Challenges of Life Support/Medical Support for Human Missions (8)
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STUDIES OF HUMAN HEMODYNAMICS IN A REDUCED MAGNETIC FIELD

Abstract

Preparing for the future manned space flights to the Moon or another planets, in particular beyond the orbit of the Earth, it is necessary to begin studying the psychophysiological characteristics of a human organism and their changes under conditions of short-term exposure to a reduced magnetic field. Despite the importance of this issue, the influence of hypomagnetic conditions on the human body is still poorly understood and questionable. These studies were conducted at the Institute of Biomedical Problems RAS with participation of 8 healthy male volunteers (average age 33.3 1.3). The aim of the experiment was to study the influence of the simulated factor of the hypomagnetic environment (magnetic field decrease by about 1000 times) on cognitive, operator functions, an auditory analyzer, pain sensitivity indicators and the cardio-respiratory system of the human body under conditions of 8 hours exposure in a hypomagnetic environment. The study was carried out in 2 stages. The subjects and responsible performers were not informed of the exposure or placebo on the day of participation. During the adaptation to any changing environmental conditions, regulatory mechanisms change the parameters of the cardiovascular system. With the Mobilograph device which is used by cosmonauts at the ISS, data on blood circulation parameters during exposure (or lack of exposure) to hypomagnetic environmental conditions were obtained. An important role in studying the reactions of the cardiovascular system to the influence of various factors (including space flight) is played by central hemodynamics and the state of the vascular wall. Hemodynamic analysis makes possible to assess the "age" of the arteries and plays an important role in assessing the risk of cardiovascular disease. Our study was aimed at determining the main parameters of central hemodynamics at different stages of the body's adaptation to the conditions of a hypomagnetic environment, as well as their control before and after exposure. Data on heart rate, central pressure in the aorta, stroke volume, peripheral vascular resistance, and pulse wave velocity were obtained. As a result of comparison of the data these two tests, it was suggested that a decrease in the magnetic field (in this duration) does not significantly affect the parameters of central hemodynamics. It is concluded that the studies should be continued with an increased duration of exposure and the number of subjects for a deeper understanding of the mechanisms of adaptation of the cardiovascular system to conditions of hypomagnetic effects.