

SPACE LIFE SCIENCES SYMPOSIUM (A1)

Human Physiology in Space (2)

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THE NEW SPACE EXPERIMENT COSMOCARD ONBOARD THE ISS

Abstract

Based on the evidence of long-term investigations in and post spaceflight, there are frequent changes in ECG of different variety, mostly in the terminal portion of the ventricular complex, which are viewed as an indicator of alterations in the myocardial function on the level of metabolism. It is thought that shifts in the system of circulation regulation, water-electrolyte balance, emotional and physical stresses may affect metabolic processes in the myocardium. However, ECG changes can also be a result of already present metabolic shifts in the myocardium manifested by arrhythmias or alterations of T-wave and ST-segment during space flight and particularly in the period of recovery. We are launching the new space experiment OSMOCARD in 2014 - Studies of the spaceflight factors' effect on the myocardium electrophysiological properties and their relationship with the autonomic regulation of blood circulation during long term space flight. Experiment COSMOCARD within the Russian space research program onboard the ISS assumes a special significance as one of the sources of information about cosmonaut's cardiovascular condition and functional reserve. Goal of the experiment is to evaluate functioning of the myocardium as the central component in providing blood flow to organs and tissues. The distinguishing feature of the experiment is that it is aimed at as determination of the actual myocardium functional properties and reserve, so prognostication of possible pathological developments. The scientific concept of the experiment is grounded on the theory of electrophysiological characteristics of the myocardium as indicators of energy and metabolic processes on the cell level; role of energy characteristics of the heart in maintaining cardiovascular homeostasis in space flight and, in particular, in the period of re-adaptation; association between energy and metabolic processes in the myocardium with autonomic regulation of circulation. The experiment is conducted with the use of equipment COSMOCARD that registers ECG in three leads. Equipment interfaces the onboard medical computer. One COSMOCARD session takes 24 hours. The experimental procedure does not cause any discomfort to crew members. Participants in

the experiment will be Russian members of the ISS crew. They will be investigated twice before flight to obtain firm data about individual electrophysiological characteristics of the myocardium and reliable baseline heart rate variability values and diurnal dynamics to be compared with future flight data. In flight, 5 to 6 experimental sessions are planned that is virtually every month to ensure tracing of dynamics and, having enough data, to construct statistically grounded prognosis.