AGE-DEPEDENT EFFECT OF MICROWAVE RADIATION ON PROLIFERATION AND CELL DYING IN THE RAT ROSTRAL MIGRATORY STREAM

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Microwave radiation (MWR) from the mobile phone base stations is regarded as having low power, but the output is continual. This radiation is one of the most significant environmental factors and its effect on living organism is a subject of intensive studies. The research of MWR effect is increasingly focused on the brain regions where new neurons are produced in adulthood. It has been shown that both neurogenic areas, the hippocampus and the subventricular zone (SVZ) are vulnerable to adverse factors of an environment and MWR seems to have the most severe impact on adult neurogenesis among exogenous factors studied in this relation.
The aim of our work was to investigate the effect of MWR on proliferation and cell dying in the rat rostral migratory stream (RMS) - a migration route for the SVZ neuroblasts to reach the olfactory bulb. Adult and neonatal (two weeks old) rats were exposed to a pulsed-wave electromagnetic radiation at the frequency of 2.45 GHz and mean power density of 2.8 mW/cm^2, in a purpose-designed exposure chamber for 3 hours daily during 3 weeks. After the exposure to MWR, neonatal rats were allowed to survive till adulthood. Regarding the survival time after the exposure, the adult rats were divided into two groups: without survival and with two weeks survival. Sham-exposed rats of the same ages underwent the same procedures as irradiated animals, except for the MWR exposure. After perfusion fixation, the brains of all rats were processed for morphological analysis. Proliferating cells were immunohistochemically labelled using antibody against the marker of proliferation - Ki-67; dying cells were visualized by Fluoro-Jade C histochemistry.
Quantitative analysis of proliferating cells in the RMS of rats irradiated as adults confirmed the negative effect of MWR on proliferation, which was manifested by the highly significant decrease of the number of dividing cells. After 2 weeks of survival, the proliferation activity slightly increased, but it was still markedly reduced in comparison with control rats. Reduction of dividing cells number was accompanied by non-significant increase of dying cells in both groups of rats irradiated as adults. The MWR impact on proliferation and cell dying in rats that were irradiated as neonatal was manifested differently. The number of proliferating cells in their RMS was also decreased, but this decrease did not show any statistical significance. Interestingly, exposure of neonatal rats to MWR strikingly affected the cells dying. Two months after irradiation, the number of dying cells in the RMS of rats exposed to MWR was about twice as high as in control rats. It suggests that the radiation carried out in neonatal age had long-lasting influence on processes of postnatal neurogenesis, which is more likely manifested by altered cell dying than by changes in proliferation.

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