

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

Author: Prof. Roman Baevsky
Institute for Biomedical Problems, Russian Federation

Dr. Evgeny Bersenev
Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS), Russian Federation

Dr. Vasily Rusanov
Institute for Bio-Medical Problems of RAS, Russian Federation

Dr. Azaliya Berseneva
Institute for Biomedical Problems, Russian Federation

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

Dr. Tatyana Zenchenko
Institute for Bio-Medical Problems of RAS, Russian Federation

PRENOSOLOGICAL APPROACH AND HEALTH ASSESSMENT OF CREW-MEMBERS DURING
SIMULATED MARS MISSION**Abstract**

Introduction. One of the most important conditions for success of Mars mission is the ability of human body to adapt to conditions of prolonged space flight. Functional states at which adaptation takes place at the cost of regulatory systems tension, called prenosological, because they precede the development of pathological states (nosological states or diseases). New scientific and practical field - prenosological diagnosis is assessing functional states on the border of normal and pathological. This paper demonstrates the benefits of prenosological approach in terrestrial model experiment "Mars-500".

Methods. Long-term 520-day experiment, simulating the work of the crew during Mars expedition, has been completed in November, 2011. To develop new approaches to health assessing while studying the Martian crew, long-term satellite investigations of 120 healthy individuals, living under usual conditions, were organized and conducted in 12 regions of the world. These studies were conducted in 6 cities in Russia, in Minsk (Belarus), Alma Ata (Kazakhstan), Berlin (Germany), Prague (Czech Republic) Toronto (Canada) and Poulso (USA). The studies were conducted monthly using the equipment and research protocol, similar to those, used in the model experiment.

Results. Database, which collects the results of experimental and satellite studies, were created. These data include the results of electrocardiographic and polycardiographic research, heart rate variability (HRV) analysis, blood pressure and anthropometric measurements (height, weight), results of questionnaire analysis and medical history. HRV analysis under conditions of prolonged isolation when modeling "mission to Mars" showed, that there are no significant changes in health status of crew-members. Group evaluation of the functional state dynamics on the base of probabilistic approach showed, that there was a slight tendency to increase the probability of prenosological states. The results of satellite studies have shown that the worst group evaluations of functional states with increased risk of disease were observed in groups of Syktyvkar and Magadan cities, which are in the northern regions of Russia with unfavorable climatic conditions.

Conclusion. The results of our studies have shown that the use of prenosological diagnostics principles can detect features of adaptation reactions, associated with exposure to environmental factors. Further analysis of the results will allow develop criteria for evaluating and predicting the risk of disease during

prolonged observations of practically healthy people, working in stressful conditions. The obtained data may be useful in developing an adequate methodology for assessing the health status during prolonged space missions, including interplanetary flights.