

Blood

In humans, the average blood volume is 5 liters, constituting 7% of the body mass. Blood is a specialized connective tissue consisting of cells and cell fragments (46% of blood volume) floating in a unique liquid extracellular matrix(plasma) (54% of blood volume).

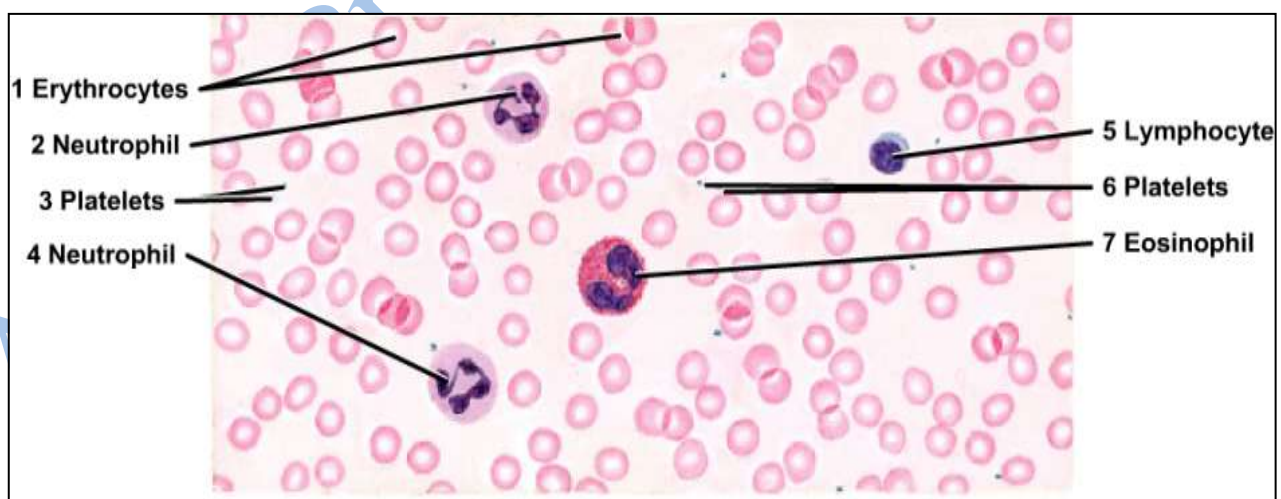
Components

Cells and cell fragments

- _ Red blood cells (erythrocytes, RBCs), produced in the bone marrow
- _ White blood cells (leukocytes, WBCs), produced in the bone marrow and lymphoid tissues and organs.
- _ Platelets.(Thrombocytes) .Cell fragments derived from megakaryocytes in the bone Marrow, contain granules and function in blood coagulation; 150,000–450,000 per micro liter blood

Plasma.

Constitutes the extracellular matrix of blood . Composed of 90% water and 8–9% protein. Plasma proteins contains fibrinogen, a fiber precursor protein, which is converted into fibrin when blood clots. Serum(Yellowish fluid remaining after blood has clotted).



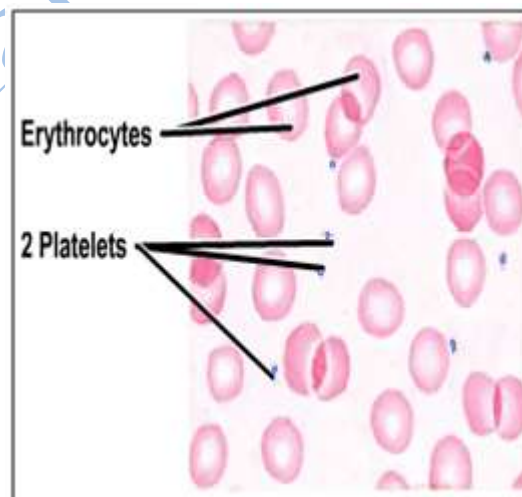
Blood smear

Blood cells transport gases ,nutrients , wastes products ,hormones ,antibodies , various chemicals , ions and other substance in the plasma to and from different cells in the body
The major blood cells are:-

- 1- Erythrocytes (Red Blood Cells- RBC)
- 2- Leukocytes (White Blood Cells – WBC)
- 3- Thrombocytes (Platelets)

1-Red Blood Cells(RBC)

(RBC) resemble bi-concave discs, 6–8 microns in diameter; 4–6 million per micro liter of blood . Cells are non-nucleated. Cytoplasm contains hemoglobin and cytoskeletal elements but lacks other organelles. Transport oxygen and carbon dioxide. the life span of RBC 120 days . Mature RBC are specialized to transport oxygen O₂ and carbon dioxide CO₂ which depend on the presence of protein hemoglobin .



2-Thrombocytes

Are cytoplasmic remnants of large bone marrow cells called megakaryocytes , thrombocytes are the smallest cells in the blood nonnucleated cytoplasmic remnants . The main function of platelets, its adhere to the damaged site and initiate a complex process that result information of a blood clot .

3- White Blood Cell (WBC) Leukocytes

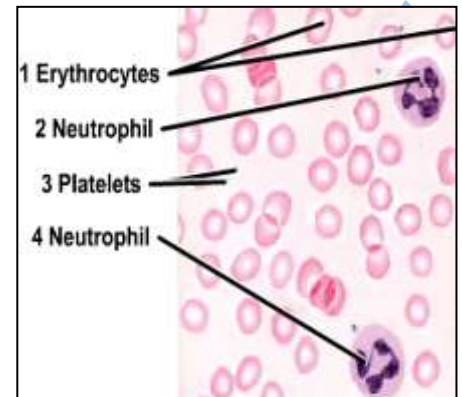
WBCs have a short life span in the blood vessels approximately 10 hours and then enter the connective tissue where there survive 2-3 days . Are transported in the blood and migrate through vessel walls (diapedesis) to become active in connective

tissues; 5–10 thousand per micro liter of blood.. The main function of WBC is phagocytosis . there are two types of WBC :-

1-Granular leukocytes

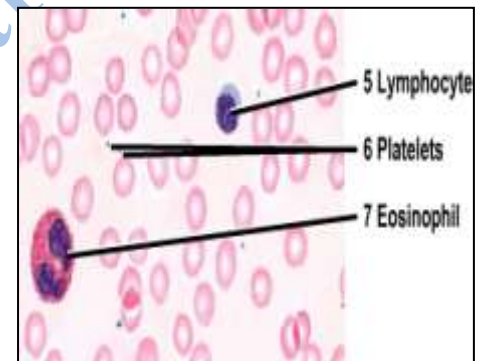
a-Neutrophils :-

46–81% of circulating WBCs Spherical cell, 12–15 microns in diameter; pale or unstained cytoplasmic granules; heterochromatic nucleus with (3-5)lobes Move from the blood to sites of infection Phagocytose bacteria and debris



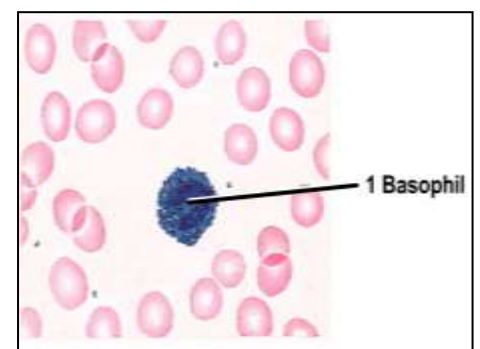
b-Eosinophil

1–3% of circulating WBCs Spherical cell, 12–15 microns in diameter; cytoplasmic granules stain with eosin; bi-lobed nucleus Move from the blood to sites of infection . Secrete proteins cytotoxic to parasites, neutralize histamine, and internalize antigen-antibody complexes.



c-Basophils

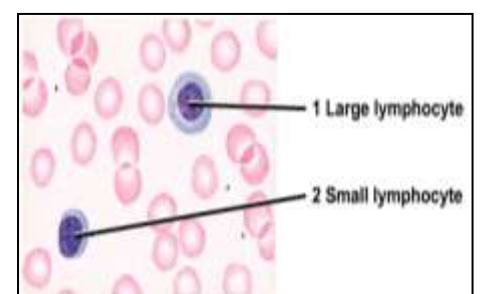
<1% of circulating WBCs Spherical cell, 12–15 microns in diameter; cytoplasmic granules stain dark blue with hematoxylin; S-shaped nucleus Similar to mast cells; participate in the hypersensitivity reaction by secreting histamine and heparin



2-A granular leukocytes

a-Lymphocyte

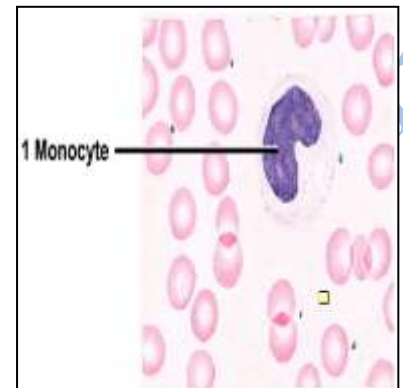
A granular leukocytes 24–44% of circulating WBCs



Spherical cell, 6–8 microns in diameter; scant cytoplasm have a few or no cytoplasmic granular, it's vary in size(small ,large) , two types T and B lymphocytes

b- Monocytes

3–7% of circulating WBCs Are largest a granular leukocytes . Large spherical cells, 12–18 microns in diameter; abundant cytoplasm stains gray-blue; large, U-shaped, Enter connective tissue, where they transform into macrophages; function in phagocytosis and antigen presentat.

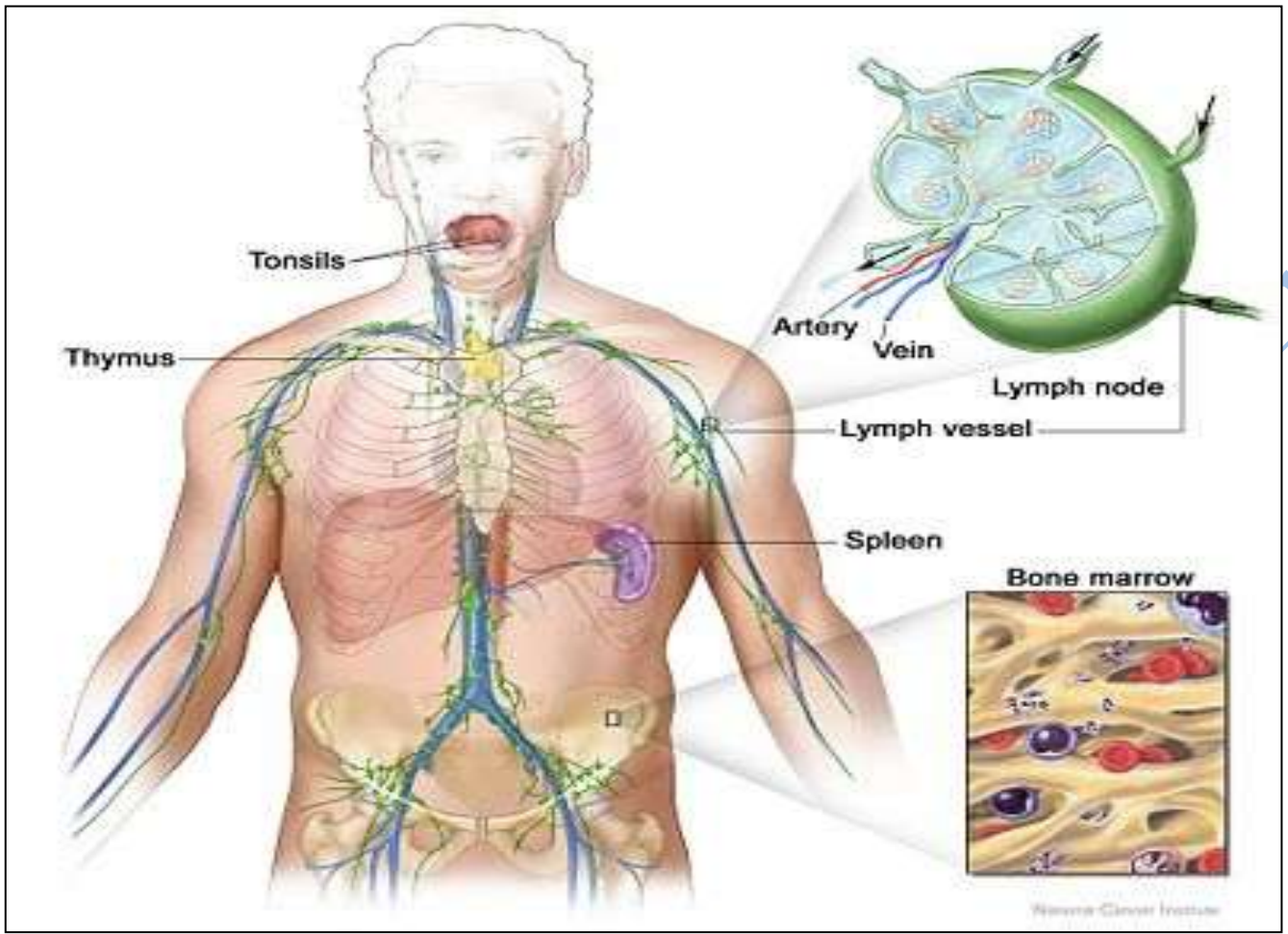


Steps of Hemopoiesis in the bone marrow

LYMPH

Lymph is tissue fluid that enters the lymphatic vessels. It drains into the venous blood via the thoracic and right lymphatic ducts. It contains clotting factors . It also contains proteins that traverse capillary walls and return to the blood via the lymph. Its protein content is generally lower than that of plasma, which contains about 7 g/dL, but lymph protein content varies with the region from which the lymph drain.

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Assist Prof.Dr.