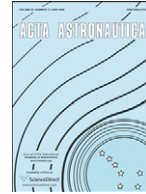




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Mechanisms of spinal motoneurons survival in rats under simulated hypogravity on earth

R.R. Islamov^{a,*}, E.A. Mishagina^b, O.V. Tyapkina^b, G.F. Shajmardanova^b, A.A. Ereemeev^c, I.B. Kozlovskaya^d, E.E. Nikolskij^{a,b}, A.I. Grigorjev^d

^a Department of Histology, Kazan State Medical University, Butlerov str., Kazan 420012, Russia

^b Kazan Institute of Biochemistry and Biophysics, Kazan scientific center, Russian Academy of Science, Lobachevsky str., Kazan 420111, Russia

^c Department of Human Physiology, Kazan State University, Kremlyovskaya str., Kazan 420008, Russia

^d Institute of Medicine and Biology Problems at Russian Academy of Science, Moscow, Russia

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ABSTRACT

It was previously shown that different cell types *in vivo* and *in vitro* may die via apoptosis under weightlessness conditions in space as well as in simulated hypogravity on the Earth. We assessed survivability of spinal motoneurons of rats after 35-day antiorthostatic hind limb suspension. Following weight bearing, unloading the total protein content in lumbar spinal cord is dropped by 21%. The electrophysiological studies of *m. gastrocnemius* revealed an elevated motoneurons' reflex excitability and conduction disturbances in the sciatic nerve axons. The number of myelinated fibers in the ventral root of experimental animals was insignificantly increased by 35-day of antiorthostatic hind limb suspension, although the retrograde axonal transport was significantly decreased during the first week of simulated hypogravity. The results of the immunohistochemical assay with antibodies against proapoptotic protein caspase 9 and cytotoxicity marker neuron specific nitric oxide synthase (nNOS) and the TUNEL staining did not reveal any signs of apoptosis in motoneurons of suspended and control animals. To examine the possible adaptation mechanisms activated in motoneurons in response to simulated hypogravity we investigated immunoprecipitation of Hsp25 and Hsp70 in lumbar spinal cord of the rats after 35-day antiorthostatic hind limb suspension. Comparative analysis of the immunohistochemical reaction with anti-Hsp25 antibodies revealed differential staining of motoneurons in intact and experimental animals. The density of immunoprecipitate with anti-Hsp25 antibodies was substantially higher in motoneurons of the 35-day suspended than control rats and the more intensive precipitate in this reaction was observed in motoneuron neuritis. Quantitative analysis of Hsp25 expression demonstrated an increase in the Hsp25 level by 95% in experimental rats compared to the control. The immunoprecipitation of Hsp70 found no qualitative and quantitative differences in control and experimental lumbar spinal cords. Taken together our results show that (1) rat motoneurons survived after 35-day antiorthostatic hind limb suspension and the changes in neurons had a mostly functional character, and (2) the increased immunoprecipitation of Hsp25 can be considered as the anti-apoptotic factor.

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* Corresponding author. Tel.: +7 843 292 76 54; fax: +843 292 76 19.

E-mail addresses: islamru@yahoo.com (R.R. Islamov), modeljane@yandex.ru (E.A. Mishagina), anti-toxin@mail.ru (O.V. Tyapkina), gulnara_kzn@rambler.ru (G.F. Shajmardanova), 2anton.eremeev@mail.ru (A.A. Ereemeev), ikozlov@mail.ru (I.B. Kozlovskaya), eenik1947@mail.ru (E.E. Nikolskij).