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RESULTS OF THE BIOCHEMICAL ANALYSIS DURING LONG-TERM SPACE FLIGHTS ON THE RUSSIAN SEGMENT OF THE INTERNATIONAL SPACE STATION

Abstract

Importance of the biochemical analysis directly carried out onboard ISS is caused by the problems of the control of cosmonauts' health during the various periods of space flight (SF) and a revealing of possible abnormalities which can reduce working capacity and functional reserves that are especially necessary during extravehicular activity, at stages of active descent from the orbit and early readaptation. Results of blood analysis by "dry chemistry" method (Reflotron-4, LaRoche) onboard ISS have revealed episodes of abnormal deviations within SF of all determined parameters - hemoglobin (Hb), glucose (GL), total bilirubin (TB), amylase (AM), aspartate and alanine aminotransferases, pancreatic amylase, creatine-phosphokinase (CPK), uric acid, gamma-glutamil transpeptidase, creatinine, cholesterol (CHL), triglycerides (TG) and urea. It could be caused by specificity of crewmembers' adaptation to microgravity, by alimentary errors, time shifts of work-rest mode, etc. Dynamics of biochemical parameters has shown a decreased Hb and increased GL and AM in 1-2 months of SF, decreased GL and CHL in the middle of flight that could be caused by fluid shifts, physical activity and changes in lipid and carbohydrate metabolism. The increased blood TB accompanied by urobilinogenuria was found in some missions (more often at the end of SF) that evidently indicated on change of liver's barrier function, dyskinesia in bile ducts, hypotrophy of muscles and disintegration of products of Hb exchange. Significant distinctions between groups of cosmonauts less and over 45 years old of in-flight blood CHL and CPK were found. Increased blood CHL in the senior group of cosmonauts specifies in necessity of the additional control of their lipid exchange during and after SF due to increased risk of age-specific atherosclerosis. Multiply regression analysis has shown that the increase of SF's duration is accompanied by body mass and CPK decreases and by blood TG and Hb increases. It could be caused by intake of the hemopoietic drugs, hypotrophic processes in muscles, low physical activity and strengthening of lipids' role in metabolism under the influence of microgravity and other factors of flight. Received results testify, that the biochemical analysis of blood and urine onboard ISS allows to carry out the dynamic control of cosmonauts' health and to define the parameters characterizing various metabolic pathways in organism in the conditions of SF.