



SNS COLLEGE OF TECHNOLOGY **(AN AUTONOMOUS INSTITUTION)**

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Department of Biomedical Engineering

Course Name: 19BMT201 Anatomy & Physiology

II Year : III Semester

Unit III- Cardiovascular System

Topic : Blood Composition – RBC, WBC, Platelets

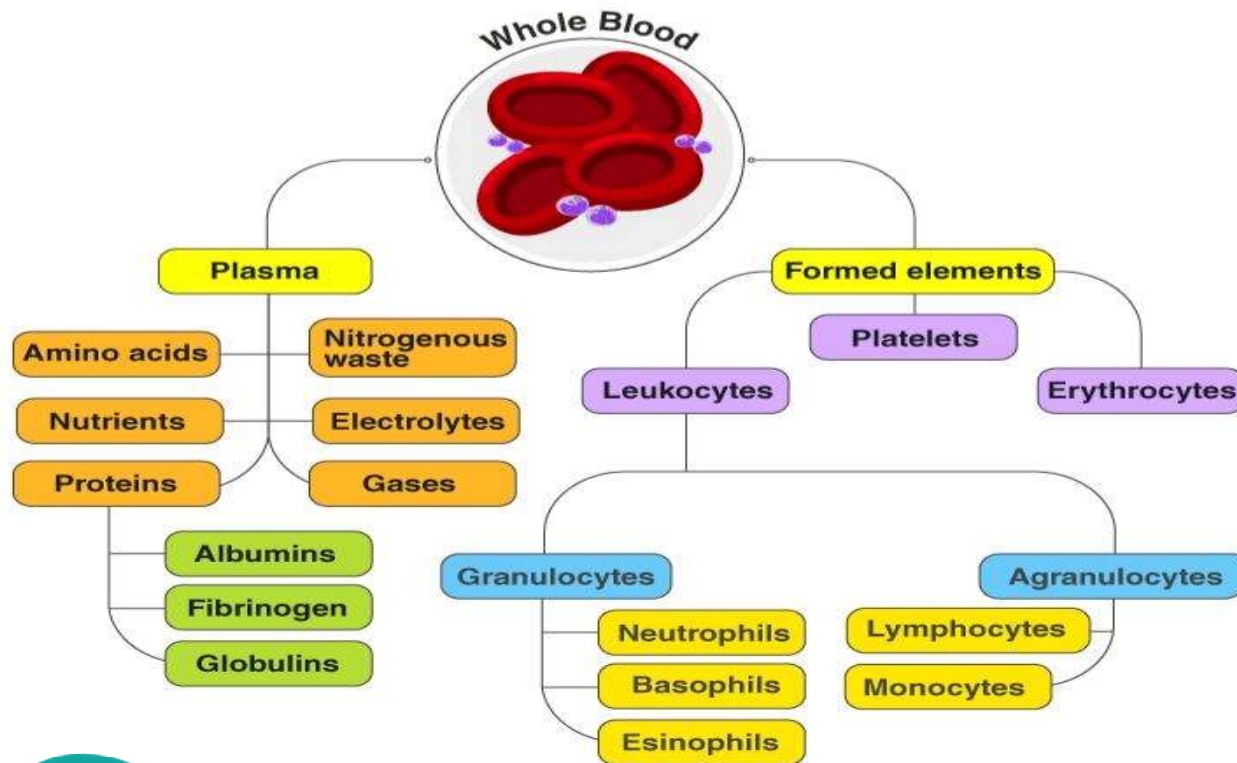


BLOOD

- Blood is a fluid connective tissue that consists of plasma, blood cells and platelets.
- It circulates throughout our body delivering oxygen and nutrients to various cells and tissues.
- It makes up 8% of our body weight. An average adult possesses around 5-6 litres of blood.



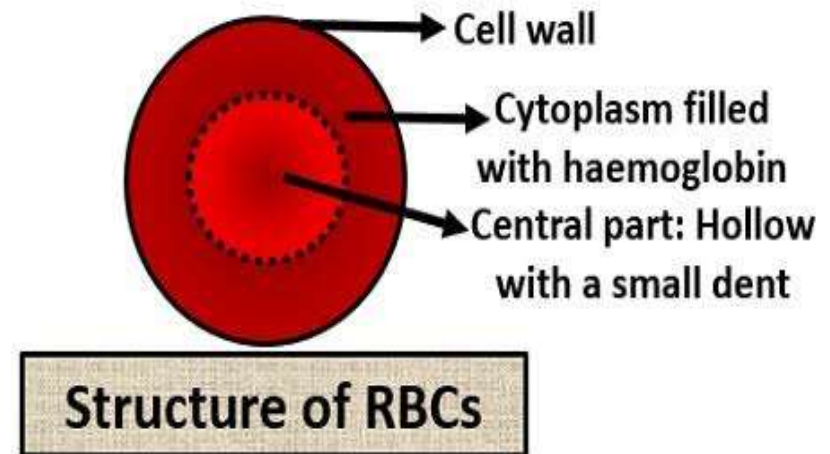
BLOOD COMPOSITION





RBC- RED BLOOD CELLS (ERYTHROCYTES)

- RBCs are biconcave cells without nucleus in humans; also known as erythrocytes.
- RBCs contain the iron-rich protein called haemoglobin; give blood its red colour.
- RBCs are the most copious blood cells produced in bone marrows.
- Their main function is to transport oxygen from and to various tissues and organs





WBC-WHITE BLOOD CELLS (LEUCOCYTES)

- Leucocytes are colourless blood cells. They are colourless because it is devoid of haemoglobin.
- They are further classified as granulocytes and agranulocytes
- WBCs mainly contribute to immunity and defence mechanism

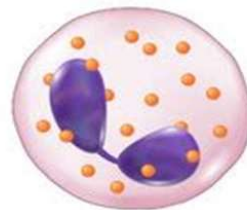
White blood cells



Basophil



Neutrophil



Eosinophil



Monocyte

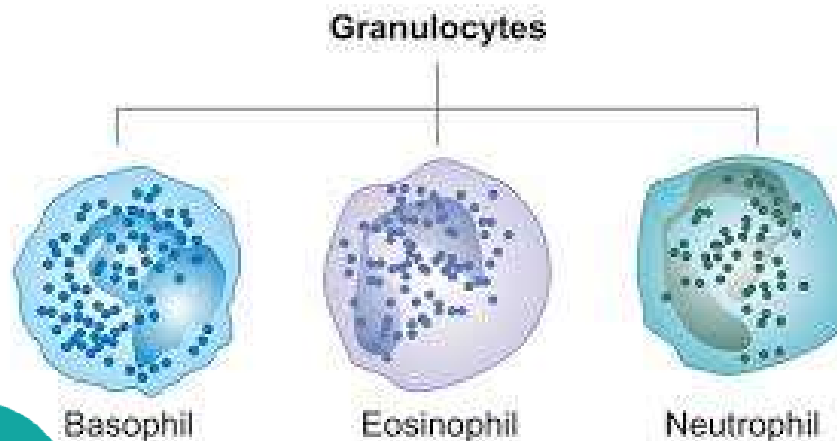


Lymphocyte



GRANULOCYTES

- They are leukocytes, with the presence of granules in their cytoplasm. The granulated cells include- eosinophil, basophil, and neutrophil.



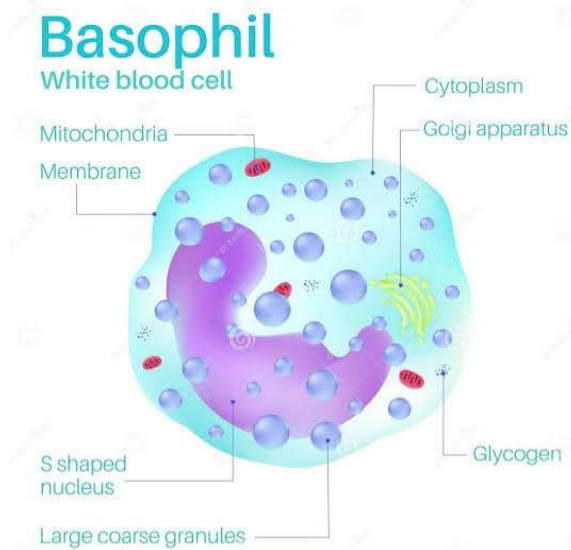


BASOPHIL

- They are the least common of the granulocytes, ranging from 0.5 to 1 per cent of WBCs.
- They contain large cytoplasmic granules, which play a vital role in mounting a non-specific immune response to pathogens, and allergic reactions by releasing histamine and dilating the blood vessels.
- These white blood cells have the ability to be stained when exposed to basic dyes, hence referred to as basophil.



- These cells are best known for their role in asthma and their result in inflammation and bronchoconstriction in the airways.
- They secrete serotonin, histamine and heparin.



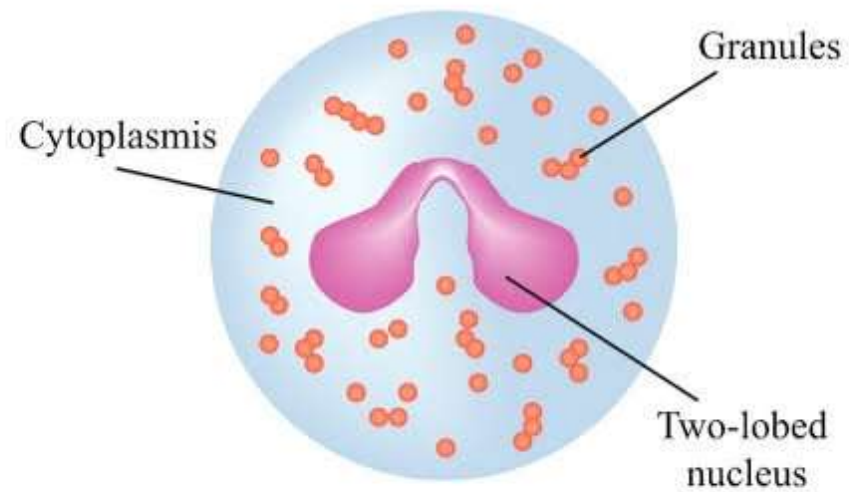


EOSINOPHIL

- They are the cells of leukocytes, which are present in the immune system.
- These cells are responsible for combating infections in parasites of vertebrates and for controlling mechanisms associated with allergy and [asthma](#).
- Eosinophil cells are small granulocyte, which are produced in the bone marrow and makes 2 to 3 per cent of whole WBCs.
- These cells are present in high concentrations in the digestive tract



Eosinophil



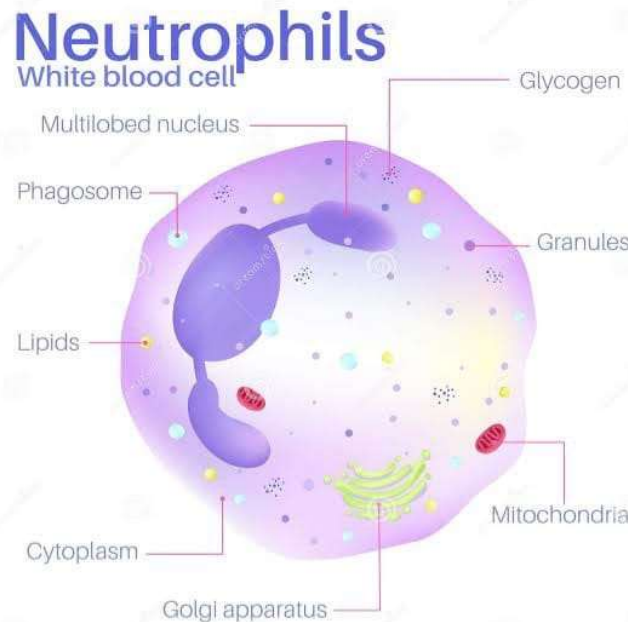
NEUTROPHILS



- They are normally found in the bloodstream.
- They are predominant cells, which are present in pus.
- Around 60 to 65 per cent of WBCs are neutrophils with a diameter of 10 to 12 micrometres.
- The nucleus is 2 to 5 lobed and the cytoplasm has very fine granules.
- Neutrophil helps in the destruction of bacteria with lysosomes, and it acts as a strong oxidant.
- Neutrophils are stained only using neutral dyes.



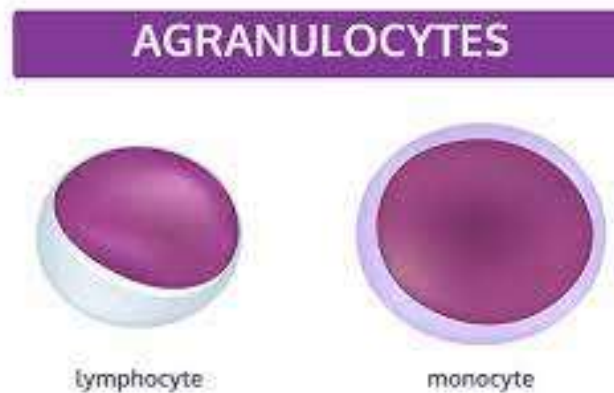
- Neutrophils are also the first cells of the immune system to respond to an invader such as a bacteria or a virus.
- The lifespan of these WBCs extends for up to eight hours and is produced every day in the bone marrow.





AGRANULOCYTES

- They are leukocytes, with the absence of granules in their cytoplasm. Agranulocytes are further classified into monocytes and lymphocytes



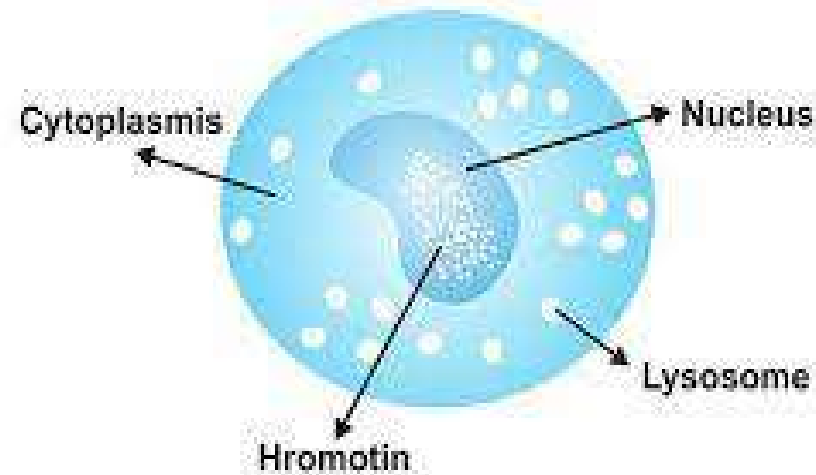


MONOCYTE

- These cells usually have a large bilobed nucleus, with a diameter of 12 to 20 micrometres.
- The nucleus is generally half-moon shaped or kidney-shaped and it occupies 6 to 8 per cent of WBCs.
- They are the garbage trucks of the immune system.
- The most important functions of monocytes are to migrate into tissues and clean up dead cells, protect against bloodborne pathogens and move very quickly to the sites of infections in the tissues.



- These white blood cells have a single bean-shaped nucleus, hence referred to as Monocytes.



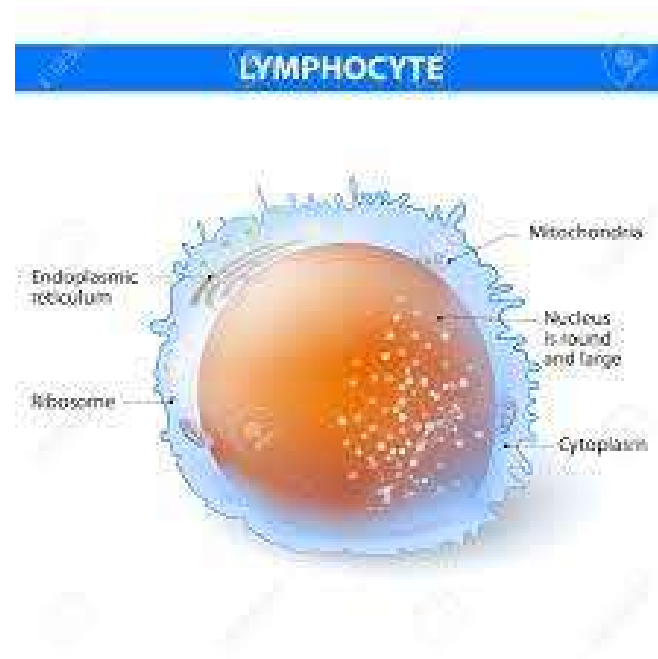


LYMPOCYTE

- They play a vital role in producing antibodies.
- Their size ranges from 8 to 10 micrometres.
- They are commonly known as natural killer cells.
- They play an important role in body defence.
- These white blood cells are colourless cells formed in lymphoid tissue, hence referred to as lymphocytes.
- There are two main types of lymphocytes – B lymphocytes and T lymphocytes.



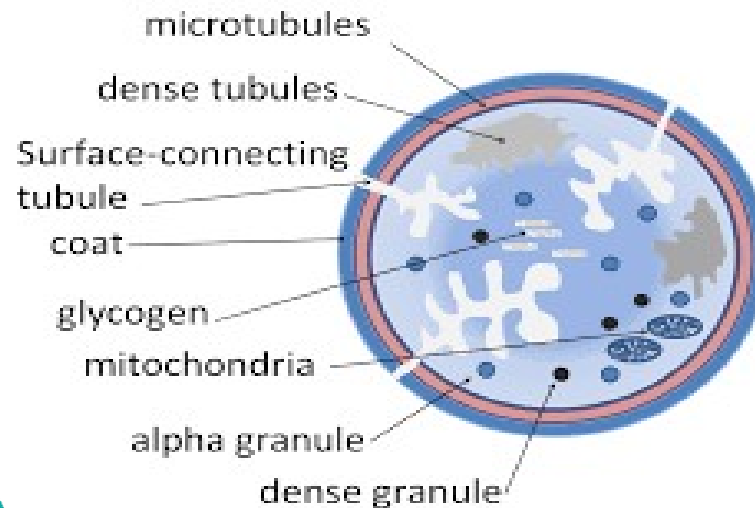
- These cells are very important in the immune systems and are responsible for humoral and cell-mediated immunity.





BLOOD PLATELETS

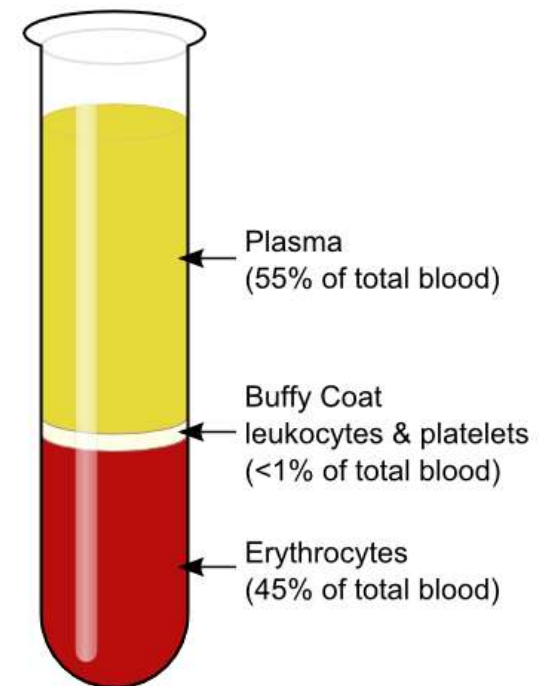
- Thrombocytes are specialized blood cells produced from bone marrow.
- Platelets come into play when there is bleeding or haemorrhage.
- They help in clotting and coagulation of blood. Platelets help in coagulation during a cut or wound.





COMPOSITION OF BLOOD

- There are many cellular structures in the composition of blood.
- When a sample of blood is spun in a centrifuge machine, they separate into the following constituents: Plasma, buffy coat and erythrocytes. Thus blood contains RBC, WBC, platelets and plasma.





PLASMA

- The liquid state of blood can be contributed to plasma as it makes up ~55% of blood.
- It is pale yellow in colour and when separated.
- Blood plasma consists of salts, nutrients, water and enzymes.
- Blood plasma also contains important proteins and other components necessary for overall health.
- Hence, blood plasma transfusions are given to patients with liver failure and life-threatening injuries.



COMPONENTS OF PLASMA

- Blood plasma has several protein components. Proteins in blood plasma are:
 1. Serum globulin
 2. Serum albumin
 3. Fibrinogen
- The serum contains only globulin and albumin. Fibrinogen is absent in serum because it is converted into fibrin during blood clotting.