

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

Author: Dr. Anna Chernikova
SSC RF Institute of bio-medical problems RAS, Russian Federation

Prof. Roman Baevsky
SSC RF Institute for bio-medical problems RAS, Russian Federation

PROBLEM OF INDIVIDUAL NORM AND ASSESSMENT OF ADAPTATION RISKS IN SPACE AND
ON EARTH.

Abstract

Projects, related to interplanetary missions, are developed intensively. Human's ability to live and work in microgravity without significant changes in basic vital systems and health is important precondition for successful implementation of these plans. This conclusion can be drawn from the fact that long-term studies during and after long stays on orbital stations did not reveal any abnormalities that could prevent the gradual increase in the duration of space flights. However, the developing of principles and instruments for dynamic assessing and monitoring of health status remains relevant. A similar problem is also facing the Earth medicine, where there are practically no means for controlling functional conditions in healthy subjects. The concept about role of cardiovascular system as indicator of adaptive abilities, since it provides adaptive reactions to the environment, was introduced in space medicine. Based on this concept prenosological approach considers health as adaptation abilities, that allows us to evaluate and predict its possible changes by the level of functionality and degree of regulatory systems stress. Applied to long-term space flights, we have proposed previously the concept of adaptive risk and the method for its assessment according to heart rate variability (HRV) analysis. This method has been tested in space investigations (experiments "Pulse", "Pneumocard" and "Sonocard" in 27 cosmonauts in Russian ISS segment) and in terrestrial project "Mars-500" (6 members of the 'Martian' crew and 120 subjects in parallel studies). The analysis of experimental data confirmed a major role of autonomic regulation in adaptive reactions of the human body. When carrying out functional tests (the deep breathing test and orthostatic test) it was demonstrated that HRV decreasing is associated with reduced functional abilities and increased adaptation risk. During readaptation after space flight it is particularly evident in the postural tolerance (orthostatic tachycardia). By the results of "Mars-500" project, adaptive risk increases accordingly to workloads of the crew and the environmental loads in people living in different climatic and geographical conditions. The obtained results have also revealed that the adaptive responses of healthy subjects both in space and on Earth are characterized by pronounced individuality. One of the most pressing problems now is to design further the concept of adaptation risks and preventive approach to health assessment towards the developing of criteria and instruments for determining individual norms. We propose some new approaches to take into account individual differences which will allow more surely assess autonomic status and health.