JOURNAL OF INTERNATIONAL SCIENTIFIC RESEARCH
Volume 2, Issue 4, February, 2025 Online ISSN: 3030-3508
https://spaceknowladge.com

CORPUSCULAR ELEMENTS OF BLOOD

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ARTICLE INFO

ARTICLE HISTORY:
Received:07.02.2025
Revised: 08.02.2025
Accepted:09.02.2025

KEYWORDS:
Educational institutions, Medical profession, Cardiovascular system, Respiratory system, Healthy lifestyle, Prevention, Health, Medical education, Disease prevention, Physiology

ABSTRACT:

Blood is a vital fluid composed of plasma and corpuscular elements, which include red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes). These formed elements perform essential physiological functions such as oxygen transport, immune defense, and hemostasis. Erythrocytes, the most abundant corpuscular element, specialize in gas exchange through hemoglobin, while leukocytes provide immune protection via various cellular mechanisms. Platelets play a crucial role in coagulation and wound healing, preventing excessive blood loss. This article explores the structural and functional characteristics of corpuscular elements, their production processes in hematopoiesis, and their significance in maintaining homeostasis. Understanding these elements is essential for diagnosing and managing hematological disorders, which can impact overall health and disease progression.

INTRODUCTION. Blood is a vital fluid that sustains life by transporting oxygen, nutrients, hormones, and waste products throughout the body. It consists of two main components:

Plasma – The liquid portion, making up about 55% of blood volume.

Corpuscular Elements – The cellular components, which include:

Red Blood Cells (Erythrocytes) – Responsible for oxygen transport.

White Blood Cells (Leukocytes) – Essential for immune defense.

Platelets (Thrombocytes) – Play a crucial role in blood clotting.

The corpuscular elements are produced in the bone marrow through a process called hematopoiesis. Their balance and function are critical for maintaining homeostasis and preventing disease.

Red Blood Cells (Erythrocytes)

Structure and Composition

Erythrocytes are the most abundant blood cells, characterized by their biconcave shape, which increases surface area for gas exchange and enhances flexibility in capillaries. These cells lack a nucleus and organelles, allowing maximum space for hemoglobin (Hb), the protein responsible for oxygen transport.

Functions

Oxygen Transport: Hemoglobin binds oxygen in the lungs and delivers it to tissues.

Carbon Dioxide Removal: RBCs help transport CO_2 back to the lungs for exhalation.

pH Regulation: Hemoglobin assists in maintaining blood pH balance.

Erythropoiesis (RBC Production)

RBCs are formed in the bone marrow from hematopoietic stem cells (HSCs).

The hormone erythropoietin (EPO), released by the kidneys, stimulates RBC production in response to low oxygen levels.

The lifespan of an RBC is approximately 120 days, after which they are broken down in the spleen and liver.

White Blood Cells (Leukocytes)

Leukocytes are immune cells that protect the body against infections, toxins, and abnormal cells. They are divided into granulocytes and agranulocytes, based on the presence of cytoplasmic granules.

Granulocytes (Contain Granules in Cytoplasm)

Neutrophils (50-70%) – The first responders to infections, performing phagocytosis.

Eosinophils (2-4%) – Combat parasitic infections and regulate allergic responses.

Basophils (<1%) – Release histamine, playing a role in inflammation and allergies.

Agranulocytes (Lack Granules in Cytoplasm)

Lymphocytes (20-40%) – Include B cells (produce antibodies) and T cells (directly attack infected cells).

Monocytes (2-8%) – Differentiate into macrophages, aiding in long-term immune defense.

Platelets (Thrombocytes)

Structure and Function

Platelets are small, cell fragments derived from megakaryocytes in the bone marrow. They lack a nucleus but contain enzymes and proteins essential for clot formation.

Functions

Blood Clotting: Platelets adhere to damaged blood vessels, forming a temporary plug.

Wound Healing: Release growth factors that promote tissue repair.

Inflammatory Response: Interact with immune cells during infections. The corpuscular elements of blood—erythrocytes, leukocytes, and thrombocytes—are crucial for maintaining physiological stability. Erythrocytes ensure oxygen delivery, leukocytes provide immune defense, and thrombocytes regulate clotting. Disruptions in their function can lead to serious health conditions, including anemia, immune deficiencies, and clotting disorders. Understanding their roles and production mechanisms is fundamental in diagnosing and treating hematological diseases.

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