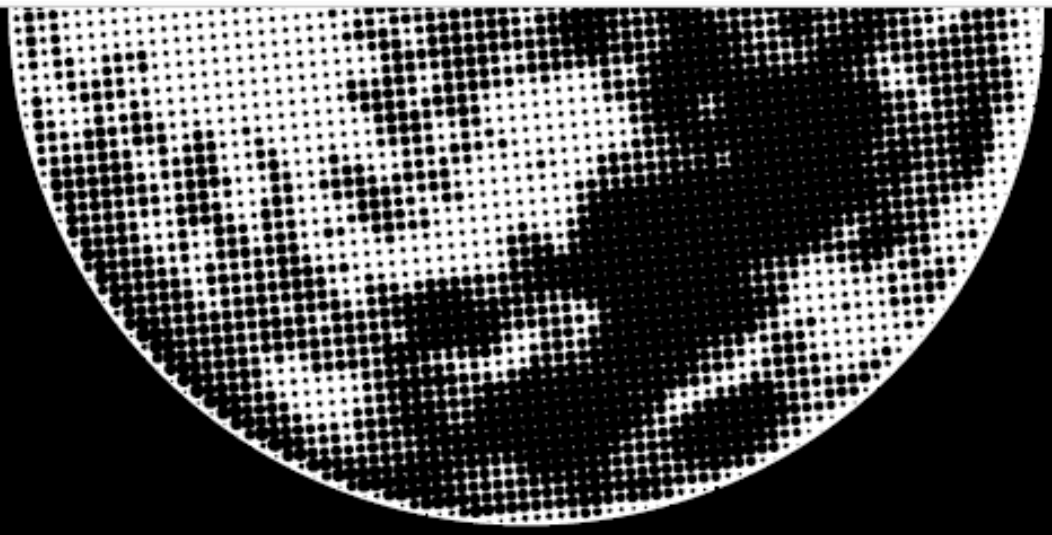

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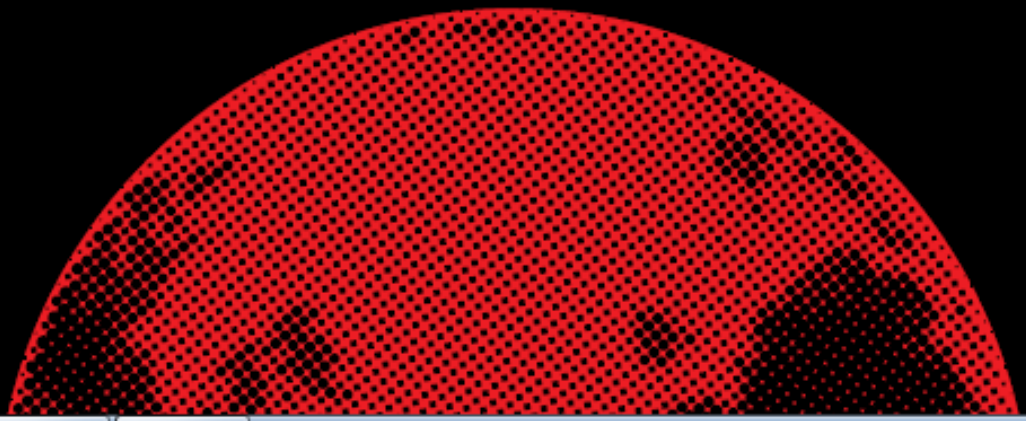

MICROGRAVITY-INDUCED EFFECTS ON MOTOR SYSTEM: INFLUENCE OF SPINAL CORD STIMULATION AND SUPPORT AFFERENTATION

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The development of innovative therapeutic strategies aimed at preventing the consequences of unloading skeletal muscles during space missions is one of the main tasks of gravitational physiology. The experiments were carried out on Wistar rats weighing 190-210 g in compliance with all bioethical standards. We are used the rat hindlimb unloading model to simulate microgravity according to the method of Morey-Holton, Globus, 2002. Depending on the experimental conditions, the animals were randomly divided into the following groups: "HU" - animals with hindlimb unloading (n=14); "HU+ES" - animals with hindlimb unloading, combined with electrical stimulation of the spinal cord (n=9); "HU+MS" - animals with hindlimb unloading, combined with magnetic stimulation of the spinal cord (n=12); "HU+SA" - animals with hindlimb unloading, combined with the activation of supporting receptors (afferentation) (n=12). After 7, 14 and 35 days of exposure to the experimental conditions, the functional state of the central (spinal motoneurons) and peripheral (muscle fibers, neuromuscular synapse) structures of the neuro-motor apparatus of the antigravity (postural) m. soleus. For this, H-reflex, M-wave were recorded, H/M ratio, M-wave amplitude decrement during frequency stimulation, and wet and dry muscle weights were estimated. The data obtained in the study of intact animals (n=5) were used as controls. After 7 days of exposure to experimental conditions, an increase in the reflex excitability of motoneurons of the spinal motor center of m. soleus in the HU and HU+MS groups was observed, an increase in the rate of propagation of excitation along the reflex arc in the HU+ES and HU+MS groups; decrease in the reliability of neuromuscular transmission in the HU and HU+MS groups, increase in the rate of generation of the action potential of motor units m. soleus in the HU+MS group, increased synchronization of motor unit recruitment in the HU+ES and HU+MS groups, the development of atrophy in the HU, HU+ES, and HU+MS groups. After 14 days of exposure to experimental conditions, no significant changes in the recorded indicators were found in comparison with the data obtained at the previous stage of the study. However, in comparison with the control, a significant increase in the reflex excitability of the motor centers and a significant atrophy of m. soleus was found in all experimental groups. After 35 days of simulated microgravity, an increase in the reflex excitability of the spinal motor center m. soleus was record in all experimental groups; a decrease in the M-wave threshold in the HU group, a decrease in the number of activated motor units, a decrease in the reliability of neuromuscular transmission and a significant atrophy of muscle fibers was recorded in all experimental groups too. Thus, simulated microgravity initiates changes in motor systems at all levels of their organization. Electrical, but not magnetic, stimulation of the spinal cord during short-term microgravity prevents changes in reflex excitability of motor neurons and does not affect peripheral microgravitational transformations. The activation of support afferents completely excludes the effects of 7 days of simulated microgravity, but does not exclude changes in the functional state of postural neuro-motor systems under prolonged exposure to microgravity. The reported study was funded by RFBR according to the research project No. 19-04-01067.