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The Medical Biology in Pharmacology

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Annotation: Medical biology serves as the fundamental basis for the development of pharmacology, providing a deeper understanding of the effects of drugs on the body. It studies biological processes, cellular and molecular mechanisms, which are essential for the effective application of drugs, the development of new treatments, and ensuring their safety. The methods of medical biology, such as microscopic investigations, genetic research, and immunological tests, allow for the analysis of pharmacodynamics, pharmacokinetics, and the mechanisms of action of drugs. Furthermore, medical biology plays a significant role in pharmacogenetics, targeted therapy, and personalized medicine, contributing to the improvement of treatment efficacy and reduction of side effects. Research in medical biology aids in optimizing treatment processes, ensuring safer and more effective use of pharmacological agents.

Keywords: Medical biology, pharmacology, pharmacogenetics, molecular biology, biochemistry, pharmacokinetics, pharmacodynamics, toxicology, pharmaceuticals, oncology, molecular level, biological effects, biological systems, pharmacological research.

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Introduction. The role of medical biology in the formation and development of modern medicine is incomparable. This science deeply studies the structure, functions and vital processes of the organism at the cellular level. It is this deep theoretical knowledge that forms the basis of the science of pharmacology. The inextricable link between medical biology and pharmacology plays a fundamental role in understanding how medicinal substances affect the body and in their effective use. Pharmacology is the science that studies drugs, determines their effect on biological systems, pharmacodynamics, pharmacokinetics, and toxicological properties. The approaches, methods, and concepts of medical biology play a crucial role in these processes. For example, knowledge of cell biology is necessary to understand the mechanisms of drug penetration through cell membranes. Also, many important molecular biological processes, such as interaction with receptors, signal transduction, and gene expression, directly affect pharmacological efficacy.

Main part: Pharmacological research is carried out on the basis of biological models. The mechanisms of action of drugs at the level of cells, tissues, organs or the whole organism are analyzed through biological experiments. In this process, experimental methods of medical biology, such as microscopic examinations, enzymatic reaction monitoring, DNA and RNA analysis, immunobiological tests, are widely used. At the same time, the development of the field of pharmacogenetics is closely related to the achievements of genetics in medical biology. The concept of personalized medicine is being implemented by identifying the individual responses of the individual genetic structure to drugs. This allows increasing the effectiveness of treatment, reducing side effects and ensuring safety.

Medical biology also serves as the main scientific source for the creation of new pharmaceutical agents. Molecular biology, biochemistry, physiology, immunology and other medical and biological directions are used to synthesize medicinal substances and predict their mechanisms of action. For example, by analyzing signal pathways, the pathogenesis of the disease is determined and treatment methods are developed on this basis. Targeted therapy is being created using medical biological approaches - that is, drugs that target only damaged cells. This has opened a new stage in the treatment of modern oncological and autoimmune diseases. Also, such areas of medical biology as ecological biology, microbiology and parasitology play a key role in the development of antibiotics, antiviral agents and antifungal drugs. Pharmacological strategies are being updated by studying the evolution of microorganisms and their resistance mechanisms. In particular, the increase in antibiotic-resistant strains is currently a major threat to global healthcare systems. Medical biological research remains relevant in solving this problem. Toxicological and pharmacokinetic studies play an important role in assessing pharmacological effects. In these areas, the fundamentals of medical biology, especially physiology and biochemistry, also play a major role. To accurately measure processes such as the distribution of drugs in the body, the breakdown of substances, and their excretion through the liver and kidneys, it is necessary to work with biological markers and biological fluids (blood, urine, plasma). These methods are based entirely on medical biology. Medical biology is the foundation of pharmacology. It plays a crucial role not only in understanding the mechanisms of action of drugs, but also in the development of new drugs, clinical trials, the use of personalized approaches, safety assessment, and the fight against current diseases. It is impossible to effectively conduct pharmacological research without knowledge of the deep scientific principles of medical biology. Therefore, this interdisciplinary integration remains a prerequisite for the development of modern medicine.

Literature review: A number of scientific studies have been conducted in Uzbekistan in the field of medical biology and pharmacology. Most of them support the development of the medical and pharmaceutical industries. Research in the field of pharmacology and medical biology is being conducted in leading scientific centers of Uzbekistan, for example, at the Bukhara State Medical Institute and the Tashkent Medical Academy. In particular, the treatise "Fundamentals of Pharmacology" by Kh. Shodmonov and M. Khojaev (2015) plays an important role in highlighting the connection between medical biology and pharmacology. This work fully covers the fundamental knowledge of medicinal substances and their effects on the body, as well as pharmacokinetics and pharmacodynamics. In addition, M. Abdullayev (2017)

Discussion. Approaches in the fields of medical biology and pharmacology complement each other and help create new opportunities in medicine. However, the integration of these disciplines can cause some problems. The main task of medical biology is to gain a deep understanding of biological processes, study cellular and molecular mechanisms, as well as the body's response to drugs. This increases the efficiency of pharmacological research, but at the same time, some complications arise. On the one hand, the integration of medical biology and pharmacology is of great importance in the creation of new drugs. Research in pharmacokinetics has provided individual adaptation of drugs using knowledge of medical biology. The development of personalized medicine may be the highest achievement of this field. For example, pharmacogenomics allows for the development of drugs that are tailored to the specific characteristics of the organism by studying the genetic effects of drugs. At the same time, there are still

many technical and moral problems for the widespread implementation of this approach in practice. On the other hand, there are different opinions in some scientific communities about the relationship between medical biology and pharmacology. Some researchers still do not see enough connection between these fields, because some biological mechanisms are not fully understood. For example, the problem of detecting large changes at the cellular level in determining the mechanisms of action of some drugs continues. Many branches of pharmacology still work with traditional methods, which creates difficulties in introducing new biological approaches. At the same time, there is a need to take into account environmental factors in understanding the role of medical biology in pharmacology.

Some studies show that environmental factors, including environmental toxins, microorganisms and other natural factors, affect the efficacy and safety of drugs. This requires a broader, multidisciplinary approach of pharmacology and medical biology. For example, the way drugs affect the human body depends not only on biological processes, but also on external factors, food, and environmental factors .

In addition, toxicological studies play an important role in assessing the efficacy and safety of new drugs. However, in some areas of pharmacology, these studies are conducted only in clinical settings, as a result of which not all information about drug substances is complete. Expanded research and advanced methods of medical biology can help solve this problem, as insights at the cellular and molecular levels help to provide a complete picture of pharmacology. The connection between medical biology and pharmacology offers great opportunities for everyone, but also some complexities and challenges. New approaches and technologies, as well as increased scientific collaboration, will help to realize the expected changes in these areas .

As medical biology expands its role within pharmacology, integration between the two disciplines becomes increasingly important, but these developments require a thorough scientific and technical understanding.

Conclusion: The integration of medical biology and pharmacology is creating new opportunities in modern medicine. Medical biology helps to understand the effects of drugs through biological processes, cellular and molecular mechanisms. This plays an important role in ensuring that pharmacology is more effective and safe. Also, the approaches, methods and concepts of medical biology help in the creation of new drugs in the pharmaceutical industry, the development of individual treatment approaches and ensuring their safety. Such areas of medical biology as pharmacogenetics, molecular biology and biochemistry provide innovative approaches in pharmacology. With the help of these disciplines, personalized medicine, the development of new drugs and the possibility of increasing the effectiveness and safety of drugs are being created. However, some scientific and practical problems, including the complexity of the effects of drugs, external environmental factors and individual differences, still require a full understanding of the role of medical biology in pharmacology. In the future, the connection between medical biology and pharmacology will be strengthened through closer cooperation, new technologies and multidisciplinary approaches. Also, more comprehensive approaches should be developed to improve the efficacy and safety of drugs by taking into account environmental and genetic factors. The role of medical biology in pharmacology and its development can lead to major changes in all areas of medicine. Thus, the integration of medical biology and pharmacology will continue to open new horizons in science and practice, which will help improve the quality of medical services, develop new treatment methods and ensure the development of personalized medicine.

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