Challenges of Life Support/Medical Support for Human Missions (8)
Challenges of Life Support/Medical Support for Human Missions (1) (1)

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ACUTE PHASE RESPONSE IN ADAPTATION TO ALTERNATING GRAVITATIONAL ENVIRONMENTS

Abstract

Cosmonaut studies and earth-based simulation experiments produce the evidence of the development of acute phase response (APR) at the transition from 1g gravity to weightlessness conditions, and after the return to the earth as well. Acute phase response, or acute phase reaction, is an innate defense mechanism evoked in response to inflammation, which is characterized by the increased or decreased production of hepatically-derived blood proteins termed acute phase proteins (APP). APR is considered as systemic host defense response which can be caused by infectious agents, or by a great variety of noxious insults that are harmful to the host, the onset of APR is associated with the activation of innate immune system. Imitation of the effects of weightlessness in experiments with immersion showed the emergence of acute phase response which was manifested in the increase of the levels of positive acute phase proteins in the blood, decline of negative APPs, enhancement of oxidative activity of blood leukocytes and greater release of proteolytic enzymes by immune cells. The signs of APR were observed both at the transition to simulated microgravity conditions and in the first days of readaptation to the usual way of life. Post-experimental deploy of acute phase response was obtained in short-time experiments (5 to 7 days) and after long-duration (21 day) immersion study as well. With the oncoming human missions to the Moon a perspective of shuttle Earth-Moon flights can become common practice which consequently cause serial changes of gravity conditions for the crew members. Compared to Earth-orbital flights, implementation of manned lunar missions includes additional gravitational impacts with the descent on the moon surface and at the return to Earth. Space radiation adds to the formation of oxygen radicals, besides, staying on the Moon by itself is considerably stressful factor. The intensity of the production of acute phase proteins in the course of APR is essential for the recovery to normal state of the organism. Medical support in moon flights, and especially shuttle moon flights, should take into account the individual features of the systems responsible for APR realization. Monitoring the oxidative activity of immune cells can provide a health control tool for space missions.