**Ministry of Higher Education And Scientific Research Al-Mustaqbal University College**

**Department of Pathological analysis techniques**

**White Blood Cells**

**Lec 13 3ed stage**

**Hematology**

#### Leucocytes in the human body

White blood cells are a group of cells circulating in the peripheral blood

Divided into two systems 1-Phagocytic system are

Neutrophils, Eosinophils, Basophils Mononuclear phagocytic cells

2-The non-phagocytic system (Lymphocytes) B-cells .T-cells

-The normal adult human leukocyte count in peripheral blood is 4.0-10.0 x 109/L.



**Cells distribution**

1-In bone marrow: RBC:WBC=1:5 2-In Circulation: RBC:WBC=500:1



**1 Granulocytes:**

are a group of white blood cells characterized by the presence of granules in their cytoplasm

**They are 3 types:**

**1-Neutrophils**

Polysegmented nucleus (3-5 lobes)

**Enzymes,** Peroxidase reacting enzyme, and Alkaline phosphates

**Percentage**. 40-65 %,

**Function** ,Kill bacteria, Called pus cells

**Storage place1-** Mainly in Bone marrow 2- inside wall of vessels (veins) 3- spleen



**Stages of granular white cell phagocytosis**

In the presence of bacterial or fungal infections, the neutrophil is activated

###### A- CHEMOTAXIS:

chemical signals sent by foreign body, More neutrophils mobilize and rush to site of infection.

###### B- OPSONIZATON:

needs the help of IgG+C3 to make it easily recognized by neutrophil and ingested.

###### C- INGESTION:

The foreign body is engulfed by the neutrophilic pseudopod membranes

###### D-KILLING:

the foreign body killed by the neutrophilc enzym

**2-Eosinophilic**

2 lobes, content**:** histamine, serotonin, and heparin etc.

**Function** is defense Against parasites; and allergic cases.

**3-Basophilic**

Nucleus: 2 lobes ,content: histamine, serotonin, and heparin, Function :*increase vascular permeability* , the basophils in the tissue called mast cell( more specific cells)

contain acid phosphatase, alkaline phosphatase, and protease.



**4-Monocytes**

**Immature** cell in the peripheral blood and cannot fight infectious , After they stay 2-3 days in the peripheral blood they migrate into the tissues to form ***Macrophage.***

**it take new name in that tissue**

1-**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

**Function of Macrophage (Monocyte) :**

1-Defense against bacteria, fungi, viruses, and foreign bodie 2-Remove the dead cells from tissue and circulation

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**Phagocytosis by Macrophages**

1. Much more **powerful** than neutrophils,Can phagocytoze more bacteria
2. Engulf much larger particles (ex.leishmania and toxoplasma), malarial parasites

**Lymphocytes**

Types: two major groups T and B lymphocytes, non granular, has one rounded nucleus General function: responsible for the immunity in the body

**T-lymphocytes** :(Thymus)

Percentage of all lymphocyte: 60-80%, Site of production: Bone marrow, Site of developing: thymus Function: The main immune cell responsible for cellular immunity.

**B-lymphocytes** :(Bone marrow)

B lymphocytes mature in the bone marrow Percentage 20% of all lymphocyte: 20%

Site of production: Bone marrow Site of developing: the secondary lymphoid organs (spleen, lymph nodes, etc)

**Function**: humoral immunity (against viruses, bacteria, and allergens) secreting plasma cells, to produce antibodies