«Neuroprotection» Experiment

MAINTENANCE OF A CAPACITY FOR WORK OF ASTRONAUTS DURING A SPACE MISSION: NEW TECHNOLOGY BASED ON SELECTED GASEOUS MIXTURES

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The objective of experiment is to work out a method for maintenance of the high stress resistance and high capacity for work of astronauts. To meet this objective, we are planning to carry out the following:

— to enhance a level of antioxidant protection of a human body by restriction of electron acceptors in the chain of biological oxidation;

— to ensure the activation of alternate paths of energy metabolism of the central nervous system;

— to develop equipment for maintenance of dosed oxygen deprivation;

— to develop medical technology providing the oxygen deprivation in short-term and long-term space flights and on Earth.

Equipment designed specially for maintenance of dosed oxygen deprivation on board the space station will be a modification of the membrane gas-separation device. The particular response pattern of an individual will be taken into consideration to develop a special medical technology for enhancement of a capacity for work of astronauts. The mental capacity for work of astronauts will be monitored by medical equipment, which is usually used for this purpose on board the space station. The healthy young persons and those of an older age will be objects of this study. We are planning to apply PNN-4 computer system to study the mobility of nervous processes in the central nervous system, as well as the selective membrane gaseous separation or compressed gases (on board the station) for creation of gaseous mixtures.

We assume that the dosed oxygen deprivation in a special mode can allow maintaining a higher level of the capacity for work and stress resistance of astronauts under microgravity and influence of other factors during the long-term space flight.

«Comfort» Experiment

PSYCHOPHYSIOLOGICAL MONITORING OF ASTRONAUTS

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The purpose of the experiment is development of an onboard system for the psychophysiological monitoring of astronauts during a space flight.

This system will ensure evaluation of the current state and capacity of astronauts for work.

The main objectives are as follows:

— to develop new methods for the psychophysiological monitoring of a capacity of the crew for work;

— to develop new methods for analysis of synchronization of psychological and physiological parameters of the human capacity for work;

— to develop an algorithm for construction of a psychophysiological model of the human capacity for work;

— to design a system, which will execute such an algorithm;

— to examine the efficiency of such a system;
— to modify the system by the results of examination.

We will apply the following methods: measurement of psychophysiological indices of the capacity of an operator for work; mathematical simulation of psychophysiological reliability of the operator capacity for work; psychophysiological analysis of the system reliability; analysis of biorhythms; development of the recursive algorithms and predictive models; software development. Computer recording of an electrocardiogram and sphigmogram is envisaged in the experiment.

«Microflora» Experiment

INFLUENCE OF SPACE FLIGHT FACTORS ON BIOLOGICAL PROPERTIES OF HUMAN RESIDENT MICROFLORA: EXPERIMENTS INVIVO AND INVITRO

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The purpose of experiment is to study the influence of space flight conditions on the biological properties of representatives of the normal (resident) human microflora and to evaluate their ability to manifest the potential pathogenic properties under extreme conditions.

The main objectives are as follows:
— to develop and apply the method of integral evaluation of vitality and functional state of microorganisms belonging to the resident human microflora;
— to study the vitality of bacteria, their functional state and features of interaction with eukaryotic cells in a space flight;
— to study the virulence of some microorganisms (in control before and after the microgravity influence) in ground-based experiments.

The test objects will be the representatives of resident human microflora (*Proteus mirabilis, Mycoplasma hominis*) and the test animals (mice of Balb line and mongrel white mice). The microbiological, serological, immunological, histological, morphological, biophysical, genetic and electronic microscopy methods will be used.

Experiments carried out *in vitro* and *in vivo* will facilitate studying the structural and functional state of bacteria under the influence of space flight factors. Results obtained will promote substantiation of biological protection of astronauts from the aggressive effect of resident microflora.