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Relationship Between Structure and Function of Tissues: Histological and Biochemical Analysis

Khusanova Ruqayya
Student, Kimyo International University In Tashkent, Uzbekistan

Tolipova Dilrabo
Student, Scientific Directors, Kimyo International University In Tashkent, Uzbekistan

Mirsavurova Nilufar Rakhimberdievna
Senior Lecturer, Kimyo International University In Tashkent, Uzbekistan

Alimbekova Lobar Utkurovna
Senior Lecturer Kimyo International University In Tashkent, Uzbekistan

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Abstract: This article analyzes the relationship between the structure and function of human tissues from the point of view of histology and biochemistry. Four main types of tissues are considered - epithelial, connective, muscle and nervous - in terms of their morphological structure and molecular mechanisms of functioning. Particular attention is paid to how the features of the cellular composition, intercellular substance and specialized structures ensure the performance of biological functions of tissues. Key biochemical processes underlying tissue activity are also analyzed, including protein synthesis, energy metabolism and intercellular signaling. The analysis allows for a deeper understanding of the principles of tissue functioning and their importance for the body's homeostasis.

Keywords: Tissue, histology, biochemistry, structure, function, epithelium, connective tissue, muscle tissue, nervous tissue, cellular composition, metabolism.

Introduction: The human body is a complex system, the functioning of which is ensured by a multitude of specialized cells and tissues. Tissue is a collection of cells and intercellular substance that have a similar structure and perform certain functions. There are four main types of tissue: epithelial, connective, muscle and nervous. Each of them has unique morphological features and biochemical mechanisms underlying its physiological role.

Histology, as a science about tissues, studies their structure at the cellular and subcellular levels, while biochemistry studies the molecular processes occurring inside cells and ensuring the vital activity of tissues. Only a comprehensive approach combining histological and biochemical analysis allows us to deeply understand how the structure of a tissue determines its function, and biochemical processes — adaptive and pathological changes .

The purpose of this article is to examine the relationship between the morphological structure and biochemical characteristics of various types of human tissue. This approach allows not only to expand the understanding of normal physiology, but also to understand the mechanisms underlying a number of pathological processes.

Materials and methods

This work is theoretical and analytical in nature and is based on an interdisciplinary approach combining histological and biochemical data. In the course of preparing the article, a review of scientific literature

was conducted, including domestic and foreign textbooks, scientific articles, publications in peer-reviewed journals, as well as electronic databases (PubMed , Scopus , eLIBRARY).

The main criteria for selecting sources were their scientific reliability, relevance (publications mainly over the last 10 years), and thematic focus on the structural and functional features of human tissues. Particular attention was paid to modern concepts of the molecular mechanisms underlying tissue functioning, as well as the relationship between morphological features and biochemical processes.

The analysis was carried out by tissue types: epithelial, connective, muscle and nervous. For each tissue, the features of the cellular composition, the structure of the intercellular substance, as well as the main biochemical processes characteristic of this type of tissue were considered .

Results

As a result of the analysis of literary sources, a close relationship was established between the morphological structure of tissues and their biochemical functions. The key features of each of the main types of tissues are presented below:

1. Epithelial tissue

Epithelial cells are tightly adjacent to each other and form solid layers, which provides barrier and protective functions. Biochemically, epithelium is characterized by high activity of enzymes involved in the transport and secretion of substances (for example, in the intestines and kidneys), as well as the presence of proteins of intercellular contacts - claudins , occludins and cadherins .

2. Connective tissue

Connective tissue is characterized by a variety of cells and a significant amount of intercellular substance rich in collagen, elastin and proteoglycans . Biochemical processes include fiber synthesis, remodeling of the extracellular matrix and participation in immune reactions. Mineralization of the intercellular substance in bone tissue is provided by biochemical mechanisms associated with calcium and phosphate metabolism.

3. Muscle tissue

Muscle tissue is specialized in contraction, which is ensured by the interaction of contractile proteins - actin and myosin. It is characterized by a high level of metabolic activity, especially aerobic and anaerobic synthesis of ATP. In the cardiac muscle, an important role is played by ion exchange (primarily calcium ions), regulating the automatic contraction of the myocardium.

4. Nervous tissue

Nervous tissue consists of neurons and glial cells. Morphologically, neurons are characterized by pronounced processes that provide impulse conduction. Biochemically, key processes are the synthesis and release of neurotransmitters (acetylcholine, glutamate, GABA, etc.), the operation of ion channels, and the provision of energy exchange, which is critically important for maintaining resting and excitation potential.

Conclusion

An analysis of the structural and biochemical characteristics of the main types of human tissue shows that the morphological structure directly determines their functional properties. Epithelial tissue performs barrier and secretory functions due to tight cellular contact and high metabolic activity. Connective tissue provides support, protective and trophic functions due to a rich extracellular matrix and the ability to synthesize biomolecules . Muscle tissue is adapted to contraction due to specific proteins and energy metabolism mechanisms. Nervous tissue is specialized in transmitting information, which is achieved through complex molecular processes and high structural organization of neurons.

Thus, the structure and function of tissues represent a single whole, where morphology and biochemistry are closely interrelated. Understanding this relationship is important not only for fundamental biology and medicine, but also for clinical practice - in particular, in the diagnosis and treatment of diseases associated with disruption of tissue organization and metabolism.

References

Kaplan M. M., Savitskaya T. V. Human histology . - M.: Medicine, 2018. - 320 p.

Luria A. V. Biochemistry . - St. Petersburg: Piter, 2020. - 480 p.

Holmes K., Fraser R. Fundamentals of Histology . - M.: Mir, 2017. - 400 p.

Nelson DL, Cox MM Lehninger Principles of Biochemistry . 7th Edition. - WH Freeman, 2017. - 1264 p.

Ross M.H., Pawlina W. Histology: A Text and Atlas . 7th Edition. — Wolters Kluwer, 2015. — 656 p.

Alberts B. et al. Molecular Biology of the Cell . 6th Edition. - Garland Science, 2015. - 1464 p.

Vlasov T. N., Zorina E. A. Biochemistry of tissues and organs . - M.: Nauka, 2019. - 280 p.

Lodish H. et al. Molecular Cell Biology . 8th Edition. - WH Freeman, 2016. - 1232 p.

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eLIBRARY.RU: https://elibrary.ru/