that you have,» – says Kareva. «Mathematics can show us the right way or, on the contrary, tell us that we have reached a dead end.» In the end, all you need is the ability to put the right questions and translate them into the equations language and vice versa. To her opinion, a key aspect of mathematical modeling is that it doesn't matter to us what things are; we care about what they do. We investigate the relationships between individuals: cells, animals or people, and how they interact with each other and the environment. She gives the example. What do foxes and immune cells have in common? They are predators. Only foxes eat rabbits, and immune cells eat invaders, such as cancer cells. But from the mathematical point of view, the same system of predator-prey equations (picture1) can serve to describe the relationship between a fox and a rabbit, and between cancer and immune cells.

Let x(t) – be the number of foxes, y – be the number of rabbits at time (t). Then the number of foxes will grow until they have food (i.e. rabbits). If there is not enough, the number of foxes will decrease and then, from some point, the number of rabbits will increase.

The model of this example looks like this:

$$\begin{cases} \frac{dx}{dt} = -ax + bxy \\ \frac{dy}{dt} = cx - dxy \end{cases}$$

(picture1)

a,b,c,d are positive constants.

bxy expresses the dependence of foxes number increase from and rabbits number, and -dxy – reducing the number of foxes from rabbits.

On the example of this model – fox-rabbits (picture1), we can make the appropriate model – immune cells – cancer cells or tumor (picture2).

$$\begin{cases} \frac{dx}{dt} = -kx + gxy \\ \frac{dy}{dt} = fx - exy \end{cases}$$

(picture2)

k,g,f,e are positive constants.

gxy expresses the dependence of the immune cells growth from cancer cells number, but in the case when we reproduce the necessary environment for these cancer cells, and -exy expresses a decrease in the immune cells number from the cancer cells number, in the case when cancer cells will «eat» the nutrients of immune cells.

Results and discussion. This system of equations will help to investigate and compare the environment of the immune system and the tumor. It can also help to develop a hypothesis and simulate a scenario of safe therapy for humans, but vicious to cancer.

Conclusions. Therefore, mathematical modeling can answer questions that are directly related to human health, because mathematical modeling is the key to personalized medicine.

COMPUTER MODELING OF RANDOM PROCESSES

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Introduction. Monte Carlo method is used at research of many processes in physics, chemistry, biology. This method is basing on the use of random numbers. Nuclear reactors settle accounts by this method, it is widely used in geophysics, economy, biology, ecology – for the solving of those tasks, wherever the analytical or numeral methods are not work from the high degree of complication.

There are random numbers generators in the mathematical programs of MATHCAD, MAPLE, MATLAB, STATISTICS and other. It is possible to get the arrays of random numbers with the different laws of distributing – even, normal, exponential and other with their help.

It is shows the study of Brownian motion by using of random number generator and calculations of integrals in this work.

Aim of work. Different tasks for the decision of which the method of Monte Carlo is used are considered in our researches.

Methods of research. The program MATHCAD is using for demonstration of solving of different tasks by using of Monte-Carlo method:

1.Generation of random numbers. The different variants of the programs realizing this process are considered.

2.Demonstration of one-dimension moving of particle.

3.Two-dimension Brownian motion of particle. The numeral experiment is made on verification of Einshtein-Smolukhovsky equation for diffusive processes.

4. Three-dimension Brownian motion of particle.

5. The numeral experiment is made on verification of Einshtein-Smolukhovsky equation for diffusive processes.

6. Calculation of double integrals, triple and multiple.

Results of researches. The numeral experiments are look the possibilities of Monte-Carlo method for modelling of different processes in physics, mathematics, biology.

Conclusions. Monte-Carlo method can be using for solving of many tasks, which not possible to solve by traditional methods.

REFRACTOMETRY IN ANALYSIS OF MULTICOMPONENT MEDICINES

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Relevance. Currently, a lot of attention in pharmacy is given to multi-component drugs, which, due to the various substances that make up their composition, ensure the complexity of their properties. Examples of such drugs are multivitamins, agents for the symptomatic treatment of colds. The presence of several substances in the pharmaceutical composition causes a wider spectrum of action, accelerating the process of recovery of the patient. In this regard, the efforts of scientists are aimed at the creation and study of combined drugs.

Purpose of the study. Theoretically justify the use of refractometry in the analysis of multi-component drugs.

Materials and methods. Various chemical and physicochemical methods, in particular, based on refractive index measurement, are used to analyze such drugs.

Refractometry is one of the most common methods for the identification of chemical compounds, quantitative and structural analysis, and the determination of the physicochemical parameters of substances.

Refractometric determination of dosage forms consisting of two or more components is based on the additivity of the increments of the refractive indices.

For example, scientists-pharmacists have developed a method for applying refractometry for the quantitative determination of polyvinylpyrrolidone (PVP), which has an advantage compared to other physicochemical methods, since polyvinylpyrrolidone is a polymer that is obsessed with titrimetric methods in its composition.

To determine the PVP content, the analyte powder was transferred to a solution of the exact concentration by a volume-volume method, and the refractive index was determined for the resulting aqueous solution.