

## CORPUSCULAR ELEMENTS OF BLOOD

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**Abstract:** Blood is a specialized connective tissue that plays a vital role in the transport of gases, nutrients, hormones, and waste products throughout the human body. It is composed of plasma and formed elements, which include red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes). These formed elements make up about 45% of the blood volume and are essential for maintaining homeostasis, immune defense, and tissue repair. Understanding the structure, function, and pathology of these cellular components is crucial for comprehending the physiological mechanisms of life and disease.

**Keywords:** erythrocytes (red blood cells), leukocytes (white blood cells), and thrombocytes (platelets).

### **Composition of Blood**

Blood consists of two primary components: plasma and formed elements. Plasma makes up approximately 55% of total blood volume and contains water, proteins, electrolytes, and dissolved substances. The remaining 45% comprises the formed elements—red blood cells, white blood cells, and platelets. These cellular components are produced in the bone marrow through a process known as hematopoiesis.

### **Red Blood Cells (Erythrocytes)**

Red blood cells are biconcave, anucleate cells that function primarily in oxygen transport. Each cell contains hemoglobin, an iron-containing protein that binds oxygen in the lungs and releases it to tissues. The lifespan of an erythrocyte is approximately 120 days, after which it is removed from circulation by the spleen and liver. The production of RBCs is regulated by erythropoietin, a hormone secreted by the kidneys in response to hypoxia. Disorders such as anemia, polycythemia, and sickle cell disease can result from abnormalities in red blood cell count or function.

### **White Blood Cells (Leukocytes)**

White blood cells are key components of the immune system and protect the body against infectious agents and foreign substances. Leukocytes are divided into two major groups: granulocytes and agranulocytes. Granulocytes include neutrophils, eosinophils, and basophils, each with distinct roles in inflammation and defense. Agranulocytes consist of lymphocytes and monocytes. Lymphocytes, including T cells, B cells, and natural killer cells, play vital roles in adaptive immunity, while monocytes differentiate into macrophages that engulf pathogens and cellular debris.

### **Platelets (Thrombocytes)**

Platelets are small, anucleate fragments derived from megakaryocytes in the bone marrow. They play an essential role in hemostasis—the process that prevents blood loss after vascular injury. When a blood vessel is damaged, platelets adhere to the exposed collagen fibers, aggregate, and release chemical mediators that promote clot formation. Deficiencies or dysfunctions in platelets can lead to bleeding disorders such as thrombocytopenia or excessive clotting conditions like thrombosis.

### **Functions of the Formed Elements**

The formed elements of blood collectively contribute to vital physiological functions. Red blood cells ensure efficient oxygen and carbon dioxide exchange, white blood cells defend the body against infection and disease, and platelets maintain vascular integrity. Together, they regulate pH, temperature, and osmotic balance, supporting homeostasis in the human body.

### Disorders Related to Blood Cells

Various disorders can affect the formed elements of blood. Anemia results from a decreased number of red blood cells or hemoglobin, leading to reduced oxygen transport. Leukemia is a malignancy of white blood cells characterized by uncontrolled proliferation of immature leukocytes. Thrombocytopenia causes abnormal bleeding due to a deficiency of platelets, while thrombocytosis increases the risk of clot formation. Studying these conditions provides insight into the critical roles that blood cells play in maintaining health.

### Recent Research and Advances

Recent scientific advancements have expanded our understanding of hematopoiesis and blood cell regulation. Stem cell research has revealed new possibilities for regenerative medicine, allowing scientists to generate functional blood cells in vitro. Genetic studies have identified molecular pathways involved in anemia, leukemia, and thrombosis, leading to the development of targeted therapies. Additionally, artificial blood substitutes and improved transfusion methods are being investigated to enhance patient care and reduce complications.

### Conclusion

The formed elements of blood—erythrocytes, leukocytes, and thrombocytes—are indispensable for sustaining life. They work synergistically to transport gases, fight infections, and prevent blood loss. Disruptions in their formation or function can lead to serious health issues. Continued research in hematology is essential to deepen our understanding and improve the diagnosis and treatment of blood-related diseases.

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