

## **The Blood**

Is a type of C-T in which the cells are suspended in fluid called plasma. The cells are circulating in the plasma including the Erythrocytes (red blood cells) and Leukocytes (white blood cells) and the platelets.

Blood transporting O<sub>2</sub> and CO<sub>2</sub>, metabolites, hormones and other substances to cells throughout the blood vessels, O<sub>2</sub> is bound mainly to hemoglobin in erythrocytes and is much abundant in arteries than veins, blood is also participates in heat distribution, the regulation of both temperature and the maintain of acid-base balance and osmosis.

Leukocytes are assist for the body defense against infections. These cells are spherical with nuclei and could be migrate into the tissue for defensive capabilities.

### **Composition of Plasma (serum):**

It is an aqueous solution, its PH is 7.4, it make up 7% of the total blood volume. It has plasma proteins, nutrients, respiratory gases, nitrogenous waste products, hormones, inorganic ions, collectively called electrolytes.

The main plasma proteins include:

- 1- Albumin, made by liver and assist for formation of prothrombin and fibronectin.
- 2- Globulin, immunoglobulin (AB<sub>2</sub>) secreted by plasma cells.
- 3- Fibrinogen, plasma protein, transform into fibrin assist for blood clot.
- 4- Complement protein, assist for destruction of microorganism in case of inflammation.

### **Blood cells:**

#### **1- Erythrocytes (RBCs)**

A nucleated cells, completely filled with O<sub>2</sub>, carrying protein hemoglobin, its function only inside the B-VS, these cells are biconcave discs, its diameter is about 7.5 mm, thicken 2.6 mm, its shape as biconcave facilitate large surface for gas exchange.

The total number in blood is about 3.9-5.5 million per microliter or mm<sup>3</sup> in male, and 4.1-6 million/ml in female.

Erythrocytes are flexible which permits them to bend and accommodate to the pass through irregular turns and small diameters of capillaries. In large blood vessels RBCs often adhere to one another loosely in stacks called Rouleaux. The plasma membrane of RBCs consist of 40% lipids, 20% CHO, 40% proteins. The cytoplasm lacks all organelles and filled with Hb combined with O<sub>2</sub> to form oxy-hemoglobin or with CO<sub>2</sub> to form carboxy hemoglobin, those structures are reversible for perform gas exchange but combination of Hb with CO is irreversible which reduce the cells capacity to transport O<sub>2</sub>. The life span of RBC is about 120 days.

## 2- Leukocytes (WBCs):

Leave the blood to the tissue to perform activities related to immune response, these WBCs are divided into granular or a granular cells according to the presence or no of the granules in its cytoplasm, when leave the blood stream they become amoeboid and motile and invading the tissue.

## 3- Granulocytes:

Possess granules in its cytoplasm called (A zurophilic granules). it have polymorphic nuclei with 2-3 nuclear lobes and includes Neutrophils, Eosinophils and Basophils.

In the cytoplasm of the cells, the Golgi apparatus and RER are poorly developed, they have few mitochondria, these cells are normally die by apoptosis in the C-T and billions of Neutrophils die by apoptosis every day in the adult human, the resulting cellular Debris is removed by macrophage. (The apoptosis

## 4- Agranulocytes:

Doesn't have specific granules, they don't have a zurophilic granules in its cytoplasm, the nucleus is spherical or indented but not lobulated, this group includes lymphocytes and monocytes, all leukocytes are play important role in the defense against invading microorganisms and in the repair of injured tissues, it leave the micro vascular sites of injured or infected tissue and the cytokines are released from various sources trigger loosening of inter cellular sanctions, the endothelial cells of local post capillary venules.

## 5- Diapedesis:

The WBC send extensions through the opening between the endothelial cells, migrate out of the venules into the surrounding tissue space and leave directly for the site of injury or invasion. The number of WBC in the blood varies according to age, sex and physiologic conditions, healthy adult have 4500-11000 WBC per microliter of blood.



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