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CORPUSCULAR ELEMENTS OF BLOOD

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ABSTRACT:

Blood is a specialized connective tissue that performs essential physiological functions in the human body. It consists of plasma and corpuscular elements, also known as formed elements, which include erythrocytes, leukocytes, and thrombocytes. These cellular components are produced mainly in the bone marrow through hematopoiesis and play important roles in transportation, protection, and hemostasis. Erythrocytes are responsible for carrying oxygen and carbon dioxide through the action of hemoglobin. Leukocytes provide immune defense against pathogens and participate in inflammatory reactions, while thrombocytes ensure blood coagulation and prevention of excessive blood loss. The quantity, structure, and function of these corpuscular elements are important indicators of health and disease. Abnormalities in blood cells may lead to anemia, infections, immune disorders, leukemia, thrombosis, and hemorrhagic conditions. Modern hematological investigations allow early diagnosis and monitoring of many pathological processes through the study of blood components. The investigation of corpuscular elements is therefore significant in physiology, pathology, hematology, and clinical medicine. Understanding the morphology and functions of blood cells contributes to the

development of effective diagnostic and therapeutic approaches in modern healthcare.

Blood is one of the most important tissues of the human organism and serves as the internal environment that ensures the continuity of life processes. It circulates through blood vessels and connects all organs and systems into a unified functional structure. Blood performs numerous vital functions such as transportation of respiratory gases, nutrients, hormones, metabolic products, and biologically active substances. It also plays a major role in thermoregulation, maintenance of acid-base balance, water-electrolyte equilibrium, immune protection, and hemostasis. Blood consists of two main components: plasma and corpuscular elements. Plasma is the liquid part containing water, proteins, electrolytes, hormones, enzymes, and waste products, while corpuscular elements are represented by blood cells and cell fragments suspended in plasma.

The corpuscular elements of blood include erythrocytes, leukocytes, and thrombocytes. These formed elements originate primarily in the red bone marrow from hematopoietic stem cells through a complex process called hematopoiesis. The formation and maturation of blood cells are regulated by various growth factors, cytokines, and hormones. Proper functioning of corpuscular elements is essential for maintaining normal physiological conditions in the body.

Erythrocytes, commonly known as red blood cells, are the most numerous corpuscular elements in human blood. In adults, their average number is approximately 4–5.5 million cells per microliter of blood. Erythrocytes are non-nucleated cells with a characteristic biconcave disc shape. This morphology increases the surface area available for gas exchange and allows the cells to pass through narrow capillaries efficiently. The cytoplasm of erythrocytes contains hemoglobin, an iron-containing protein responsible for oxygen transport.

The primary function of erythrocytes is the transportation of oxygen from the lungs to tissues and carbon dioxide from tissues back to the lungs. Hemoglobin binds oxygen molecules in pulmonary capillaries and releases them in peripheral tissues according to metabolic demands. Carbon dioxide is transported partly dissolved in plasma, partly as bicarbonate ions, and partly bound to hemoglobin. Erythrocytes also contribute to acid-base balance through buffering mechanisms.

The lifespan of erythrocytes is approximately 120 days. Old or damaged erythrocytes are destroyed mainly in the spleen, liver, and bone marrow by macrophages of the reticuloendothelial system. Hemoglobin released from destroyed erythrocytes undergoes

decomposition into globin, iron, and bilirubin. Iron is reused for synthesis of new hemoglobin molecules, while bilirubin is excreted through the liver into bile.

Disorders affecting erythrocytes may result in serious pathological conditions. Anemia develops when the number of erythrocytes or the concentration of hemoglobin decreases below normal levels, reducing oxygen transport capacity. Iron deficiency anemia, megaloblastic anemia, hemolytic anemia, and aplastic anemia are common forms of this condition. Polycythemia, on the other hand, is characterized by an increased number of erythrocytes and elevated blood viscosity. Genetic disorders such as sickle cell anemia and thalassemia alter erythrocyte structure and function, leading to chronic health complications.

Leukocytes, or white blood cells, are nucleated cells responsible for protecting the body against infections and foreign substances. Their number in peripheral blood is much lower than erythrocytes and normally ranges from 4,000 to 10,000 cells per microliter. Leukocytes possess the ability to migrate through blood vessel walls into tissues, where they participate in immune and inflammatory responses.

Leukocytes are divided into two major groups: granulocytes and agranulocytes. Granulocytes include neutrophils, eosinophils, and basophils, while agranulocytes consist of lymphocytes and monocytes. Each type has distinct structural characteristics and functions.

Neutrophils are the most abundant leukocytes and serve as the first line of defense against bacterial infections. They possess phagocytic activity and destroy microorganisms through enzymatic digestion. During acute infections, the number of neutrophils often increases significantly. Eosinophils participate in allergic reactions and defense against parasitic infections. They release enzymes and inflammatory mediators that contribute to immune responses. Basophils contain histamine and heparin within cytoplasmic granules and are involved in allergic and inflammatory reactions.

Lymphocytes are central components of the adaptive immune system. They include T lymphocytes, B lymphocytes, and natural killer cells. T lymphocytes regulate cellular immunity and destroy infected or abnormal cells. B lymphocytes produce antibodies that neutralize pathogens and toxins. Natural killer cells attack virus-infected and tumor cells without prior sensitization. Monocytes are large leukocytes that migrate into tissues and transform into macrophages. Macrophages perform phagocytosis, remove dead cells, and present antigens to lymphocytes.

Abnormalities in leukocyte count or function are associated with various diseases. Leukocytosis refers to an increased leukocyte count and may occur during infections, inflammation, trauma, or leukemia. Leukopenia indicates decreased leukocyte levels and can

result from bone marrow suppression, viral infections, radiation exposure, or certain medications. Leukemia is a malignant disorder characterized by uncontrolled proliferation of abnormal white blood cells in bone marrow and blood.

Thrombocytes, also called platelets, are small non-nucleated cell fragments derived from megakaryocytes in the bone marrow. Their normal concentration ranges from 150,000 to 400,000 per microliter of blood. The average lifespan of platelets is about 7–10 days. Although platelets are smaller than other blood cells, they play a critical role in hemostasis and blood coagulation.

When blood vessels are damaged, platelets adhere to the injured endothelial surface and aggregate to form a temporary platelet plug. They release biologically active substances such as serotonin, thromboxane, and platelet-derived growth factor, which promote vasoconstriction and coagulation. Platelets also interact with coagulation factors to form fibrin clots that stabilize the damaged vessel wall and prevent blood loss.

Disorders involving thrombocytes can lead to bleeding or thrombotic complications. Thrombocytopenia is characterized by decreased platelet count and increased risk of hemorrhage. Causes may include bone marrow diseases, autoimmune disorders, infections, and certain drugs. Thrombocytosis refers to excessive platelet production and may contribute to thrombosis and vascular occlusion. Hemophilia and other coagulation disorders affect normal blood clotting mechanisms and may result in severe bleeding episodes.

Hematopoiesis is the physiological process responsible for the production and differentiation of blood cells. In embryonic development, hematopoiesis occurs initially in the yolk sac, later in the liver and spleen, and finally in the bone marrow. In adults, red bone marrow located in flat bones and epiphyses of long bones serves as the primary site of blood cell formation. Hematopoietic stem cells possess the ability to self-renew and differentiate into all blood cell lineages.

The regulation of hematopoiesis involves multiple factors. Erythropoietin, produced mainly by the kidneys, stimulates erythrocyte production in response to hypoxia. Colony-stimulating factors regulate leukocyte formation, while thrombopoietin controls platelet production. Adequate nutrition is also essential for normal hematopoiesis, particularly sufficient intake of iron, vitamin B12, folic acid, and proteins.

Laboratory examination of blood plays an important role in medical diagnostics. Complete blood count analysis provides information about the number, size, morphology, and concentration of corpuscular elements. Hemoglobin level, hematocrit, erythrocyte sedimentation rate, leukocyte differential count, and platelet count are important

hematological indicators used in clinical practice. Microscopic examination of blood smears allows identification of abnormal cell morphology associated with various diseases.

Modern scientific research continues to explore the molecular and cellular mechanisms underlying blood cell formation and function. Advances in hematology have improved understanding of stem cell biology, immune regulation, coagulation pathways, and genetic blood disorders. Bone marrow transplantation, immunotherapy, gene therapy, and targeted treatments have become important therapeutic approaches for hematological diseases.

The corpuscular elements of blood represent an essential component of the circulatory system and are indispensable for human survival. Erythrocytes ensure effective gas transport, leukocytes provide immune defense, and thrombocytes maintain hemostasis. Disturbances in their structure or function can significantly affect health and may lead to serious diseases. Therefore, detailed study of blood cells remains highly important in physiology, pathology, laboratory diagnostics, and clinical medicine. Continuous scientific investigations contribute to the development of modern diagnostic methods and effective therapeutic strategies aimed at preserving human health and improving quality of life.

References

1. Guyton and Hall Textbook of Medical Physiology. Hall J.E. *Guyton and Hall Textbook of Medical Physiology*. 14th edition. Philadelphia: Elsevier, 2021. 1152 pages.
2. Junqueira's Basic Histology. Mescher A.L. *Junqueira's Basic Histology: Text and Atlas*. 16th edition. New York: McGraw-Hill Education, 2021. 608 pages.
3. Ross & Wilson Anatomy and Physiology in Health and Illness. Waugh A., Grant A. *Ross & Wilson Anatomy and Physiology in Health and Illness*. 14th edition. Edinburgh: Elsevier, 2022. 576 pages.
4. Essential Hematology. Hoffbrand A.V., Moss P.A.H. *Essential Hematology*. 8th edition. Wiley-Blackwell, 2019. 400 pages.
5. Williams Hematology. Kaushansky K. et al. *Williams Hematology*. 10th edition. New York: McGraw-Hill Education, 2021. 2450 pages.