Paper ID: 34632
oral

IAA/IAF SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (4)

Author: Dr. Igor Nichiporuk
SRC RF Institute of Biomedical Problems RAS, Russian Federation, igor.nichiporuk@yandex.ru

Prof. Anatoly Grigoriev
SRC RF Institute of Biomedical Problems RAS, Russian Federation, info@imbp.ru
Dr. Vladislav Petrov
SRC RF Institute of Biomedical Problems RAS, Russian Federation, info@imbp.ru

INFLUENCE OF THE ABSORBED DOSE OF SPACE RADIATION ON BIOCHEMICAL PARAMETERS OF BLOOD DURING LONG-TERM SPACE FLIGHTS ON THE RUSSIAN SEGMENT OF THE INTERNATIONAL SPACE STATION

Abstract

The biochemical analysis of blood onboard ISS allows monitoring of cosmonauts' health and to define the dynamics of parameters, characterizing various metabolic pathways in human organism within space flight (SF). The episodes of abnormalities in blood hemoglobin (Hb), glucose (GLU), total bilirubin, amylase (AM), aspartate aminotransferase, alanine aminotransferase (ALT), pancreatic amylase, creatine phosphokinase (CPK), uric acid (UA), gamma-glutamiltranspeptidase, creatinine, cholesterol (CHOL), triglycerides (TG) and urea during SF were found, estimation of biochemical parameters in dynamics has shown a small decrease of Hb and increased GLU and AM in the first 1-2 months of SF, GLU and CHOL decreases in the middle of flight, significant distinctions between groups of cosmonauts less and over 45 years old in in-flight CHOL and CPK, and it was found that the rise in SF duration is accompanied by body mass and CPK decreased and by blood TG and Hb increases (I.A. Nichiporuk, B.V. Morukov, A.I. Grigoriev, 2013). The main objective of the present research aimed to estimate the possible influence of individual absorbed doses of space radiation (ADSR) by the Russian cosmonauts on their blood biochemistry during long-term SF of 1-10 and 16 basic missions on the Russian segment of ISS. The total ADSR doses to dates of onboard blood analyses (30-182 days of SF, n = 21) varied from 0,51 to 3,19 sGy for one crewmember according to individual dosimetry control data (dosimeters ID-3). The linear correlation analyses (Spearmen and Pearson) have not revealed any significant links of blood biochemistry with ADSR, and only by more complex statistical data processing the ADSR (as one of independent variables along with anthropometry and dates of onboard biochemical analyses of blood = days of SF) made moderate to low but the significant contribution into the equations of multiple regression when dependent variables were in turn blood concentrations of Hb, GLU, UA, ALT, AM and CPK. The received results, first, indicate on the influence of ADSR on the blood biochemical parameters during SF but obviously less than age, mode of work and rest, fluid shifts, hypotrophic processes in muscles, low physical activity, changes in lipid and carbohydrate metabolism and other microgravity effects, and, second, evidenced of good level of onboard radioprotection as estimated parameters of blood biochemistry, characterizing functional activity and state of main organs and physiological systems, varied mainly within normal physiological range even at the presence of Solar Particle Events during observed period (2001-2005 years).