

ELECTROMAGNETIC FIELD INFLUENCE ON BIOLOGICAL SYSTEMS

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Electromagnetic fields influence becomes more and more significant for humanity. Electromagnetic fields action on living systems may be discussed from the view point of (i) origin and evolution of life, (ii) ecological aspects (iii) social hygiene, (iiii) general biophysics, (iiiii) magnetodiagnosics and magnetotherapy, (iiiii) biotechnology.

Study of the biophysical mechanisms of electromagnetic field influence on living systems includes evaluation of the magnetobiological effects on organism, tissue, cell, membrane level.

This communication is concentrated on the effects of constant and alternating magnetic fields as well as of electric current on biological membranes. General subject will be red blood cell membranes. Large intervals of magnetic induction (0–350 mT), of frequency (1–50 Hz), of time exposure (5–120 min) has been studied. It has been evaluated the efficiency of the electromagnetic factors on the passive electrical properties, surface charge, electrophoretic mobility, rate of hemolysis, electropermeabilization of erythrocyte membranes.

Generally speaking, electromagnetic fields action strongly depending on the physical parameters of the applied fields or current. Simultaneous study of the changes in electrophoretic mobility, protrombine time, fibrinogen quantity in white rats and quinea pigs (in vivo experiment) demonstrates that for every particular parameter exists a definite optimum which depends on the frequency, exposure time and induction of applied field.

The pulse impedance experiments give evidence about the changes in the conductivity and capacity of membranes exposed to electromagnetic field action. It has been established that changes of conductivity and capacity strongly depend on the value of magnetic induction. The same experimental procedure gives the possibility to evaluate the effects of some chemicals which modify the surface charge of membrane with and without electromagnetic field action.

The electromagnetic field influence on electropermeabilization of erythrocyte membrane has been studied recently. It has been found that alternative magnetic field, electric current as well make membrane more rigid and favour electroporation of red blood cells. The opposite, constant magnetic field plays as a factor pre-

venting electroporabilization of erythrocytes, especially at higher values of the electroporation impulse. The preventing hemolysis role of constant magnetic field was established in experiments in vitro about the conservation of blood prepared for transfusion.

These results have a great significance for medical practice. It is known that most of drugs are charged substances and because of that it is very necessary to have exact biophysical methods for evaluation of behavior of these medicines in the presence of electromagnetic fields. We had successful magnetotherapy of number of different diseases as hypertension, myocardial infarction, varicose ulcers, fractures, bronchial asthma etc.

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