«Impulse» Experiment

INFLUENCE OF MICROGRAVITY ON THE NERVOUS SIGNAL TRANSMISSION

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A long-term stay under the conditions of space flight leads to the pathological changes of a wide variety of neuronal systems ranging from motor to hypothalamic function. Such changes are likely to involve both functional and morphological alterations in the brain. The underlying mechanisms are still unclear.

The objective of the proposed research is to identify the alterations in synaptic transmission characteristics, which correlate with the process of adaptation to microgravity. A comparative analysis will be performed on rats exposed to micro- and hypergravity. Special attention will be paid to the two main stages of this process, namely the excitation and neurosecretion. The effect of microgravity on the potential-dependent calcium channels and process of neurosecretion in nerve terminals will be studied. The nerve terminals (synaptosomes) used in this experiment will be purified from rat brain.

Three sets of ground-based and space-based experiments are planned: 1) analysis of the presynaptic membrane calcium permeability; 2) monitoring the cytoplasmic Ca^{2+} concentration; 3) study of uptake and release of neurotransmitters.

These studies will allow recognition of neurochemical bases for the synaptic plasticity, which accompanies CNS responses to altered gravitational environment. They will provide insight into the molecular changes, which may occur in the brain during exposure to space flight, and will advance our understanding of the role of gravity in the maintenance of normal nervous signal transmission.

«Netcells» Experiment

INFLUENCE OF MICROGRAVITY ON GROWTH, STRUCTURE, AND FUNCTIONS OF NERVOUS, ENDOCRINE AND TRANSFORMED CELLS

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The purpose of the proposed experiment is to study the cellular and molecular mechanisms of changes in functioning of the nervous and endocrinal systems, induced by long-term staying in an orbital station. The latter may be important for development of prophylactic recommendations and usage of pharmacological preparations to prevent pathological changes in human health. It is planned to use a large set of methods for testing the morphological and functional changes of excitable cells under the conditions of orbital flight. It will be possible to conduct microphotoshooting of development of either normal or transformed cells under low gravity during the flight. The detailed analysis of data, as well as