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Author: Dr. Galina Vassilieva

Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS), Russian Federation,
galvassilieva@mail.ru

Mrs. Milena Koloteva

Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS), Russian Federation,
milenaKoloteva@mail.ru

Mr. Ivan Vasilev

Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS), Russian Federation,
mdivas@mail.ru

Mrs. Olga Zhuravleva

Institute of Biomedical Problems (IBMP), Russian Academy of Sciences (RAS), Russian Federation,
juravlyovabc@mail.ru

Dr. Andrey Nosovsky

Institute of Biomedical Problems, Russian Academy of Sciences, Russian Federation, nam@imbp.ru
Prof. Oleg Orlov

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

EFFECT OF DIFFERENT SHORT RADIUS CENTRIFUGE ROTATION REGIMES ON
ELECTROLYTES CONCENTRATION AND MARKERS OF THE CARDIOVASCULAR SYSTEM IN
VOLUNTEERS- SUBJECTS

Abstract

The necessity of development of the methods and means differing from those currently used for preventing possible disturbances in certain functional systems of the body increases for future long-term manned flights to other planets. One of the solutions for the long-term exposure to microgravity could be the installation on board of manned spacecraft of a short-radius centrifuge (SRC), inducing a periodic gravitational effect on the human body. One of the tasks currently studied in the IBMP ground tests with the participation of volunteers-subjects is the choice of the optimal regimes for creation of artificial gravity on the SRC. The system of water-electrolyte metabolism regulation is a system that provides stabilization of the composition and volume of internal environment fluids. This system quickly responds to any change in the gravitational environment. Therefore, the analysis of the dynamics of concentrations of water-electrolyte metabolism markers presents an objective picture of the changes occurring in the body at a given time point, in particular at the change of acceleration value and duration. A comparative analysis of the effect of different SRC rotation regimes on the dynamics of markers of the cardiovascular system and water-electrolyte metabolism in biological samples (venous blood and saliva) in 9 healthy males – volunteers (25-40 years old) at three regimes of SRC rotation with intervals between tests not less than 3 days was conducted. The active factor in testing was acceleration of the head-pelvis (+ Gz 2.0-2.9 g at the level of feet) with duration 45-60 minutes. During the background period and immediately after the end of each rotation regime, venous blood samples were taken from the cubital vein (in the supine position) to analyze electrolytes in heparinized blood plasma and to determine the concentrations of BigET 1-38, Nt-proBNP, aldosterone renin activity and kininogen. The profile of individual reactions of the water-electrolyte exchange in subjects was obtained. A comparative analysis of changes in the

concentrations of aldosterone and renin in blood was carried out, demonstrating that the most expressed changes occurred during the second rotation regime ($p < 0.005$). A reliable increase in the concentration of cortisol in saliva was shown after each rotation regime ($p < 0.01$). Although the further study is needed to better understand the implications of these findings for the use of SRC as a countermeasure in space flights, this study gives an understanding of the directions of ongoing processes of water and electrolyte balance regulation.