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Possible mechanisms of peripheral blood pressure adaptation to simulated chronic hypogravity

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Human adaptation to extreme conditions primarily involves the basic vital systems of the body. The aim of our study was to analyze the mechanisms of adaptation of the cardiovascular system to simulated conditions of space flight and stay on the lunar surface. Hypo- and microgravity was simulated using orthostatic and anti-orthostatic hypokinesia, respectively (bed-rest at different angles: -6° and +9.6°) and was carried out on volunteers in hospital setting. Analysis of blood pressure variability (BPV) revealed significant increase in the systolic BPV by 8 day in head-down bed-rest group (HDBRG) and return of these parameters to baseline values by day 21. Analysis of the frequency components of systolic BPV spectrum in HDBRG showed that the main contribution to the total spectral power on day 8 was made by the very-low-frequency component. At the same term, we observed a pronounced increase in the very-low-frequency component of heart rate variability (HRV) in HDBRG in comparison with that in head-up bed-rest group (HUBRG). Coincidence of these changes may indicate that significant contribution into adaptation is made by central neural mechanisms that are activated during the first week of simulated microgravity. The diastolic BPV was markedly changes by day 21 in both experimental groups in comparison with baseline values, primarily at the expense of very-low-frequency component of BPV. In HRV, no similar changes were observed by day 21 of the experiment. These findings probably attest to predominance of local mechanisms of vascular tone regulation not directly related with the autonomic control.

Biography

Anton Cherepov graduated from Medical-Biology Faculty (Biochemistry department) of N I Pirogov Moscow Medical Institute in 1989. His first research dealt with the role of lipid peroxidation in Parkinson disease at the Institute of General Pathology and Pathophysiology, Russian Academy of Medical Sciences. Then, he studied immediately-early genes expression in learning and memory on the model of filial imprinting in chicks and other learning models in mice at P K Anokhin Institute of Normal Physiology, Russian Academy of Medical Sciences. His current research interest involves methodological approaches for evaluation of specific and non-specific responses of human organism under normal and extreme conditions.

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