

Radiation-induced long period changes of hippocampal neurons in rats

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For spaceflights it is important to consider the radiobiological effects of cosmic radiation on the central nervous system (CNS). During long flight is possible that damage of the central nervous system occurs, which can cause disturbances of the crew's operator activity during the flight, and that in turn threatens the fulfillment of the entire space mission. We applied 1 Gy/min 171 MeV proton irradiation on Sprague Dawley outbred rats. Open field tests showed statistically significant differences in comparison with control. On first day, the indicator for the orientation-exploratory reaction (OER) is lowered in both periods, the indicator of emotional status (ES) was lowered from 1-3 minutes 1.5 times. On the 7th day the OER index is lower from 1-3 minutes. On day 14, the ES was increased from 4-6 minutes 1.5 times. On both the 30th day and 90th day, the OER index was increased.

The changes in irradiated animals were observed also in the histological study, the number of intact neurons decreased 1.5 times relative to the control in both periods. Modified cells (both altered and dystrophic) in irradiated rats in the hippocampus increased 1.5 times on the 30th and 90th day. There are structural and cognitive changes observed in hippocampal neurons as a result of proton irradiation, which can be harmful in context of human space flight missions.

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