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orlov@imbp.ruTHE HEART RATE VARIABILITY VALUES ALTERATION DURING 8-HOUR COMPENSATION OF  
THE EARTH'S MAGNETIC FIELDS**Abstract**

Interplanetary missions and a long stay outside the Earth's magnetosphere found the serious problems for researchers to study the influence of the hypomagnetic environment (HM) and create an artificial geomagnetic field, the safety and reliability of local means of human protection. The main high sensitivity systems of the body to environmental factors are the central nervous system and the cardiovascular system. Studies on animals and humans have shown various disorders of higher nervous activity and changes in heart rate variability (HRV) values. We have conducted studies with an increased time of exposure to HMC in combination with a factor of limiting physical activity. For the exposition of 8 male volunteers aged 33.4 $\pm$ 1.3 years, BMI 22.0  $\pm$ 0.9 kg/sm<sup>2</sup> during a continuous 8-hour exposure, the "Arfa" installation was used, in which HMCs were created with an average 1000-fold attenuation in the group relative to the Earth's magnetic respectively one day with HMC and absence. The human cardiovascular system was studied with 24-hour monitoring ECG data and calculation of HRV. The use of the ANOVA technique with repeated measurements, in which every 5-minute fragments were analyzed step by step, revealed significant differences in most HRV values ( $p < 0.0001$ ). The heart rate decreased (63.6 $\pm$ 0.1 vs 56.8 $\pm$ 0.3 bpm), while the total HRV reflected by the SDNN components significantly increased (87.3 $\pm$ 1.1 vs 130.7 $\pm$ 4.1 ms) and TP (6.08 $\pm$ 0.1 vs 11.2 $\pm$ 0.6 ms<sup>2</sup>). Sympathetic Stress Index (by Baevsky's) significantly decreased from 45.9 $\pm$ 0.9 vs 22.3 $\pm$ 1 c.u. and the LF/HF ratio (2.9 $\pm$ 0.1 vs 1.8 $\pm$ 0.1). There was significant vagotonic activation: RMSSD (47.9 $\pm$ 0.2 vs 63.3 $\pm$ 0.9 ms) and pNN50% (26.8 $\pm$ 0.2 vs 38.6 $\pm$ 0.6), as well as an increase in HF spectrum (0.8 $\pm$ 0.02 vs 1.06 $\pm$ 0.04 ms<sup>2</sup>). With in-depth data processing, a step-by-step discriminant analysis of the data on the total number of heart rate variability indicators was performed, which made it possible to identify a group of values that are most sensitive to the influence of HMC in the experiment. The results of individuals autocorrelation and cross-correlation analysis with the variability of the level of the compensated geomagnetic field revealed an increase in the chaotization of HRV indices under HMC. Analysis by the Hilbert-Huang method made it possible to show the physiological response of the regulatory mechanisms of the heart rate of the individuals to the

variability of the parameters of compensation of the geomagnetic field. The study is supported by the RAS (64.1, 65.2).