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THE IMPORTANCE OF PHYSICAL AND BIOPHYSICAL PROCESSES IN THE STUDY OF MEDICINE

Rakhimov B.T., Abdujabbarova U.M.

ЗНАЧЕНИЕ ФИЗИЧЕСКИХ И БИОФИЗИЧЕСКИХ ПРОЦЕССОВ ПРИ ИЗУЧЕНИИ МЕДИЦИНЫ

Рахимов Б.Т., Абдужаббарова У.М.

TIBBIYOTNI O'RGANISHDA FIZIK VA BIOFIZIK JARAYONLARNING AHAMIYATI

Рахимов Б.Т., Абдужаббарова У.М.

Ташкентская медицинская академия

Аннотация. Несмотря на сложность и взаимосвязь различных процессов в организме человека, часто среди них можно выделить процессы, близкие к физическим. Во всех этих вопросах физика настолько связана с биологией, что формирует самостоятельную науку — биофизику, которая изучает физические и физико-химические процессы в живых организмах. Поэтому изучение физических и биофизических процессов имеет большое значение для изучения медицины. В статье показано, насколько важно знать эти процессы для изучения медицины в целом.

Ключевые слова: физика, биофизика, медицина, ультразвук, рентгенография, лазер.

Annotatsiya. Inson tanasidagi turli jarayonlarning murakkabligi va o'zaro bog'liqligiga qaramay, ko'pincha ular orasida jismoniy jarayonlarga yaqin bo'lgan jarayonlarni ajratib ko'rsatish mumkin. Bu masalalarning barchasida fizika biologiya bilan shunchalik bog'langanki, u tirik organizmlardagi fizik va fizik-kimyoviy jarayonlarni o'rganuvchi mustaqil fan - biofizikani tashkil etadi. Shuning uchun fizik va biofizik jarayonlarni o'rganish tibbiyot fanini o'rganish uchun katta ahamiyatga ega. Maqolada ushbu jarayonlarni bilish umuman tibbiyotni o'rganish uchun qanchalik muhimligini ko'rsatadi.

Kalit so'zlar: fizika, biofizika, tibbiyot, ultratovush, rentgenografiya, lazer.

The broadest concept, including everything that surrounds us, and ourselves, is matter. It is impossible to give an ordinary logical definition of matter, in which a broader concept is indicated, and then a sign of the subject of the definition is noted, since there is no wider concept than matter. Therefore, instead of a definition, it is often simply said that matter is an objective reality given to us in sensations.

Matter does not exist without motion. Movement refers to all the changes and processes taking place in the universe. Conditionally different and diverse forms of movement can be represented by four varieties: physical, chemical, biological and social. This allows the different sciences to be classified according to what kind of movement they study. Physics studies the physical form of motion of matter. In more detail, the physical form of the motion of matter can be divided into mechanical, molecular-thermal, electromagnetic, atomic, intranuclear. Naturally, such a division is conditional. Nevertheless, physics as an academic discipline is usually presented in precisely such sections.

Physics, like other sciences, uses various research methods, but all of them ultimately correspond to the unity of theory and practice and reflect the general scientific approach to understanding the surrounding reality: observation, reflection, experience. On the basis of observations, theories are created, laws and hypotheses are formulated, they are tested and used in practice. Practice is the criterion of theories, it allows them

to be refined. New theories and laws are formulated, they are again tested by practice. Thus, a person is moving towards a more complete understanding of the world around him.

In the study of physical phenomena, processes and systems, the modeling method is widely used, which is based on the use of models. A model is an object of any nature, speculative (virtual) or materially realized, which reproduces a phenomenon, process or system for the purpose of their study or study. Such concepts, known to the reader from a secondary school course, as a material point, an ideal gas, a thin lens, etc., are, in essence, models.

Various forms of matter motion are interdependent and interrelated, which leads to the emergence of new sciences that lie at the junction of the former ones - biophysics, astrophysics, chemical physics, etc., as well as the use of the achievements of one science for the development of another.

Despite the complexity and interconnection of various processes in the human body, it is often possible to single out processes close to physical ones among them. For example, such a complex physiological process as blood circulation is basically physical, as it is associated with the flow of fluid (hydrodynamics), the propagation of elastic vibrations through the vessels (oscillations and waves), the mechanical work of the heart (mechanics), the generation of biopotentials (electricity), etc.

Breathing is associated with the movement of gas (aerodynamics), heat transfer (thermodynamics), evaporation (phase transformations), etc.

In the body, in addition to physical macroprocesses, as in inanimate nature, there are molecular processes that ultimately determine the behavior of biological systems. Understanding the physics of such microprocesses is necessary for a correct assessment of the state of the body, the nature of certain diseases, the effects of drugs, etc.

In all these issues, physics is so connected with biology that it forms an independent science - biophysics (biological physics), which studies the physical and physico-chemical processes in living organisms, as well as the ultrastructure of biological systems at all levels of organization - from submolecular and molecular to cells and the whole organism.

Physical methods for diagnosing diseases and researching biological systems. Many methods of diagnostics and research are based on the use of physical principles and ideas. Most modern medical devices for their intended purpose are structurally physical devices. To illustrate this, it suffices to consider some examples within the framework of information known to the reader from a high school course.

The mechanical value - blood pressure - is an indicator used to assess a number of diseases. Listening to sounds, the sources of which are located inside the body, allows you to obtain information about the normal or pathological behavior of organs. A medical thermometer, which is based on the thermal expansion of mercury, is a very common diagnostic device. Over the past decade, in connection with the development of electronic devices, a diagnostic method based on the recording of biopotentials that occur in a living organism has become widespread. The most well-known method of electrocardiography is the recording of biopotentials that reflect cardiac activity. The role of a microscope for biomedical research is well known.

Modern medical devices based on fiber optics make it possible to examine the internal cavities of the body. Spectral analysis is used in forensic science, hygiene, pharmacology and biology; achievements of atomic and nuclear physics - for fairly well-known methods of diagnostics: X-ray diagnostics and the method of labeled atoms.

The impact of physical factors on the body for the purpose of treatment. In the general complex of various methods of treatment used in medicine, physical factors also find a place. Let's point out some of them. A plaster bandage applied for fractures is a mechanical fixator for the position of damaged organs. Cooling (ice) and heating (heater) for the purpose of treatment are based on the thermal effect. Electric and electromagnetic effects are widely used in physiotherapy. For therapeutic purposes, visible and invisible light (ultraviolet and infrared radiation), X-ray and gamma radiation are used.

Dressings, instruments, electrodes, prostheses, etc. used in medicine operate under environmental conditions, including in the immediate environment of biological media. To assess the possibility of using such

products in real conditions, it is necessary to have information about the physical properties of the materials from which they are made. For example, for the manufacture of prostheses (teeth, vessels, valves, etc.), it is essential to know the mechanical strength, resistance to repeated loads, elasticity, thermal conductivity, electrical conductivity and other properties. In some cases, it is important to know the physical properties of biological systems in order to assess their viability or ability to withstand certain external influences. By changing the physical properties of biological objects, it is possible to diagnose diseases.

Physical properties and characteristics of the environment. A living organism functions normally only when interacting with the environment. It reacts sharply to changes in such physical characteristics of the environment as temperature, humidity, air pressure, etc. The effect of the external environment on the body is taken into account not only as an external factor, it can be used for treatment: climatotherapy and barotherapy. These examples indicate that the doctor must be able to assess the physical properties and characteristics of the environment.

The ancients called physics any study of the surrounding world and natural phenomena. This understanding of the term "physics" survived until the end of the 17th century.

At present, the extensive line of contact between these sciences is constantly expanding and strengthening. There is not a single area of medicine where physical knowledge and devices are not applied.

Using the achievements of biophysics in the treatment of diseases:

The formation of scientific medicine would have been impossible without advances in the field of natural science and technology, methods of objective examination of the patient and methods of treatment.

In the process of development, medicine was differentiated into a number of independent branches.

The achievements of physical science and technology are widely used in therapy, surgery, and other fields of medicine.

Biophysics helps diagnose diseases.

In the diagnosis of diseases, X-rays, ultrasound examination, iridology, and radiodiagnosis are widely used.

Radiology is a field of medicine that studies the use of X-ray radiation to study the structure and functions of organs and systems and diagnose diseases. X-rays were discovered by the German physicist Wilhelm Roentgen (1845-1923).

X-rays are electromagnetic radiation invisible to the eye.

Penetrates through some materials that are opaque to visible light. X-rays are used in X-ray structural analysis, medicine, etc.

Penetrating through soft tissues, X-rays highlight the bones of the skeleton and internal organs. X-ray images can detect the disease in the early stages and take the necessary measures. However, one must take into account the fact that any radiation is safe only in certain

doses - it is not without reason that work in an X-ray room is considered unhealthy.

In addition to x-rays, the following diagnostic methods are used today:

Ultrasound examination (a study when a high-frequency sound beam probes our body, like an echosounder - the seabed, and creates its "map", noting all deviations from the norm).

Ultrasound is elastic waves that are not audible to the human ear.

Ultrasound is contained in the noise of the wind and the sea, is emitted and perceived by a number of animals (bats, fish, insects, etc.), is present in the noise of cars.

It is used in the practice of physical, physicochemical and biological research, as well as in technology for the purposes of flaw detection, navigation, underwater communications and other processes, and in medicine - for diagnosis and treatment.

Currently, the treatment of ultrasonic vibrations has become very widespread. It is mainly used ultrasound with a frequency of 22 - 44 kHz and from 800 kHz to 3 MHz. The depth of penetration of ultrasound into tissues during ultrasound therapy is from 20 to 50 mm, while ultrasound has a mechanical, thermal, physical and chemical effect, under its influence metabolic processes and immune responses are activated. Ultrasound of the characteristics used in therapy has a pronounced analgesic, antispasmodic, anti-inflammatory, antiallergic and general tonic effect, it stimulates blood and lymph circulation, as already mentioned, regeneration processes; improves tissue trophism. Due to this, ultrasound therapy has found wide application in the

clinic of internal diseases, arthrology, dermatology, otolaryngology, etc.

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THE IMPORTANCE OF PHYSICAL AND BIOPHYSICAL PROCESSES IN THE STUDY OF MEDICINE

Rakhimov B.T., Abdujabbarova U.M.

Annotation. *Despite the complexity and interconnection of various processes in the human body, it is often possible to single out processes close to physical ones among them. In all these issues, physics is so connected with biology that it forms an independent science - biophysics, which studies the physical and physicochemical processes in living organisms. Therefore, the study of physical and biophysical processes is of great importance for the study of medicine. The article shows how important it is to know these processes for the study of medicine in general.*

Key words: *physics, biophysics, medicine, ultrasound, radiography, laser.*

