Lecture 11: WBC

- The second important type of blood cell components, although called leukocytes, they are important to body defense against pathogenic agents..
- They account for less than 1 percent of total blood volume
- White Blood Cells (WBCs), also known as leukocytes, are a critical component of the immune system. They help protect the body against infections, foreign invaders, and abnormal cells.

Types of WBCs

That classified into two major groups, depending on whether or not they contain visible granules in their cytoplasm after staining (figure 1).There are five main types of WBCs, categorized into two groups: granulocytes and agranulocytes.

A.Granulocytes (contain granules in their cytoplasm)

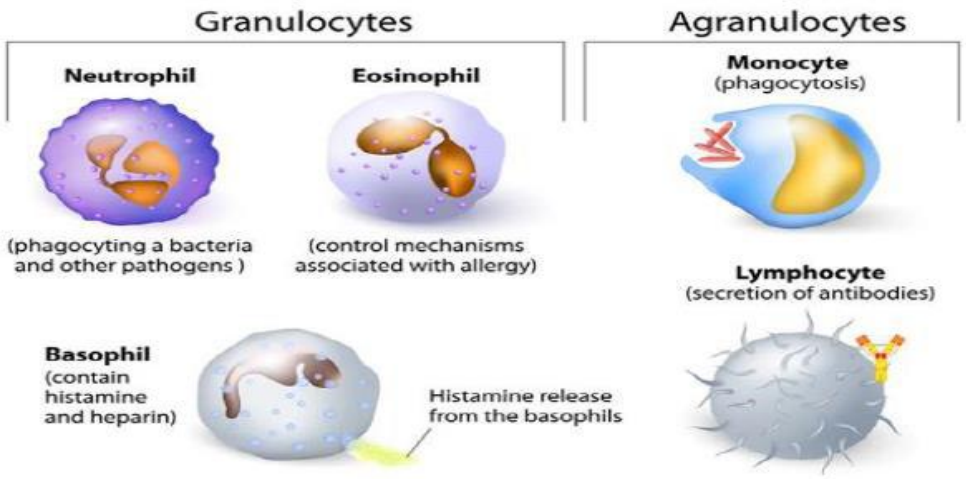

Figure 1
Leukocyte types

1. Neutrophils have a multilobed nucleus (3-5 lobes) and very fine granules that respond to both acid and basic stains. Consequently, the cytoplasm as a whole stains pink.
2. Eosinophils have a bilobed blue-red nucleus that resembles an old fashioned telephone receiver and large red cytoplasmic granules. Their number increases rapidly during allergies and infections by parasitic worms (flat-worms, tapeworms, etc.(.
3. Basophils, the rarest of the WBCs, have S shaped nucleus contain large histamine-containing granules that stain dark blue. Histamine is an inflammatory chemical that makes blood vessels leaky and attracts other WBCs to the inflammatory site

B.Agranulocytes (lack visible granules)

1.Lymphocytes have a large dark purple nucleus that occupies most of the cell volume. Only slightly larger than RBCs, lymphocytes reside in lymphatic tissues, where they play an important role in the immune response, there are two types of lymphocytes:

*T lymphocytes: provide cell mediated immunity, Percentage 60-80% from all lymphocyte percentage, site of production: bone marrow, site of developing thymus

*B lymphocytes: provide humoral immunity, it has Percentage 20% of all lymphocyte, site of production: bone marrow site of developing: the secondary lymphoid organs (spleen,lymph nodes.(

2.Monocytes are the largest of the WBCs, that has abundant cytoplasm and indented (kidney like) nucleus. Immature monocyte in the peripheral blood and cannot fight infections, after they stay 2-3 days in the peripheral blood they migrate into the tissues to form Macrophage.

Monocyte take new name when enter to different tissue:

١-Macrophages in the Lymph Nodes 2-Alveolar Macrophages in the Lungs

3-Kupffer Cells Macrophages in the Liver Sinusoids 4-Macrophages of the Spleen and Bone Marrow 5-Microglia in brain

Normal WBC Count

• Adults: 4,000–11,000 cells/µL of blood. when increase that may refer to inflammation or Patients with acute or even chronic leukemia may come in with a white blood cell count up into the 100,000-400,000 range).

•Leukocytosis: High WBC count (infections, inflammation, stress).

• Leukopenia: Low WBC count (immune suppression, bone marrow issues).

Functions of White Blood Cells

1. Defense Against Pathogens: Recognize and eliminate bacteria, viruses, fungi, and parasites.
2. Inflammatory Response: Release chemical signals to recruit other immune cells.
3. Tissue Repair: Assist in healing damaged tissues.
4. Immune Memory: Lymphocytes remember past infections for faster response.

Phagocytosis Steps- :

A- chemotaxis: Include chemical signals release by foreign body and tissues damage, induce phagocytic cell to mobilize and rush to site of infection.

B- opsonizaton: It needs the help of IgG+C3 to make it easily recognized by phagocytic cell and ingested.

C- ingestion: The foreign body is engulfed pseudopod membranes (phagosome formation).

D-killing: The foreign body killed by specific enzymes (phagolysosome).

Disorders Associated with WBCs

1. Leukemia: Cancer of the WBCs, leading to abnormal growth.
2. Lymphoma: Cancer affecting lymphocytes.
3. Neutropenia: Low neutrophil count, increasing infection risk.
4. Eosinophilia: Elevated eosinophil count, often due to allergies or parasites.

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