Conclusions. With growing concerns about online privacy and privacy in whole, more and more people are considering alternatives to Google products. After all, Google's business model is essentially based on data collection and advertising, which violates your privacy. More data means better (targeted) advertising and more revenue. People are currently looking for alternatives to Google products that respect their privacy and data.

The user must be prepared for the fact that such giant organizations gather more and more information about us to grow, cultivate our dependence and sell our data. Social networks cannot replace face-to-face communication, replace real smiles and feelings, discussions and arguments in real time. It is a great temptation to try to technologize natural human processes, but they will never be able to displace the good old real life.

MATHEMATICAL MODEL OF INFUSION METHOD OF TREATMENT OF ONCOLOGICAL DISEASES

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Introduction. Infusion is parenteral administration of drugs and biological solutions into the blood through a catheter. This method provides constant access to the patient's circulatory system for subsequent drug administration, invasive blood pressure monitoring, regular blood sampling for tests, blood transfusions and parenteral nutrition.

In treatment oncological patients by this method there is a possibility of long-term reception of medicines by an organism and regulation of properties of blood (coagulation, density, oxygenation).

Cancer is one of the least studied and unfavorable. Cancer treatment is successful in less than 10% of cases. The variety of approaches to treatment involves the use of the infusion method in an integrated approach.

Aim. Construction of a mathematical model for the treatment of cancer by using the infusion method of drug administration.

Materials and methods. In the course of work theoretical and statistical methods are applied, research material on this subject is a research material.

Cancer is the second leading cause of death in Europe. During the period from 2007 to 2017, the number of cancer cases increased by 30%. Approximately 13% of the population dies from cancer (taken since 2012). Practically speaking, this is almost every sixth death. Most often people get cancer: lung, breast, colon and rectum, (non-melanoma) skin and stomach. Fatalities usually result from cancer of the lungs, colon and rectum, stomach, liver and breast.

In case of illness, doctors perform the following methods:

- Targeted therapy
- Immunotherapy
- Hormone therapy
- Radiation therapy
- Chemotherapy
- Surgical treatment.

Almost all patients who are treated in time, fully recover, but all therapies have their drawbacks.For example: surgical treatment of esophageal cancer is often accompanied by the development of organ failure, lung damage, the accession of infectious complications.

In such cases infusion therapy in the early postoperative period allows to reduce the frequency of acute lung injury and stabilize the central hemodynamics.

Targeted therapy blocks the growth of tumor cells by interfering with the mechanism of action of specific (target) molecules, which are necessary for the growth of

tumors). Side effects include decreased skin quality, hypersensitivity to ultraviolet light, hair loss on the head, numbness of the extremities and cracks on the fingers.

Radiotherapy is the effect of ionized radiation on cells, among the side effects are general malaise, tachycardia and a complex of hemopathic disorders.

Side effects of chemotherapy - hair loss, sore throat and mouth, nausea and vomiting.

Side effects of immunotherapy - intoxication, mucosal lesions, allergic reactions, headache, gastrointestinal disorders.

According to the protocol treatment of certain types of cancer, in cases where surgery is not allowed, the alternative is radiation therapy and chemotherapy.

During the procedures, the most popular method is the infusion method of drug administration.

Results and discussion. In practice, you often have to face the problem of maintaining a constant concentration of the drug in the body. For this purpose, it is necessary to enter intravenously or intraarterially drug with continuous speed (Fig. 1).

During drug introduction (infusion) with speed v its quantity M in blood will change according to the equation

$$dM/\,dt = v - k_{el}M,,$$

where k_{el} - constant rate of excretion of the drug from the blood.

Integrate this equation within the time from 0 to t and the amount of drug from 0 to M:

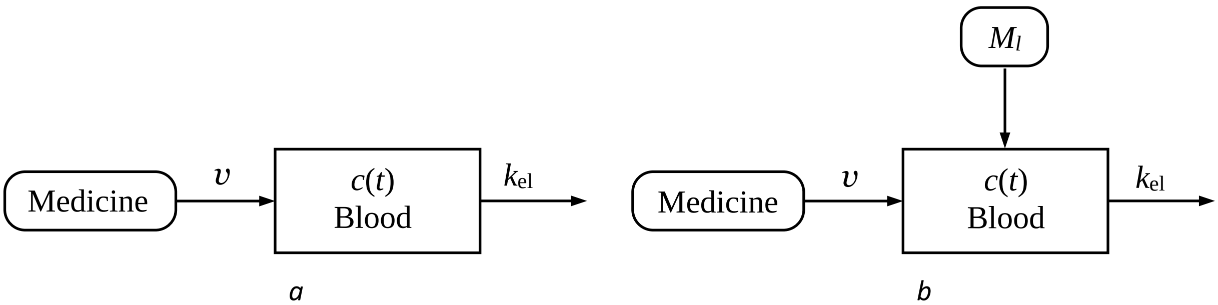

Fig. 1. Introduction of a medicine:

(*a*) with constant rate *v*; (*b*) with constant rate *v* and a load dose M_l

$$\int_0^M \frac{dM}{v - k_{el}M} = \int_0^t dt\,;$$

$$-\frac{1}{k_5}\ln(v - k_{el}M)\Big|_0^M = t\Big|_0^t\,;$$

$$\ln\frac{v - k_{el}M}{v} = -k_{el}t\,.$$

Let's express from the last equation M:

$$M = \frac{v}{k_{el}}[1 - \exp(-k_{el}t)]$$.

Next, we move from the amount of drug to its concentration, for which we divide the equation by the imaginary volume V

$$c(t) = \frac{v}{Vk_{el}}[1 - \exp(-k_{el}t)]$$.

As can be seen from previous equation, the concentration of matter increases with time and asymptotically approaches at $t \to \infty$ to a constant concentration

with$_\infty$ = v/ Vk_{el}

From this equation you can get the value of the rate at which the drug should be administered so that its concentration in the blood is equal to the required (c *):

v = c * Vk_{el}.

In order to achieve the desired effect as soon as possible, you need to enter a certain dose of the drug at the initial time, and then continuously enter the drug at a rate v. Then the term due to the loading dose (M) will be added to the equation of change of concentration in time):

$$c(t) = \frac{v}{Vk_{el}}[1 - \exp(-k_{el}t)] + \frac{M_n}{V}\exp(-k_{el}t) =$$
$$= \frac{v}{Vk_{el}} - \frac{1}{V}\left(\frac{v}{k_{el}} - M_n\right)\exp(-k_{el}t)$$.

Since at $t \to \infty$ multiplier $\exp(-k_{el}t) \to 0$, the final concentration of the drug will still be equal to c * = v/ Vk_{el}, ie will not depend on M_n. The concentration will approach c * if the second term in equation (2.18) is equal to zero, and this, in turn, can be achieved or after some time at (v/ k_{el} - M_n) $\neq$ 0, or instantly at (v/ k_{el} - M_n) = 0. From this we can obtain the expression for the loading dose (M_n*), with the introduction of which the required level of drug concentration will be achieved instantly M_n (Fig.2.):

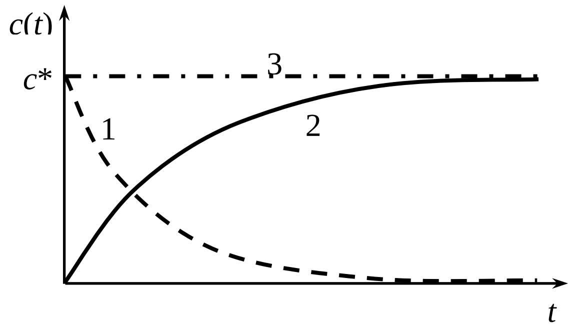

Fig. 2. Kinetics of change concentration of a medicine in blood:

1 – at single introduction: 2 – at infusion of the medicine with constant rate; 3 – at combination of administration of load dose and infusion, with the aim of instant attainment of required medicine concentration c^* in blood.

$$M_l^* = \frac{v}{k_{el}} = c^*V \, .$$

Thus, the given model allows one to determine the instantaneous load dose of medicine M_l^* and the rate of its administration v into the organism.

Conclusions: a mathematical model was built, according to the analysis - the infusion method is effective to achieve a therapeutic effect and is the least toxic. This type of administration is the most optimal in the case of chemotherapeutic treatment of cancer patients.