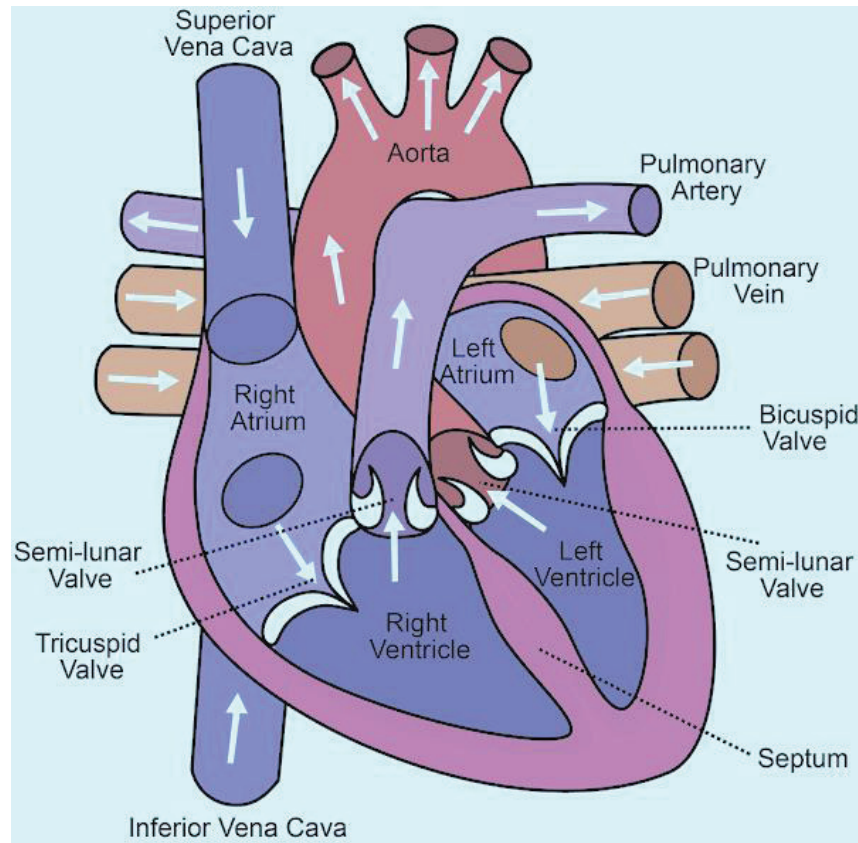


# BODY FLUIDS AND CIRCULATION



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# BODY FLUIDS AND CIRCULATION

## Blood

Blood, also known as connective tissue, is responsible for transporting oxygen, nutrients, hormones, respiratory gases, to the body, and waste materials away from it. The total volume of the blood in the human body is approximately seven per cent of the total body's weight which will be about 5 to 5.5 liters (1.5 gallons) of blood.

**Human blood comprises of 4 components that serve specific tasks, namely:**

- Plasma.
- Red Blood Cells.
- White Blood Cells.
  1. Eosinophil.
  2. Basophil.
  3. Neutrophil.
  4. Lymphocytes.
    - T-Lymphocyte.
    - B-Lymphocytes.
      1. Monocytes.
      2. Platelets.

**Plasma:** Plasma is straw colored viscous fluid that constitutes 55% of blood volume. It consists of 90-92% water, 6-8% protein (fibrinogens, albumins and globulins), glucose, amino acids and small amount of minerals like  $\text{Na}^+$ ,  $\text{Ca}^{++}$ ,  $\text{Cl}^-$  etc.

**Formed elements:** Erythrocytes, leucocytes and platelets are collectively called formed elements.

**Erythrocytes:** Erythrocytes are most abundant cells in human body. Total blood count of RBCs is 5-5.5 million, which is slightly less in females due to menstruation. It is formed in bone marrow. Nucleus is absent in mammalian RBCs having biconcave shape.

Every 100 ml of blood contain 12-16 gm. of haemoglobin. They have life span of 120 days. They are destroyed in spleen (graveyard of RBCs)

**Leucocytes:** Leucocytes or WBCs are colourless due to absence of haemoglobin. 6000-8000 of WBCs are present in each ml. of blood.

**Neutrophils:** Neutrophils are most abundant and basophils are least abundant WBCs. Monocytes and neutrophils are phagocytic cells which destroy foreign organisms.

- Basophils secrete histamine, serotonin and heparin that are involved in inflammatory reactions.
- Eosinophils resist infection and allergic reactions. B and T lymphocytes are

responsible for immune response of the body.

**Thrombocytes:** Thrombocytes or platelets are cell fragments produced from megakaryocytes in bone marrow. 150000-350000 platelets are present in each ml of blood. Platelets are involved in clotting or coagulation of blood in case of injuries.

**Serum:** Blood plasma from which fibrinogen and other clotting factors have been removed. (Plasma- (fibrinogen & other clotting factor) = blood serum.

**Lymph:** Lymph is a colorless fluid present in the interstitial tissues. It circulates throughout the lymphatic system. It can be defined as blood without the RBCs. The exchange of nutrients, hormones, and gases occurs through this fluid. It consists of lymphocytes that play a major function in the immune responses of the body.

**Blood Groups:** blood of human beings differ in certain aspects although it appear same in all individuals. Two main types of grouping are ABO and Rh.

ABO grouping is based on presence or absence of two surface antigens RBC, antigen A and antigen B. The plasma of an individual also contains two antibodies produced in response of antigens.

**Blood Groups and Donor Compatibility**

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	anti-B	A, O
B	B	anti-A	B, O
AB	A, B	nil	AB, A, B, O
O	nil	anti-A, B	O

- During blood transfusion, blood of donor has to be matched with blood of recipients to avoid clumping of RBCs.
- Group 'O' blood can be donated to any individual with any blood group, so it is called universal donor.
- Person with 'AB' blood group can receive blood from any person of any group, so it is called universal recipient.

**Rh grouping:** Rh antigen (similar to Rhesus monkey) are observed on surface of RBCs of majority of individuals (about 80%). Such people are called Rh positive (Rh+) and those in whom this antigen is absent are called Rh negative (Rh-).

**Erythroblastosis foetalis:** If father blood is Rh+ and mother blood is Rh-, the foetus blood is Rh+. During the delivery of first child there is a possibility of exposure of mother blood with foetus blood to develop antibodies in mother blood. In subsequent pregnancy the mother's blood can leak into foetus blood and

destroy the foetus RBC. This case is called erythroblastosis foetalis.

**Coagulation of blood (Blood Clotting):** When an injury is caused to a blood vessel bleeding starts which is stopped by a process called blood clotting. An injury or trauma stimulates the platelets in the blood to release certain factors that activate the mechanism of coagulation. Calcium play important role in blood clotting.

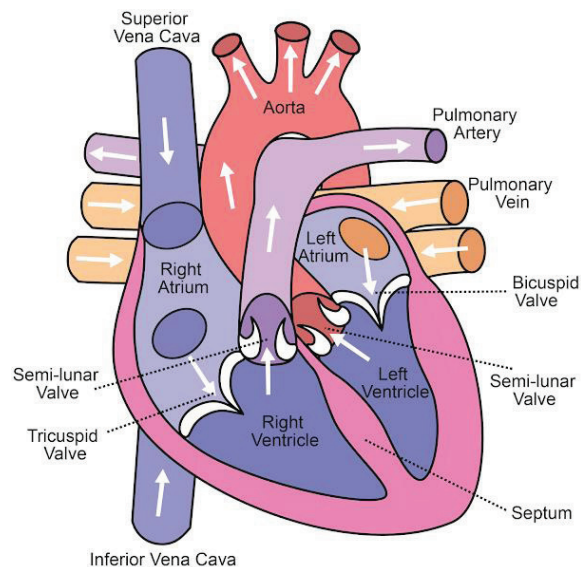
## Human Circulatory System

The human circulatory system consists of four main organs, which function together and each of them has specific roles and functions that helps in smooth circulation of blood to different parts of the body.

**The vital circulatory system organs include:**

- Heart.
- Blood.
- Blood Vessels.
- Lymphatic system.

**Heart:** Heart is the mesodermally derived muscular organ, present in thoracic cavity between the two lungs protected by double membrane of pericardium.



- The upper two chamber is called atria and lower two chambers are called ventricles. Interatrial septum separate the right and left atrium and thick walled inter ventricle septum separate the ventricles.
- The opening between right atrium and right ventricle is guarded by a three muscular flaps called tricuspid valve. Bicuspid or mitral valve guards the left atrium and ventricle.
- The opening of right and left ventricle to pulmonary artery and aorta respectively is controlled by semilunar valve.
- The nodal tissue present on upper right corner of right atrium is called SAN (sino-atrial node) and those on lower left corner of right atrium is called AVN ( atrio-ventricular node).



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