THE MATHEMATICAL MODELING AS THE BASIS OF FUNDAMENTAL KNOWLEDGE FOR THE STUDENTS OF MEDICAL AND PHARMACEUTICAL SPECIALTIES

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Introduction. Mathematical modeling as a method of scientific cognition was started using by the humanity many centuries ago, from the moment when the foundations of the differential and integral calculus were laid. The first mathematical model was developed in the XII century by Italian mathematician Fibonacci. Since the 40s of the last century, some mathematical methods penetrated into the medicine and biology through cybernetics and computer science.

Aim. Undoubtedly, the modeling in medicine has received some independent functions and is becoming more necessary in the process of the experimental research. Nowadays the modeling in medicine is the tool that allows having the profound and complex relations between the theory and experiment.

Mathematical models – are a set of formulas and equations that describe the properties of a studying object. As a rule, in the models we use the system of differential equations that describe dynamic processes characteristic of wildlife, as well as the systems of linear and nonlinear algebraic equations or inequalities.

Nowadays mathematical methods are widely used in biophysics, biochemistry, genetics, immunology, epidemiology, physiology, pharmacology, medical device manufacturing, whilst the creation of biotechnical and etc. The development of mathematical models and methods promotes the expansion of estimation filed in the medicine, the emergence of new highly efficient methods of diagnosis and treatment, the creation of some medical equipment. In recent years, an active implementation in the medicine the mathematical modeling and creation of automated, including computer, system has greatly enhanced the diagnosis and treatment of diseases.

Materials and methods. The method of mathematical modeling allows to eliminate the need for making bulky physical models related to the material costs; to reduce the time of defining characteristics (especially the calculation of mathematical models using computer technology and efficient computational methods and algorithms); to study the behavior of the object modeling for different values of parameters, predicting the nature of the changes due to the analysis of mathematical models.

In addition, the research of the modeling object and drawing its mathematical description is to establish links between the characteristics of the process, revealing

its boundary and initial conditions and formalize the process in the form of mathematical relations.

Results and discussion. Compositions of the models are produced due to a given scheme. At first we should formulate an objective of the modeling, and then express the hypothesis that represents a qualitative description of the system, after it, we should select the type of models and mathematical methods of description depending on the purpose and type of information. The final step is to create a model and compare it with the system-object to identify it.

All these stages of the models creation in biology and medicine should be accompanied by the experts of medicine and pharmacy. Therefore, knowledge of modeling for physicians and pharmacists is a powerful tool to achieve new results. On the basis of mathematical modeling as a means of the future research, doctors and pharmacists are acquainted in the study courses of medical and biological physics, higher mathematics, medical informatics, information technology in pharmacy. The curriculums of the aforementioned disciplines involve the study by mathematical modeling of the kinetics of chemical reactions, processes of dissolution of drugs from tablets, the study of the population developing processes, theory of epidemics, immunological processes, pharmacokinetics and some others.

To describe deterministic, variable in time, events differential equations are most frequently used. Within the classes in mathematics, for example, teachers explain how to solve differential equations of different types, which are the mathematical models of the above processes. Students gain an understanding of the main advantages of analytical methods of solving equations – the speed of getting functional patterns for the studying process.

In the second year of studying the medical students and pharmacists get acquainted with the formation of the computer models. At this stage, students have the opportunity to realize and explore models among the spreadsheet using differential equations solving skills acquired in the course of mathematics or medical and biological physics. Using some spreadsheets while working with the mathematical models allows researchers - beginners to receive and analyze the results of the dynamic changes in the parameters of the model.

Conclusions. The possibility of a personal modeling of the changing processes in the concentration of the drug in the cells of the body, depending on the methods of its administration, creation of automated decision support systems and systems that are similar in structure to the expert systems, work with the optimized models, a number of statistical methods creates a future specialist awareness of the place of the mathematical modeling of the research structure in biology, medicine and pharmacy. Thus, a great importance is to the question of the possibility of more in-depth study of the modeling techniques as the parts or individual courses.