

Investigation of influence of low frequency magnetic fields on biological objects

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Abstract – In this article we consider one of the possible approaches of modeling magnetotherapy effects on biological objects, for example water. We present experimental data of pH value changes in water depending on magnetic field influence and environmental variables.

Keywords – magnetotherapy, magnetic field, biological objects, a model, acid-base balance

I. INTRODUCTION

In recent years, there emerge more and more messages about using of magnetic nanoparticles as containers for transporting drugs in certain areas of the human body using magnetic field. «Release» of drugs from nanoparticles can also be implemented using an alternating magnetic field [1]. However, questions of management of magnetotherapy influence on biological object are not fully explored.

One of the reasons for this is the lack of knowledge of physics of magnetic field effect on biological objects.

II. MAIN PART

Mathematical description of the processes occurring in biological tissues, organs, functional systems is preceded, as a rule, by the construction of simulation models, often electrical simulation models, or models in accordance with the theory of elastic reservoirs [2]. The magnetic field 'relaxes' blood vessel walls, especially capillaries, nerves, muscles and connective tissues that provides blood flow to them. Under magnetic field influence charged ions of potassium, sodium, chlorine, begin to move more intensive, increasing the flow of oxygen and nutrients to the cells.

Studies of the influence of magnetic field on the human body, using direct and alternating magnetic fields, underway at the Department of Physical and Biomedical Electronics since 1991. For this purpose was developed and manufactured magnetic stimulator MS - 92M.

The device provides an experimental research in a wide range of magnetic field amplitude, frequency and form of electromagnetic pulses, which is of great importance in research. Since water is very close to the intracellular environment, it can serve as a detector of magnetic field effects on biological objects, below are studies of the of magnetic field effect on the water.

Experimental technique. Water was placed in a flat polystyrene cuvette, which was placed between the magnetic inductors.

The experiment was conducted at a constant temperature $t = 22$ °C. Measurements were made before the start of the experiment, and then after 10, 20 and 40 minutes respectively. According to the data, experimental model of pH value changes was chosen depending on the exposure time and 95% confidence interval (Fig. 1).

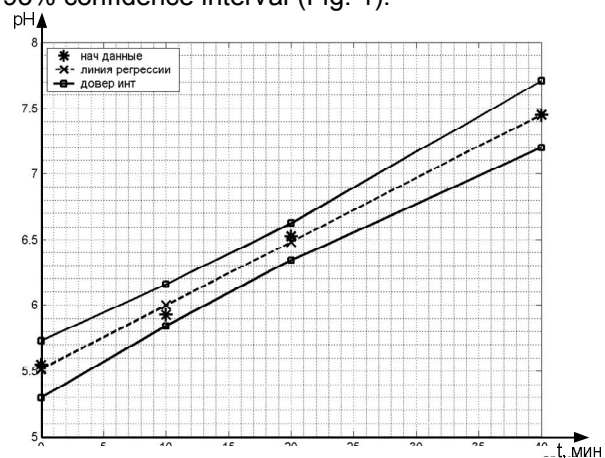


Fig. 1 Selected model and 95% confidence interval

III. CONCLUSION

The above experimental data match well with the existing [3, 4], and complement them. This paper shows that in studies of the magnetic field effect on water, including biological objects, you must consider the influence of the external factors. The dependences of pH value changes depending on magnetic field exposure time, temperature, humidity were received, confidence intervals were constructed.

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