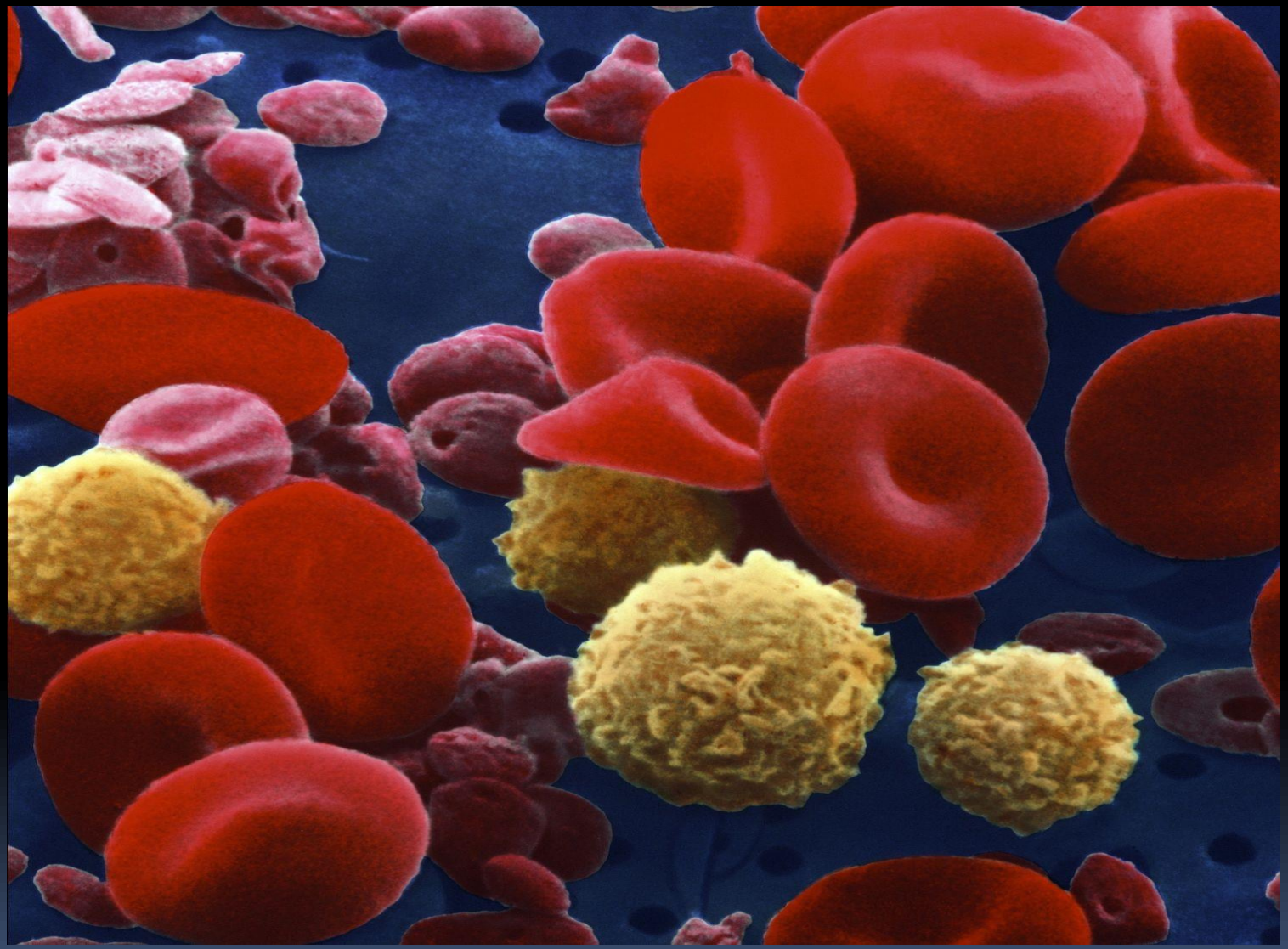
General Physiology

Blood Cells

2nd Lecture

1st Term



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TYPES OF BLOOD CELLS

1. Red Blood Cells
(Erythrocytes)

Helps in O_2 and CO_2 exchange

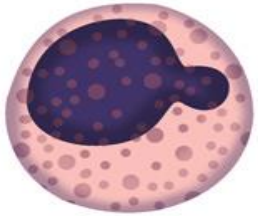
3. Platelets
(Thrombocytes)

Helps in blood clotting

2. White Blood Cells
(Leukocytes)

Neutrophil

Eosinophil

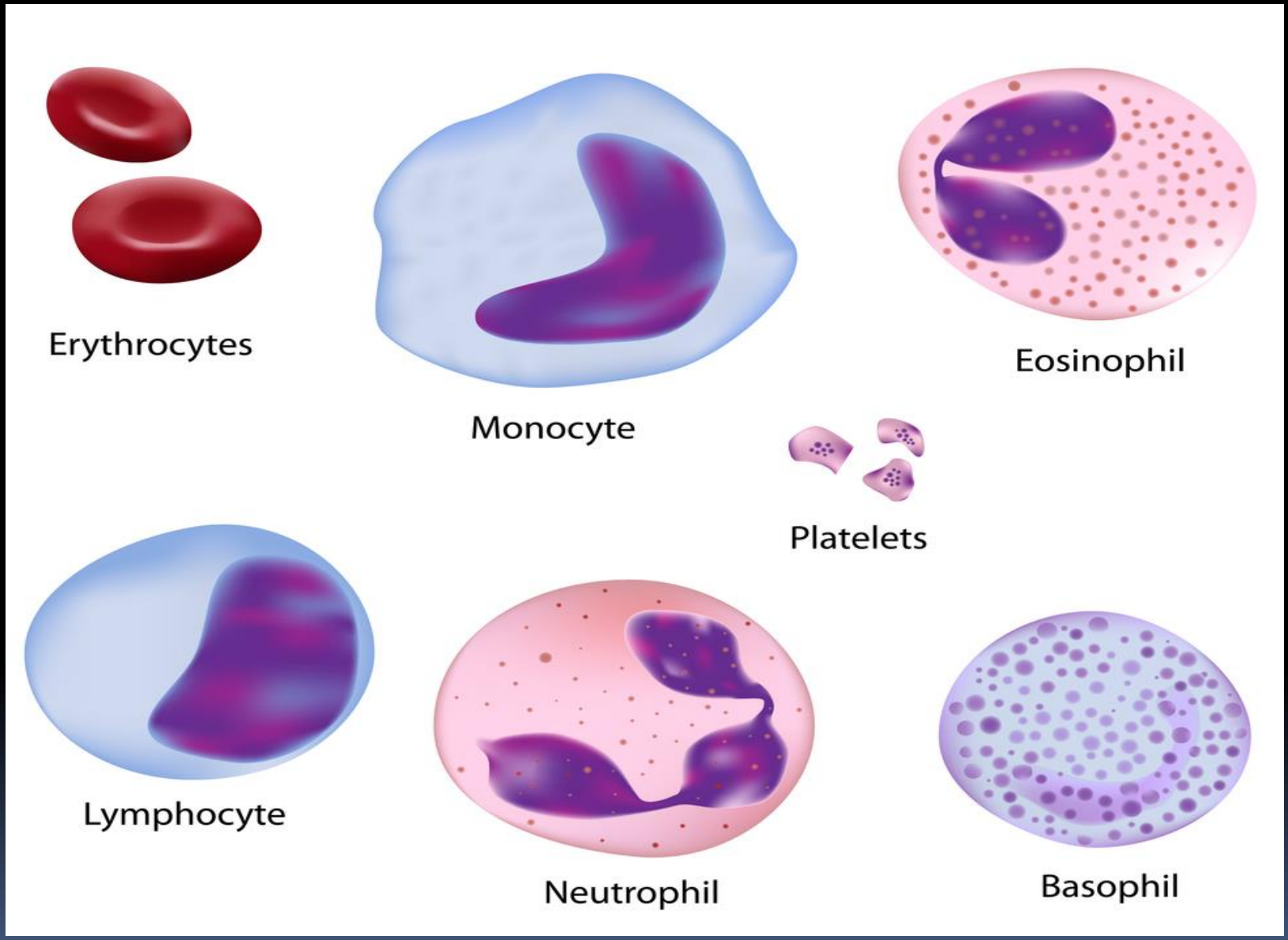


Basophil

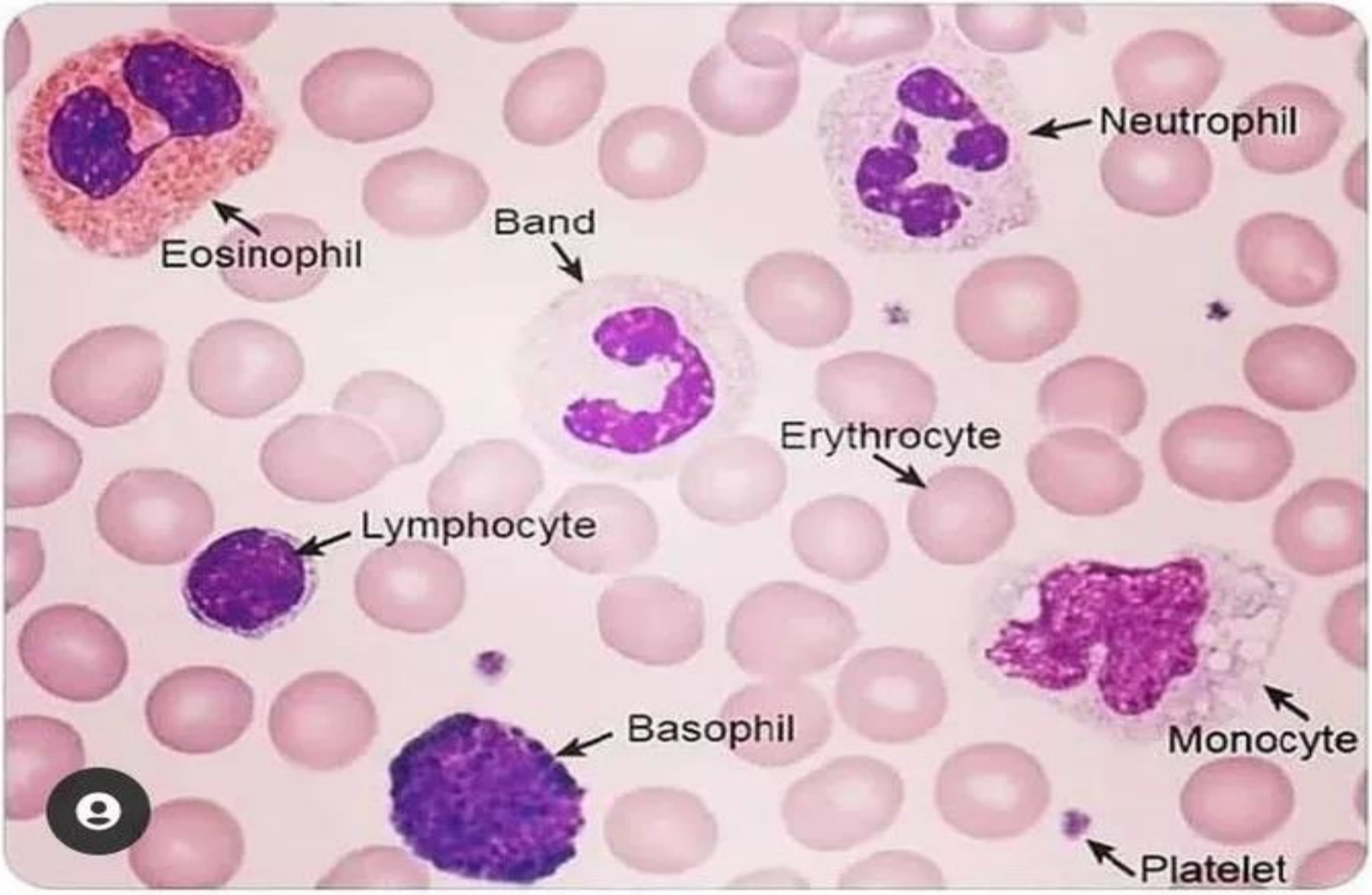
Lymphocyte

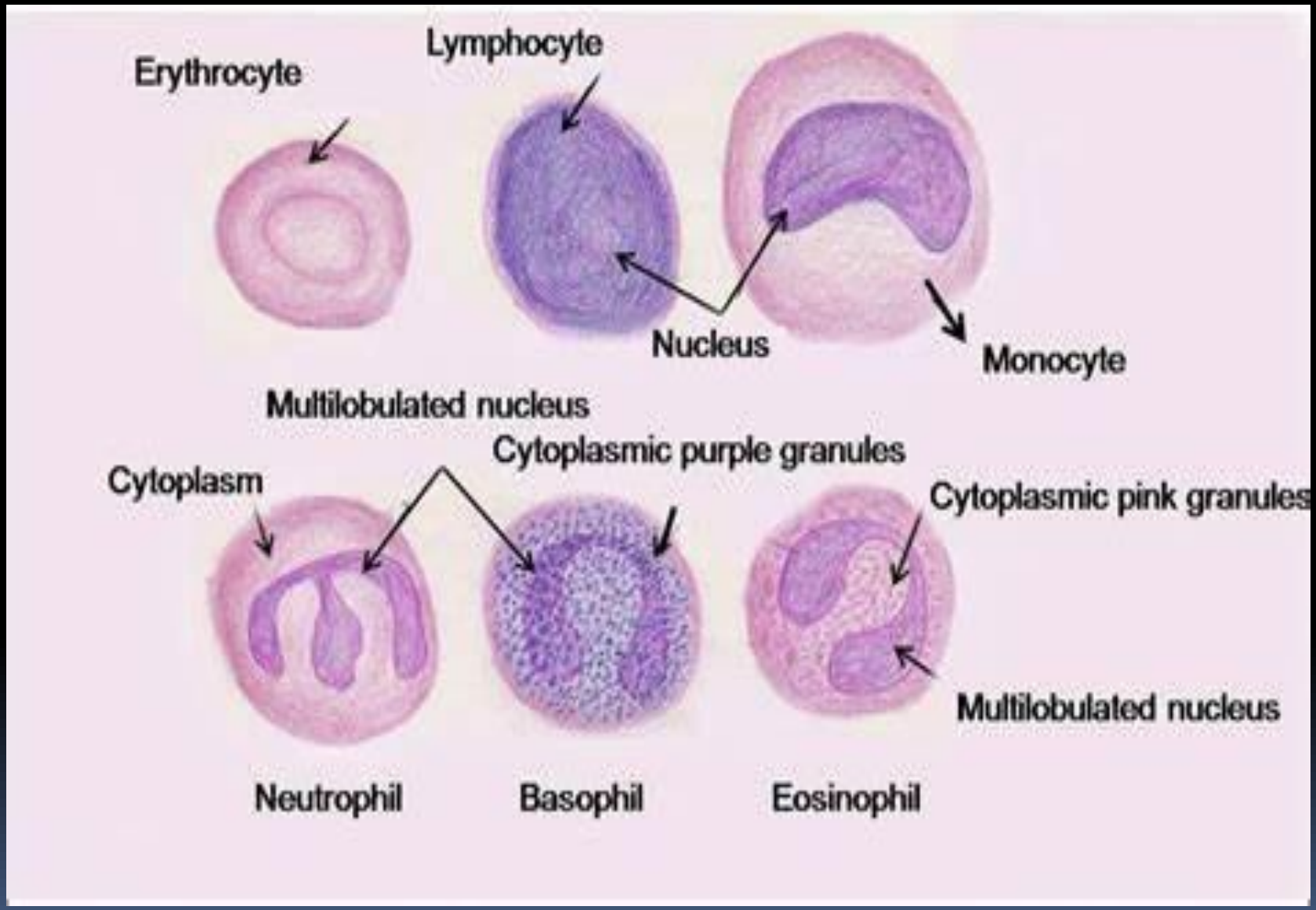
Monocyte

Fights against infections


Erythrocytes
Monocyte
Eosinophil
Platelets
Lymphocyte
Neutrophil
Basophil

Blood Cells


Neutrophil
Eosinophil
Band
Erythrocyte
Lymphocyte
Basophil
Monocyte
Platelet


Erythrocyte
Lymphocyte
Nucleus
Monocyte
Multilobulated nucleus
Cytoplasmic purple granules
Cytoplasm
Cytoplasmic pink granules
Multilobulated nucleus
Neutrophil
Basophil
Eosinophil

Blood cells, also known as hematocytes, hemocytes, or hematopoietic cells, are cells produced mostly in the blood and are synthesized primarily in the red bone marrow.

Blood cells make up about 45% of the blood volume, while the rest (55%) is occupied by blood plasma.

Blood contains three different types of blood cells, namely, red blood cell (erythrocytes), white blood cell (leukocytes), and platelets.

These cells all come from the bone marrow where they develop as stem cells, followed by their maturation into one of the three types of blood cells.

Blood cells are crucial for various functions of blood like transporting oxygen and other essentials, protecting against antigens, and restoring tissues in the body.

Blood Cells- Definition and Types with Structure and Functions

Erythrocytes

Basophil

Lymphocyte

Monocyte

Eosinophil

Neutrophil

Platelets

Dendritic cell

Macrophage

A. Red blood cells (RBC) or Erythrocytes

Red blood cells (RBCs) or erythrocytes are blood cells with terminally differentiated structures lacking nuclei and are filled with the O2-carrying protein, hemoglobin.

Because of the lack of a nucleus, erythrocytes cannot divide and thus need to be continually replaced by new cells synthesized in the red bone marrow.

The lifespan of red blood cells is about 120 days, and the development of red blood cells from stem cells occurs in about seven days via the process of erythropoiesis.

Structure of Erythrocytes

The mature human erythrocyte has a biconcave, discoid shape and is anucleated. They are approximately 7.5 µm in diameter, 2.6-µm thick at the rim, but only 0.75-µm thick in the center.

The average concentration of erythrocytes in the blood is approximately 3.9-5.5 million per microliter (µL, or mm3) in women and 4.1-6.0 million/µL in men.

Erythrocytes are quite flexible, which permits them to bend and adapt to the small diameters and irregular shape of the blood vessels.

Functions of Erythrocytes

RBCs transport oxygen from the lungs to the peripheral tissues to assist in metabolic processes.

The cells also collect the generated carbon dioxide from the periphery and return it to the lungs for elimination from the body.

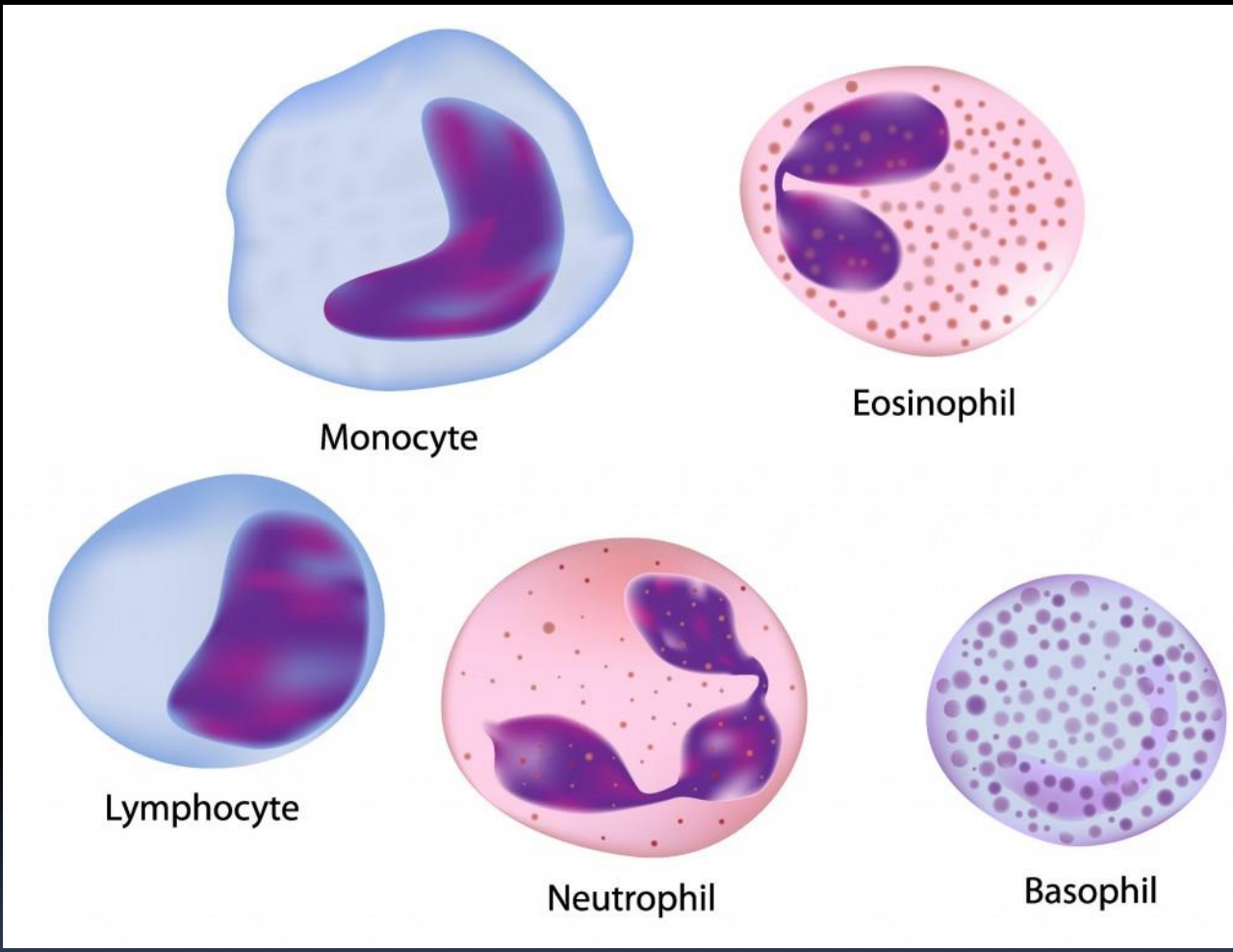
B. White blood cells (WBC) or Leukocytes

White blood cells (WBC) or leukocytes are a heterogeneous group of nucleated cells that are found in the blood that are primarily involved in the various activities related to immunity.

The normal concentration of WBCs in human blood varies between 4000 and 10,000 per microliter.

These cells play an essential role in phagocytosis and immunity and therefore in defense against infection.

Leukocytes are separated into two major groups; granulocytes and agranulocytes, based on the density of their cytoplasmic granules.


Monocyte
Eosinophil
Lymphocyte
Neutrophil
Basophil

White blood cells (WBC)

Specific WBC	Function	Deferential %
Neutrophil	General phagocytosis: acute bacterial infections	54-62%
Eosinophil	Kills parasites, allergic condition	1-3 %
Basophil	Release heparin and histamine	< 1%
Monocyte	Phagocytosis of large particles in typhoid, malaria	3-9%
Lymphocyte	Produce antibody	25-33%

Neutrophils: They kill and digest bacteria, fungi and foreign debris, and protect against bacterial and fungal infections.

Lymphocytes: They create antibodies to fight against bacteria, viruses, and other harmful invaders, and consist of T cells, natural killer cells and B cells.

Monocytes: They break down bacteria and have a longer lifespan than many white blood cells.

Eosinophils: They identify and destroy parasites, cancer cells and assist basophils with allergic responses.

Basophils: They are responsible for responses to allergens and release histamine and heparin.

C. Blood platelets (or thrombocytes)

Blood platelets (or thrombocytes) are very small, 2-4 µm in diameter, non-nucleated, membrane-bound cells derived from the cytoplasm of megakaryocytes in the red bone marrow.

Even though platelets like RBCs have no nucleus, their cytoplasm is packed with granules containing a variety of substances that promote blood clotting.

The normal blood platelet count in humans is between (200 000–350 000/mm3).

The life span of platelets is between 8 and 11 days, and those not used in clotting are destroyed by macrophages, mainly in the spleen.