelets).

Pregnancy: Hemolysis, elevated liver enzymes, low platelet count syndrome, better known as HELLP, is a condition that may occur during pregnancy. It's a type of preeclampsia (characterized by high blood pressure) and may result in the breakdown of blood cells and platelets.

Medications: Anticoagulants such as Coumadin (warfarin) and Lovenox (heparin) may stop platelet production.

Other examples of conditions that may cause thrombocytopenia include having a mechanical heart valve, chronic alcohol use disorder, liver disease, severe sepsis (a life-threatening infection), and toxic exposures.

A platelet count below 20,000 per microliter is a life-threatening condition. You might start to bleed spontaneously and seemingly without reason. The bleeding could be very hard to stop. If this occurs, you may be given a platelet transfusion.

Causes of High Platelet Count

If the body has too many platelets in circulation, it may be related to one of two conditions:

Thrombocythemia: This occurs when the bone marrow makes too many platelets. If you have thrombocythemia, you may have other blood cell disorders.

Thrombocytosis: This is a high platelet count caused by another pre-existing condition. Disorders that may contribute to high platelet count include the following:

Primary bone marrow disorder: Essential thrombocytosis is a condition in which the megakaryocytes (cells that make platelets) in bone marrow produce too many platelets, increasing the risk of blood clots.

Chronic inflammation in the body: Inflammatory conditions such as rheumatoid arthritis (RA, an autoimmune disease attacking the joints) and inflammatory bowel disease (IBD, Crohn's and ulcerative colitis, which affect the digestive tract) may result in high platelet counts because the bone marrow

to makes more white blood cells and platelets to combat cellular damage caused by inflammation.

Infection: Bone marrow cells increase production of white blood cells and platelets to help fight infection.

Iron deficiency anemia: Reactive or secondary thrombocytosis may result when the body is undergoing a breakdown of red blood cells. The bone marrow cells go into overproduction to meet the body's needs.

Spleen removal: Up to one-third of platelets are stored in the spleen at any time. Removing this organ causes a greater number of platelets to stay in the bloodstream since they can't be stored in the spleen. This is usually a temporary condition.

Cancer: High platelet counts can also be seen in cancer, especially with gastrointestinal cancer as well as lymphoma, lung, ovarian, and breast cancer. This may be caused by inflammation related to cancer.

In addition, a temporary increase in the platelet count can happen after major surgery or trauma.

Recap

If bone marrow doesn’t produce enough platelets, you may develop thrombocytopenia, which puts you at risk for prolonged bleeding. Chemo, hepatitis C, HIV, and autoimmune diseases are among the factors that put you at risk for this disorder.

Elevated platelet levels can be due to a problem with the bone marrow, or they may be the result of inflammation, infection, iron deficiency, or a missing spleen.

Summary

Platelets are tiny cells with a highly important function in the body: to stop bleeding. There is a wide range of normal in terms of platelet count. Your healthcare provider can usually determine whether there's a problem with a routine blood test. Although, additional tests that measure the size of the platelets and how well they function might also be needed.

Having too few or too many platelets is a symptom of another condition. Your doctor will need to do additional tests to understand the underlying problems so you can be properly treated, and your excessive bleeding or problems clotting can be managed.

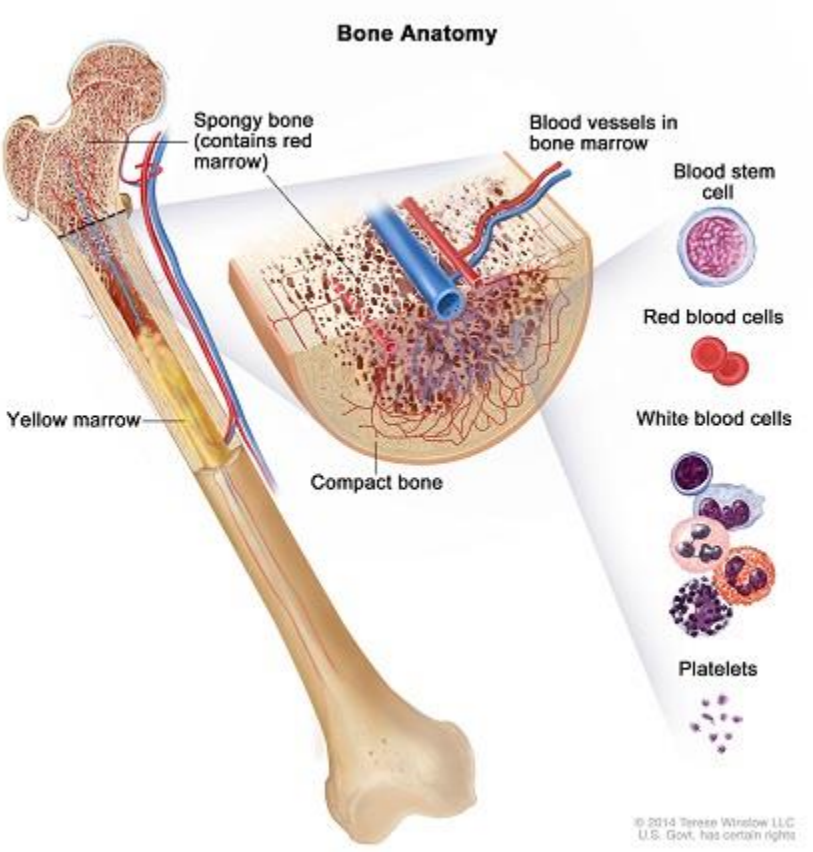
What is Bone Marrow?

The bone marrow is the spongy part of your bones where oxygen-carrying red bloods, infection-fighting white blood cells, and clot-forming platelets are made. The bone marrow is a soft tissue with many cavities located at the center of bones. It serves as the primary stem cell manufacturer of the body and participates in fat storage and bone remodeling.

Healthy bone marrow is essential to living. Sickle cell anemia, leukemia, lymphoma, and aplastic anemia are some life-threatening diseases that occur when the bone marrow fails to function properly.

Anatomy of the Bone Marrow

The bone marrow consists of bone cavities, a complex network of blood vessels, and two types of marrow—red marrow and yellow marrow.



Red marrow contains blood stem cells that can become red blood cells, white blood cells, or platelets. These hematopoietic (blood-cell forming) stem cells are pluripotent cells—meaning they're able to produce several types of cells. They are responsible for the production and maintenance of your blood cells.

Yellow marrow is made mostly of fat. It mainly consists of mesenchymal stem cells—multipotent cells found in the supporting tissue surrounding the bone marrow called the stroma. Mesenchymal stem cells have the potential to develop into a number of tissues, such as bone, cartilage, and fat.

Function

The primary function of the bone marrow is to manufacture blood cells—red cells, white cells, and platelets. Red blood cells carry oxygen throughout the body, whereas white cells help to fight infections and platelets are necessary for blood to clot.

The cells produced by the bone marrow are:

- **Lymphocytes, neutrophils, and monocytes which fight against invading bacteria, viruses, and fungi**
- **Eosinophils and basophils, which respond to parasitic infections and participate in allergic reactions**
- **B cells, which form antibodies that fight infection**
- **T cells, involved in cell signaling and fighting infections**
- **Natural killer T cells that directly attack cells infected by viruses**
- **Osteoblasts and osteoclasts, which participate in bone remodeling**
- **Red blood cells, which carry oxygen**
- **Platelets involved in blood clotting**
- **Adipocytes or fat cells**

Most of the immune and blood cells in the body are made in the red bone marrow, whereas cells that lead to the formation of bone, cartilage, and fat are made in the yellow marrow. Bone marrow also participates in bone remodeling, the removal of abnormal cells, and the recycling of cell parts used in the formation of new cells.

Your bone marrow makes more than 200 billion new blood cells every day. As you can imagine, it is vitally important to have a properly functioning bone marrow to keep up with the body's demands.

Blood and immune cells constantly undergo processes of renewal and regeneration. For example, red blood cells have a lifespan of about 120 days, so they need to be constantly replaced.

Diseases of the Bone Marrow

The bone marrow may become damaged or malfunction due to:

- **Leukemia, lymphoma, multiple myeloma, or other types of cancer**
- **Aplastic anemia**
- **Radiation, chemotherapy, or other medications**
- **Inherited abnormalities of red blood cells, such as sickle cell disease and thalassemia**
- **Inherited abnormalities of white blood cells that cause an immune deficiency**
- **Inherited or acquired abnormalities of platelets that lead to bleeding problems**

Many diseases that affect the bone marrow also affect the bone itself, as the bone and marrow work together to regulate bone remodeling.

Bone Marrow Transplants

Bone marrow transplant is the leading treatment, and oftentimes the only curative treatment, for conditions that threaten bone marrow's ability to function properly. Bone marrow transplants can help jumpstart or regenerate an immune system by increasing the body's capacity to produce healthy blood cells.

Because of a person's unique genetic makeup, a matching donor—usually a family member—needs to be found. If a genetic match is confirmed, then bone marrow is harvested and readied for transplant.

Malfunctioning Bone Marrow Symptoms

Malfunctioning bone marrow may present with nonspecific symptoms such as fatigue, easy bruising, unexplained weight loss, or fever. A person may also have recurrent infections.

When symptoms suggest the bone marrow isn't working properly, doctors conduct a complete medical history and physical exam, which may be followed by a series of tests, including a complete blood cell count, which assesses red cells, white cells, and platelets.

If these tests indicate problems, a bone marrow biopsy, genetic screening, and other tests may be performed to further explore a diagnosis.

If cancer or another blood disorder is found to be the cause of malfunctioning bone marrow, chemotherapy, radiation, or both may be used to eliminate the disease. Once the disease is eradicated, a bone marrow transplant may be considered.

Unfortunately, chemotherapy and radiation can sometimes damage the bone marrow and suppress the immune system, simultaneously heightening the potential need for a bone marrow transplant and the risk of its rejection.

Alternative Sources of Stem Cells

There are three other main sources of stem cells that may be used to repopulate the bone marrow.

1. **Peripheral blood stem cells (PBSCs): These stem cells circulate in the veins and arteries of all healthy people. Patients recovering from chemotherapy and healthy people who are treated with certain drugs that stimulate the growth of the bone marrow have relatively large numbers of PBSCs in their blood. PBSCs can be collected and used in certain situations as a source of stem cells for transplantation.**
2. **Umbilical cord blood: Stem cells can be found in the placenta of newborn babies once the umbilical cord is cut. These stem cells have been more frequently used in stem cell transplantation.**
3. **Embryos: The use of stem cells is controversial. Ethical reasons have therefore limited their use, although more research is being done to explore the future potential of this treatment.**

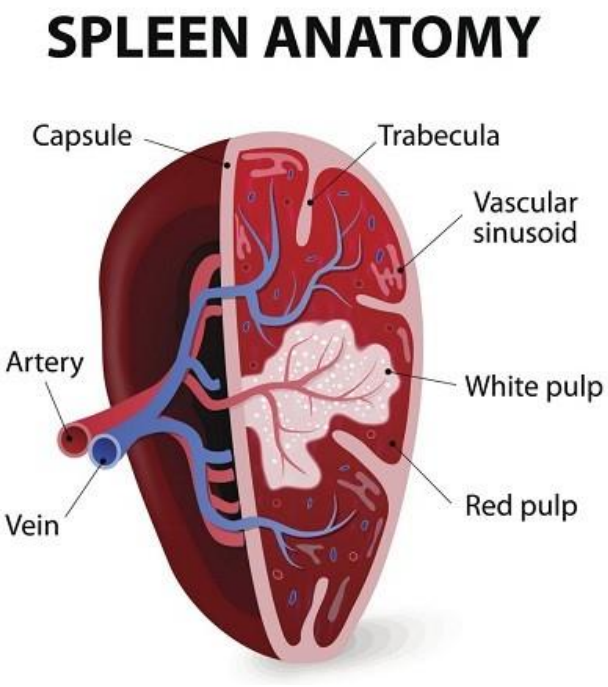
Lab test for bone marrow function

Bone marrow aspiration and bone marrow biopsy can show whether your bone marrow is healthy and making normal amounts of blood cells. Doctors use these procedures to diagnose and monitor blood and marrow diseases, including some cancers, as well as fevers of unknown origin.

The Function of the Spleen

The spleen is one of the least understood organs of the human body. Unlike organs that are noticed every day, such as the skin, most people never think about the spleen unless it becomes damaged by trauma.

While the spleen is not as well-known as other organs, it performs multiple important functions. The spleen participates in the creation of blood cells and also helps to filter out the blood, removing old blood cells and fighting infection. The spleen also helps to control the amount of blood circulating through the body by creating a reserve pool of blood that can be released during severe bleeding to help improve circulation, oxygenation, and blood pressure in dire circumstances.



The spleen is an organ in the upper far left part of the abdomen, to the left of the stomach. The spleen varies in size and shape between people, but it's commonly fist-shaped, purple, and about 4 inches long. Because the spleen is protected by the rib cage, you can't easily feel it unless it's abnormally enlarged.

The spleen is rarely the cause of health issues, so it is often overlooked when talking about wellness and prevention of illness. The spleen does contribute to overall good health, but it is also not an essential organ, which is important because it can be fragile and may need to be surgically removed.

The spleen works with other organs in the body to complete the tasks of blood storage, fighting infection and filtering the blood. While the spleen is useful and does perform vital tasks, other organs in the body also work to filter the blood and fight infection, and blood cells are mainly produced in the bones.

It is this overlap in duties makes it possible for the spleen to be removed without causing lasting harm to the individual. While most people are somewhat healthier with a spleen, it is absolutely possible to have a normal life without a spleen. So, the spleen is important, but it isn't essential.

The Fragile Spleen

The spleen holds reserve blood in case of significant bleeding, much like a blood-filled balloon, and acts as a reserve source of extra blood. In a trauma situation, particularly a severe car crash where an individual is wearing a seat belt, the force of impact can actually cause the spleen to rupture and begin to hemorrhage blood. The spleen has a high amount of blood flow, which can lead to a tremendous amount of bleeding when there is a serious injury and the bleeding can quickly become life-threatening. In some cases, when there is no other option, a splenectomy, the surgical procedure to remove the spleen, is performed.

The spleen can also become enlarged, stretching over time, until it becomes unable to function. It can expand over time from normal size (which is approximately the size of a small chicken breast) to the size of a softball or approaching the size of a volleyball. As a spleen becomes enlarged, it becomes more fragile and is more likely to be damaged in an accident.

Living Without a Spleen

As the spleen is not the only organ responsible for any of these functions, the spleen is not a necessary organ. It is possible to have the spleen removed and live a healthy life. Individuals without a spleen may be more likely to contract some types of infections as the body will have fewer B cells, the cells that "remember" exposure to bacteria and "remember" how to fight them.

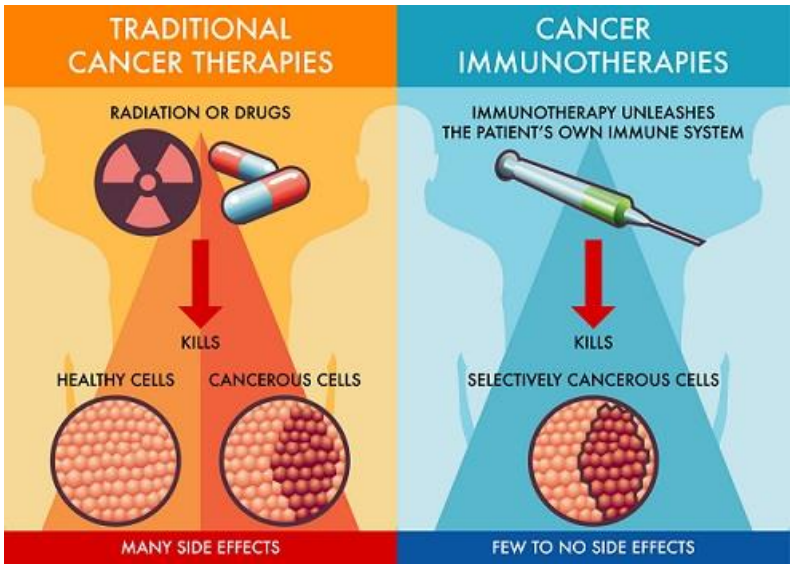
The risks of contracting an infection are highest in the first two years following surgery. Individuals who have had their spleen removed will need to tell healthcare providers that their spleen is absent, as they will always be at higher risk for infection. It is important that a person without a spleen not ignore early signs of infection, such as a fever, as the body is more likely to require antibiotics to fight infection effectively.

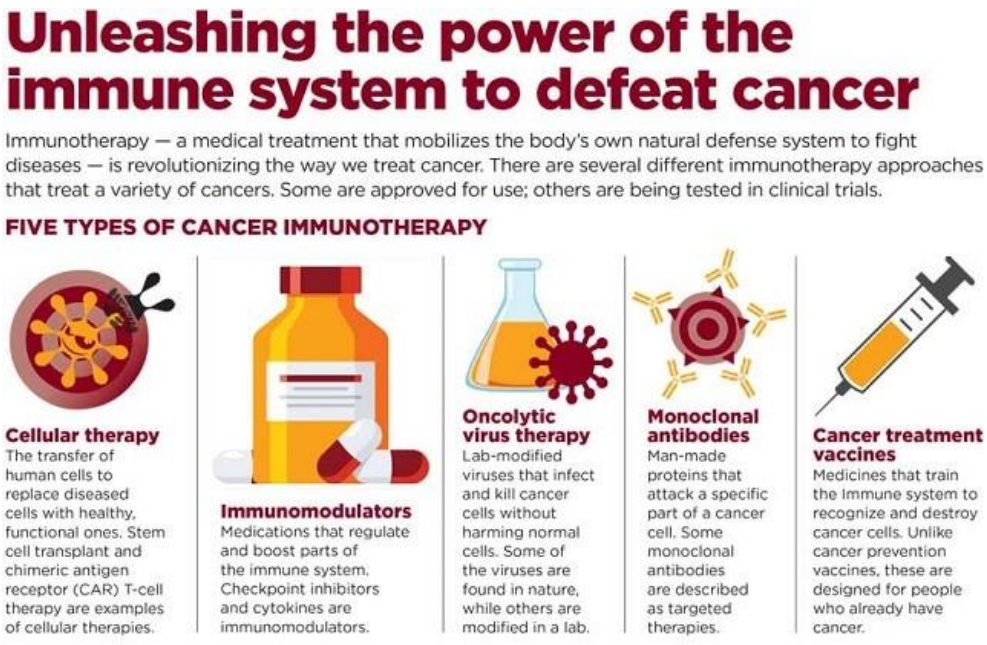
In general, a person without a spleen will go on to have a healthy life, but they will always have a greater risk of contracting pneumonia and vaccines will be less effective. Vaccines nonetheless are essential to prevent serious illness. Along with annual flu shots, talk to your healthcare provider about which other vaccines are especially important, such as vaccines to protect against pneumonia and meningitis.

Blood Disorders Treatment Options

Depending on your particular diagnosis, treatment might include:

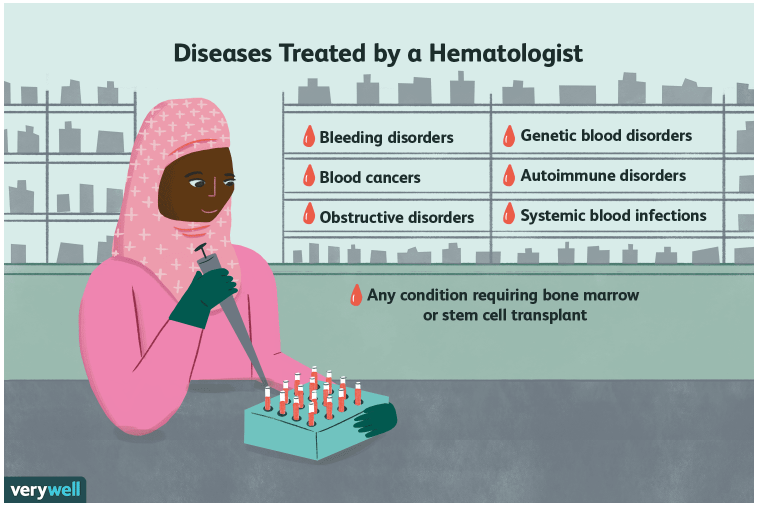
- **Growth factors to stimulate blood cell production**
- **Steroids or other drugs to suppress your immune system**
- **Chemotherapy to destroy abnormal cells**
- **Transfusions to support you with healthy blood cells**
- **Gene therapy to replace or deactivate a disease-causing gene or to introduce a disease-fighting gene**
- **Immunotherapy to harness the power of your own immune system to fight disease**





What Kind of Doctors Treat Blood Disorders?

Hematology is the study of blood and problems affecting red blood cells, white blood cells, platelets, blood vessels, bone marrow, and proteins that prevent clotting or excessive bleeding. Hematologists are physicians who study and treat common blood disorders and blood cancers.



A “hematologist-oncologist” is a doctor who specializes in treating people with blood cancers.

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