

Complex-Spectrum Magnetic Environment enhances and/or modifies Bioeffects of Hypokinetic Stress Condition: an Animal Study

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During last decades it was shown by many authors that ultra-low and extremely low frequency electric and magnetic fields (ULF: 0-10 Hz; ELF: 10-1000 Hz) may produce biological effects and consequently may be a possible source for health problems. Spaceflight electric and magnetic environments are characterized by complex combination of static and time-varying components in ULF-ELF range and by high variability. The objective of this study was to investigate the possible influence of such magnetic fields on rats to understand the pathway regarding functional state of cardiovascular system. Magnetic field (MF) pattern with variable complex spectra in 0-150 Hz frequency range was simulated using 3-axial Helmholtz coils and special computer-based equipment. The effect of the "real world" MF exposure on rats was also tested in combination with hypokinetic stress condition which is typical for spaceflights. It was revealed that variable complex-spectrum MF acts as a weak or moderate stress-like factor, which amplifies and/or modifies the functional shifts caused by other stress-factors. The value and direction of the functional shifts caused by MF exposure significantly depend on gender, individual-typological (constitutional) features and also on the physiological state (norm, stress) of organism. Our results support the idea that variable complex-spectrum MF action involves sympathetic activation, overload in cholesterol transport in blood and also secretor activation of tissue basophyls (mast cells) that can influence the regional haemodynamics. These functional shifts can be one of causes of increased risk of cardiovascular diseases.