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Medicine in Space and Extreme Environments (4)

Author: Prof. Oleg Orlov

SSC RF-Institute of Biomedical Problems RAS, Russian Federation, olegtm@bk.ru

Dr. William Paloski

University of Houston, United States, whpaloski@uh.edu

Dr. Peter Graef

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, peter.graef@dlr.de

Dr. Mark Belakovsky

SSC RF-Institute of Biomedical Problems RAS, Russian Federation, (*email is not specified*)

Dr. Leticia Vega

NASA Human Research Program, United States, leticia.m.vega@nasa.gov

INTERNATIONAL COOPERATION IN SOLVING THE MEDICAL AND BIOLOGICAL ISSUES OF  
SPACE EXPLORATIONS MISSIONS**Abstract**

Humanity is standing at the threshold of a new stage in space exploration – departure from Earth's orbit to explore the nearest objects in the Solar system, such as the Moon and Mars, with the prospect of building communities on these planetary bodies. Designers of future space vehicles will have to face the challenges of travelling beyond the Earth's radiation belts to provide biomedical safeguards for crews on long-duration autonomous missions in an artificial environment. Studies performed at the Institute of Biomedical Problems evaluating the potential medical and psychological risks in these extended autonomic missions beyond low Earth orbit show that in addition to the physiological risks, there are many other issues that require enhancement of available and development of new technologies and countermeasures to ensure the health and safety of future space crews. These include: 1. Methods to adequately train a crew for autonomy in remote transit flights and during stays on orbital and planetary bases; 2. Methods to support the cognitive and behavioral health, and professional efficiency with the crew as with each other; 3. Methods to increase the human potential in order to ensure adequate functionality in off-nominal conditions; 4. Development of in-mission medical monitoring, and diagnostics; 5. Methods to verify rates of water and food consumption, use of garments and expendables, sanitation and hygiene items, preventive measures and many other issues.

Missions beyond the Earth's orbit must be thoroughly validated and, therefore, will demand extensive theoretical, technological and biomedical investigations as well as research and development efforts. Consolidation of these efforts by the international partners is the shortest and most effective way to attain the goal. The International Academy of Astronautics encourages this cooperation. Good examples of international cooperation in ground-based chamber studies include SFINCSS (IBMP), HERA (NASA), Envihab (ESA/DLR), Mars-500 (IBMP), FMARS, MDRS, HI-SEAS, and others. IBMP is prepared to contribute to the strengthening of this cooperation by establishing an International Center for research and development of exploration missions. The international project SIRIUS (Scientific International Research In Unique Terrestrial Station) is the first project led in the Center. At present, the project duration is agreed to be up to five years but it can be extended and program reconsidered to be consistent with the strategy of remote space exploration. The authors believe that further consolidation of efforts is crucial to successful development of the biomedical system to support crews on remote space missions.