

CORPUSCULAR ELEMENTS OF BLOOD

Scientific supervisor: Asatullayev Rustamjon Baxtiyarovich

Student: Maxmonov Temurbek Lutfullayevich

Abstract: *Blood is a vital fluid responsible for oxygen transport, immune defense, and homeostasis. It is composed of plasma (55-60%) and formed elements (40-45%), including erythrocytes (red blood cells), leukocytes (white blood cells), and thrombocytes (platelets). Hemoglobin, found in erythrocytes, plays a crucial role in oxygen and carbon dioxide exchange. Leukocytes provide immunity against infections, while platelets facilitate blood clotting. Osmotic pressure, blood viscosity, and pH levels regulate fluid balance and circulation. Understanding blood composition and disorders such as anemia, erythrocytosis, leukocytosis, leukopenia, thrombocytopenia, and hemolysis is essential for medical diagnostics and treatment.*

Keywords: *Blood composition, plasma, erythrocytes, red blood cells, leukocytes, white blood cells, thrombocytes, platelets, hemoglobin, oxygen transport, carbon dioxide exchange, blood viscosity, osmotic pressure, blood pH, homeostasis, anemia, erythrocytosis, leukocytosis, leukopenia, thrombocytopenia, hemolysis, immune system, blood clotting, hemostasis, blood circulation, blood disorders, fibrinogen, albumin, globulins, hypoxia.*

Blood is one of the most vital biological fluids in the human body. It plays a crucial role in maintaining life by transporting oxygen and nutrients to cells, removing metabolic waste products, and supporting the immune system. The composition and properties of blood ensure its proper functioning in maintaining homeostasis.

Human blood consists of approximately 5.2 liters and is composed of two main parts: plasma and formed elements. Plasma makes up about 55-60% of blood and is mainly water, proteins, and dissolved substances. The formed elements, which constitute 40-45%, include erythrocytes (red blood cells), leukocytes (white blood cells), and platelets. These elements are produced in the hematopoietic organs, such as the bone marrow, and play essential roles in blood function.

The specific density of blood is slightly higher than that of water, ranging from 1.050 to 1.060 g/cm³, while plasma density is between 1.025 and 1.034 g/cm³. Blood viscosity is 5.0, meaning it is five times thicker than water. This viscosity is mainly due to the presence of proteins and erythrocytes. Loss of water due to sweating, vomiting, or diarrhea increases blood viscosity, which can affect circulation and overall health.

Erythrocytes are biconcave disc-shaped cells responsible for oxygen transport. This shape increases their surface area, facilitating efficient gas exchange. The size of erythrocytes varies, with a diameter of 7.5-8.3 μm and a thickness of 2.1 μm at the edges. The normal erythrocyte count is about $4.5\text{-}5.0 \times 10^{12}/\text{L}$ in men and slightly lower in women. A decrease in erythrocyte count is called erythropenia, while an increase is known as erythrocytosis.

The main component of erythrocytes is hemoglobin, a protein that binds to oxygen and carbon dioxide. Hemoglobin consists of globin (protein part) and heme (iron-containing part). The normal hemoglobin level is 130-160 g/L in men and 120-140 g/L in women. Hemoglobin also acts as a buffer, helping maintain blood pH balance. A deficiency of hemoglobin leads to anemia, while excessive hemoglobin may indicate polycythemia.

Blood has an osmotic pressure of about 7.6-8.1 atm, with 60% of it being due to dissolved sodium chloride. The osmotic balance is crucial for the exchange of water and salts between blood, intracellular, and extracellular fluids. A 0.9% sodium chloride solution is considered isotonic, meaning it maintains normal cell function. A hypertonic solution (higher salt concentration) causes erythrocytes to shrink due to water loss, while a hypotonic solution (lower salt concentration) makes them swell and burst, leading to hemolysis. The kidneys and skin regulate osmotic pressure by adjusting urine excretion and sweating.

Leukocytes, or white blood cells, are immune system cells responsible for protecting the body from infections. They have a nucleus and vary in size from 8 to 20 μm . The normal leukocyte count in adults is $4.0\text{-}9.0 \times 10^9/\text{L}$. An increase in leukocyte count is called leukocytosis, which may occur due to infections, physical exertion, or stress. A decrease, known as leukopenia, weakens the immune system and may result from radiation exposure or certain infections.

Leukocytes are divided into two main groups:

1. Granulocytes (neutrophils, eosinophils, basophils) – named based on their staining properties.
2. Agranulocytes (lymphocytes and monocytes) – play essential roles in immune response.

The leukocyte formula represents the percentage of different white blood cells in the blood, which helps diagnose infections and immune disorders.

Conclusion

Blood is a complex and vital fluid that supports the body's essential functions. It maintains oxygen transport, immune defense, and osmotic balance, ensuring the proper functioning of all organs. Understanding the composition and properties of blood helps in diagnosing and treating various medical conditions, making it one of the most studied components in human physiology.

REFERENCES:

1. Guyton, A. C., & Hall, J. E. (2016). Textbook of Medical Physiology (13th ed.). Elsevier.
2. Tortora, G. J., & Derrickson, B. (2020). Principles of Anatomy and Physiology (16th ed.). Wiley.
3. Marieb, E. N., & Hoehn, K. (2018). Human Anatomy & Physiology (11th ed.). Pearson.
4. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). Molecular Biology of the Cell (6th ed.). Garland Science.
5. Hoffbrand, A. V., Moss, P. A. H., & Pettit, J. E. (2019). Essential Haematology (7th ed.). Wiley-Blackwell.