Blood and the Lymphatic System
Blood

Blood is a connective tissue that contains both dissolved substances and specialized cells.

The functions of blood include:

• collecting oxygen from the lungs, nutrients from the digestive tract, and waste products from tissues.

• regulating the body’s internal environment.

• helping to fight infections.

• forming clots to repair damaged blood vessels.
Blood Plasma

The body has 4–6 liters of blood.
About 45% of blood volume is cells.
The other 55% is plasma—a straw-colored fluid.
Plasma is 90% water and 10% dissolved gases, salts, nutrients, enzymes, hormones, waste products, and plasma proteins.
Blood Composition

- Whole Blood Sample
- Sample Placed in Centrifuge
- Blood Sample That Has Been Centrifuged

- Plasma
- Platelets
- White blood cells
- Red blood cell
Plasma proteins are divided into three groups:

- albumins
- globulins
- fibrinogen
Albumins and globulins transport substances such as fatty acids, hormones, and vitamins.

Albumins regulate osmotic pressure and blood volume.

Some globulins fight viral and bacterial infections.

Fibrinogen is the protein that clots blood.
Blood Cells

The cellular portion of blood consists of:

- red blood cells
- white blood cells
- platelets
Red Blood Cells

The most numerous cells in the blood are the red blood cells.

Red blood cells transport oxygen.
Blood Cells

Red blood cells get their color from hemoglobin. **Hemoglobin** is an iron-containing protein that transports oxygen from the lungs to tissues of the body. Red blood cells look like disks that are thinner in the center. They are produced in red bone marrow. They have no nuclei. They live for about 120 days.
White Blood Cells

White blood cells do not contain hemoglobin.
They are less common than red cells.
White blood cells are produced in bone marrow.
They contain nuclei.
White blood cells may live for days, months, or years.
White blood cells are the “army” of the circulatory system—they

- guard against infection,
- fight parasites,
- attack bacteria.

There are many types of white blood cells. Phagocytes engulf and digest bacteria and other disease-causing microorganisms.

Some white blood cells release histamines. Histamines increase blood flow into the affected area, producing redness and swelling.
Lymphocytes produce antibodies.

Antibodies are essential to fighting infection and help to produce immunity to many diseases.
Platelets and Blood Clotting

The body has an internal mechanism to slow bleeding and begin healing.

Bleeding stops because blood has the ability to form a clot.

Blood clotting is made possible by plasma proteins and platelets.
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Clot Forms

Thrombin converts fibrinogen into fibrin, which causes a clot. The clot prevents further loss of blood.
Blood Clotting Problems

If one of the clotting factors is missing or defective, the clotting process does not work well.

Hemophilia is a genetic disorder that results from a defective protein in the clotting pathway.

Hemophiliacs cannot produce blood clots that are firm enough to stop even minor bleeding.
The Lymphatic System

As blood circulates, some fluid leaks into surrounding tissues.

This helps maintain movement of nutrients and salts from the blood into the tissues.

The lymphatic system collects the fluid that is lost by the blood and returns it back to the circulatory system.

The fluid is known as **lymph**.
The lymphatic system collects and returns fluid that leaks from blood vessels. The spleen is an organ whose main function is to destroy damaged red blood cells and platelets. Certain white blood cells called T cells mature in the thymus gland, which produces hormones that promote their development.
The Lymphatic System

Lymph collects in lymphatic capillaries and flows into larger lymph vessels.

Ducts collect the lymph and return it to the circulatory system through two openings in the superior vena cava.

Along lymph vessels are enlargements called lymph nodes.

Lymph nodes trap disease-causing microorganisms. When large numbers of microorganisms are trapped in the lymph nodes, the nodes become enlarged.
The Lymphatic System

Some diseases of the lymphatic system

Adenitis: inflammation of the lymph node or gland: several kinds

I.e. cervical adenitis a condition characterized by enlarged, inflamed, and tender lymph nodes of the neck; seen in certain infectious diseases of children, such as acute infections of the throat.
Some lymphatic diseases and disorders

Lymphedema - Elephantiasis is a condition characterized by gross enlargement of an area of the body, especially the limbs. Elephantiasis is caused by obstruction of the lymphatic system normally a parasite, which results in the accumulation of a fluid called lymph in the affected areas.

Hodgkin's lymphoma, cells in the lymphatic system grow abnormally and may spread beyond the lymphatic system. As Hodgkin's lymphoma progresses, it compromises your body's ability to fight infection.

Non-Hodgkin lymphoma (also known as non-Hodgkin’s lymphoma, NHL, or sometimes just lymphoma) is a cancer that starts in cells called lymphocytes, which are part of the body’s immune system. Lymphocytes are in the lymph nodes and other lymphoid tissues (such as the spleen and bone marrow).