молозива стимулируют преобразование В-лимфоцитов в плазматические клетки, которые усиливают синтез собственного sIgA новорожденного, тем самым препятствуя бактериальной колонизации.

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Modern biophysical research in medicine

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Аннотация

Изучение живого организма, основываясь на достижениях фундаментальных наук, является актуальной проблемой. Математическое описание биофизических процессов в живом организме позволяет более глубоко проникнуть в сущность явления и дает возможность создать автоматизированные системы, обеспечивающих доступ локальным и удаленным машинным ресурсам, что приведет к сокращению различных видов затрат. (материальных, энергетических и финансовых) в

здравоохранении. Современные биофизические исследования в медицине охватывают широкий спектр биологических и медицинских задач. Медицинское образование – часть мирового образовательного пространства.

Ключевые слова: фундаментальные науки, биофизическое исследование, медицинское образование.

Abstract

The study of a living organism, based on the achievements of fundamental sciences, is an urgent problem. The mathematical description of biophysical processes in a living organism allows a deeper penetration into the essence of the phenomenon and makes it possible to create automated systems that provide access to local and remote machine resources, which will lead to a reduction in various material costs, energy and financial costs in healthcare. Modern biophysical research in medicine covers a wide range of biological and medical problems. Medical education is part of the global educational space.

Keywords: basic sciences, biophysical research, medical education.

The study of a living organism at various levels of its organization, based on the achievements of fundamental sciences, is currently an urgent problem. The rigor of mathematical calculations and the universality of physico-biological laws enable medicine to more deeply analyze and study processes at the cellular and subcellular levels. Fundamental research in medicine is unthinkable without the use of methods based on information technology. Medical information is descriptive and represents the systematic results of observations and experiments. At the present stage, there is an increasingly significant penetration into medicine of biophysical research methods. Complex biophysical processes occurring in a living organism can be represented as physical processes. For example, blood circulation obeys the laws of hydrodynamics, the propagation of a pulse wave – oscillations and waves, respiration – aerodynamics, etc. Moreover, an understanding of the physical nature of phenomena is necessary for studies of the ultrastructure of biological systems at all levels of organization, from the molecular to the cell and the whole organism. In the body, in addition to physical processes, molecular processes are observed that mainly determine the behavior of biological systems. It is important to know the physical properties of biological systems (mechanical strength, elasticity, resistance to stress, heat and electrical conductivity and others) to assess their viability, which makes it possible to diagnose diseases. The possibilities of a mathematical description of the physical processes occurring in a living organism are invaluable.

Nowadays, there are significantly expanding the professional capabilities of the doctor various automated diagnostic systems based on modern computer technology. The use of information systems based on computer technology for various studies, including biophysical ones, access to local, remote machine resources, technologies and databases will lead to a reduction in various types of material, energy, and financial costs. The development of this diagnostic method is necessary for students of medical educational institutions [1-2]. There is particular interest to students who devote themselves to creating unique methods of studying a living organism, combining the latest information technologies with the achievements of basic sciences (mathematics, physics, biology, etc.).

Furthermore, there is a great successes have been observed in identifying the general principles of the functioning of organisms using basic research. The training of fundamental disciplines in higher education institutions of a non-technical profile has significant features. They are determined by the specifics of the subject area, with the psychological restructuring of the teaching staff to introduce new forms and methods of teaching. For example, mathematics is necessary for the speedy mastery of the modern level of knowledge, the achievements of scientific and technological progress, as well as to achieve a better level of this knowledge. This is the requirement of our entire society, of all spheres of our life. In

higher medical educational institutions, universities, they should act as a means of obtaining special knowledge, developing professional skills and the formation of new knowledge. The study of a living organism at various levels of its organization, it is necessary to use the universality of physical and biological laws, the rigor of mathematical calculations. Basic research in medicine is unthinkable without the use of modern information technology. Great successes have been achieved in revealing the general principles of the functioning of organisms.

Today, there is no doubt that the interest in the problems of medicine is increasing; the desire to identify the general principles of the functioning of these systems, to understand the essence of life has intensified. The creation and use of mathematical models of diagnosis is one of the aspects of the future medicine.

Mathematical models of biophysical processes in a living organism make it possible to detect deep connections between phenomena that previously seemed isolated, for example, the propagation of impulses along nerve fibers and the propagation of an electromagnetic wave through wires. Some problems of control processes in living organisms are similar to control in technical devices, and therefore the mathematical methods used in technology are also used to study biological, medical processes.

A mathematical analysis of the results of numerous biomedical observations in biophysical studies (a mathematical model for the development of infectious diseases, a model of pharmacokinetics, etc.) opens up new possibilities. The widespread introduction of mathematical methods is impossible without the use of modern high-speed computer technology [3-5]. It is important to note the fact that the material can be analyzed much more deeply and comprehensively. Medical equipment, a mathematical approach, and the use of the unique capabilities of electronic computing technology open up fundamentally new possibilities for using them both in statistical processing of results obtained on the basis of biomedical research and in solving issues related to biophysical research of biological objects. The practical work of students and students allows not only to comprehend the essence of the phenomena underlying the experiment, but also to acquire research skills: find the mathematical, graphic relationship between the data obtained, justify from the point of view of the appropriateness of their use in medicine (therapeutic effect, diagnosis of pathological changes, etc.)

Moreover, medical biophysics as one of the fundamental disciplines is based on the latest scientific achievements of physics, chemistry, biology, physiology, etc. and studies the physical and physico-chemical processes in biological objects. The main section of biophysics (cell biophysics) is devoted to the physical and physicochemical properties of cellular and subcellular structures. Quantum biophysics explores the mechanisms of energy processes that occur in the body at the subcellular level. Sensory biophysics deals with perceptual mechanisms. Biophysics of complex systems explores the origin of man, heredity, etc. In biophysics of ecology considers the influence of external factors. For example: exploring biopotentials, biophysics is interested in the mechanism of the occurrence of electromagnetic processes in a living organism. For a physiologist, biopotential is an indicator of excitability, conductivity, etc. biological tissue. Biophysicists are interested in primary (light) photochemical processes, while secondary, dark photochemical processes are the object of study of biochemists.

Currently, much attention is paid to studies of the influence of various types of radiation on biological objects. The obtained therapeutic effects for various pathologies indicate that the radiation absorbed by the body affects the mechanisms that ensure the vital activity of the body.

In the field of development of the latest medical technology, methods of medical biophysics, such as spectrophotometry; luminescent analysis; photochemical methods; spectrometry and others, occupy a special place. Because, it is allows solving different medical problems at the cellular and subcellular levels. For example, in pharmacology, the

individual properties of various drugs are revealed using biophysical research methods. Laser radiation used in therapy stimulates the metabolic activity of cells by acting on various tissues of the body.

Studying the course of medical biophysics, which gives fundamental knowledge, contributing to the development of logical thinking, is also justified by the fact that the creation and use of various biophysical models, unlike other models, allows you to quickly test all possible situations, which saves money and time for researching medical system. The more complex a professional subject area in which training is carried out, the more important it is to teach a specialist to effectively use new technologies, which can be based on physical and mathematical models that reproduce the studied object or process.

A wide range of medical problems using biophysical methods indicates the need to more deeply study biophysics in medical universities and other educational centers, to introduce its methods in scientific research. The current requirements of the university standard provide for a deeper integration of fundamental disciplines with medical issues. We believe that this problem is worthy of attention. The successful development of biophysical research in medicine contributes to the creation of the latest technologies, in particular, using the achievements of nanotechnology. Medical education should be part of world education and the bar of universities should now be planetary.

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