SPACE LIFE SCIENCES SYMPOSIUM (A1)
Fundamental Gravitational Biology (7)

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MICROFLUORIMETRY METHOD FOR THE INVESTIGATION OF THE CELL CHANGES UNDER MICROGRAVITY

Abstract

As various flight and ground-based experiments show two groups of cellular microgravity effects can be distinguished: 1 – immediate cellular responses due to cytoskeleton remodeling, changes in membrane-associated processes, "early" genes activation and modification of cell cycle gene expression, 2 – postponed reactions manifested themselves in changes in transcription factors, synthesis and modification of cellular and matrix proteins. Main signal transduction systems participate during both period of adaptation to microgravity. As a result we could observe the modification of cell proliferation, adhesion, motility, commitment, differentiation etc. The majority of flight experiments with the use of cell cultures and equipment like KUBIK and CRIOGEM and carried out on board of the satellites (Bion, Foton) and ISS in the framework of scientific program of RS, NASA and ESA only allows the after-flight biomaterials, including fixed cells, to be analyzed. As far as with few exceptions, the real-time cellular parameters registration for a long period is hard to be implemented. We worked out the "FLUOR-"– precision, small-sized, autonomous, two-channel, programmed fluorimeter. This device is designed for registration of differential fluorescent signal from organic and non-organic objects of nano- and microscale in small volumes (cellular organelles suspensions, animal and human cells, unicellular algae, bacteria, various fluorescent colloid solutions. Beside that, "FLUOR-" allows simultaneous detection of temperature and gravity shifts (position, acceleration in any direction, shock load) of main factors influencing analyzed objects. The device is designed for long-term, autonomous, programmed experiments in space flights on board of pilot space ships and space stations as well as on biosatellites. The laboratory ground-based tests of the device proved successful. The developed software can support complex experimental schedules while real-time data registration with the help of built-in storage device allows changes in selected parameters to be analyzed using wide range of fluorescent probes. The work was supported by Russian Space Agency and Russian Ministry of Sciences.