THE ROLE OF HISTOLOGY IN PERSONALIZED MEDICINE

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Background: Personalized medicine, or patient-centered medicine, involves an individual approach to treating each patient based on their unique genetic, molecular, and clinical data. In recent decades, personalized medicine has become an integral part of medical practice, especially in areas such as oncology, cardiology, and endocrinology. One of the key tools for implementing a personalized approach is histology, the science of tissues, their structure, and function. Histological methods, combining molecular and cellular approaches, play an important role in identifying individual characteristics of a disease, which allows for the development of personalized treatment strategies.

Objective of the study : To determine the role of histology as the basis for diagnostics in personalized medicine, with an emphasis on its importance in the analysis of cellular composition, morphological changes in tissues in various diseases, as well as in substantiating the choice of individual therapy using modern diagnostic directions.

Materials and methods : The following materials and methods were used in this study to analyze modern achievements and development prospects in personalized medicine:

- **Molecular histology** : Allows detection of molecular changes in cells and tissues that are important for diagnosis and prognosis. In oncology, this helps identify tumor-associated mutations and select effective treatments, including targeted therapy and immunotherapy.
- **Immunofluorescence and immunocytochemistry** : These techniques can identify specific molecules (such as receptors or proteins) that are expressed in tumor cells or other tissues. This information helps select therapeutic drugs that specifically target these molecules, increasing the effectiveness of treatment and minimizing side effects.
- **Use of biomarkers :** identification of specific molecules associated with disease development and their use in diagnosis and treatment.

- **Artificial Intelligence Systems:** With the advancement of technology, artificial intelligence and machine learning can be used to analyze histological data, which will improve diagnostic accuracy and speed up treatment decisions.
- **Molecular and cellular diagnostics:** continued development of molecular histology, which will allow for a deeper understanding of disease mechanisms and the selection of targeted treatment methods.

Results and discussion: Achievements:

1. The role of histology in the diagnosis of oncological diseases. Oncology is one of the brightest and most important areas where histology plays a key role in personalized medicine. Histological analysis helps to understand what type of tumor the patient has, what molecular mutations are present in it.

- **Genetic testing** : Histology can help identify mutations in the BRCA1 and BRCA2 genes associated with breast and ovarian cancer risk. This can help guide treatment, including PARP inhibitors.
- **Individualized treatment** : based on the molecular picture of the tumor, it is possible to prescribe targeted drugs that act directly on the molecular targets of the tumor, minimizing side effects and increasing the effectiveness of therapy.

2.Histology and cardiology: personalized approach in the treatment of heart diseases. Histology also plays an important role in cardiology. Cardiovascular diseases are one of the main causes of death in the world.

- **Microstructural changes in tissues** : histological analysis can study the microstructural changes that occur in cardiac tissue during myocardial infarction, ischemic heart disease or cardiomyopathies.
- **Cellular changes** : Identifying specific changes in cardiac tissue allows us to predict the development of heart failure and select individual treatment.

3. Histology in endocrinology: approaches to the treatment of endocrine gland diseases. In endocrinology, histology allows not only to identify pathological changes in tissues, but also to understand the molecular mechanisms of diseases, which contributes to the development of more accurate and personalized treatment methods.

- **Thyroid disease diagnostics** : this test allows us to detect changes in thyroid tissue in hypo- and hyperthyroidism, as well as cancer. Molecular diagnostics helps to detect genetic mutations and select effective treatment.
- **Insulin resistance and diabetes** : In histology, it is important to study changes in pancreatic cells that indicate the development of type 2 diabetes. Understanding the molecular mechanisms of the disease allows for personalized treatment and the selection of effective drugs.

Conclusion: Histology plays a key role in personalized medicine, revealing individual disease characteristics and helping to select effective treatments.

Innovations such as molecular histology and genetic studies open up new possibilities for precise diagnostics and therapy, making histology an important tool in a patient-centered approach.