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THE SENSITIVITY OF THE CULTURED MURINE NEURAL STEM CELLS TO THE IONIZING RADIATION

G. A. Posypanova[a], M. G. Ratushnyak[a], Y. P. Semochkina[a], A. A. Abisheva[a], and E. Yu. Moskaleva[a, *]

[a]NRC Kurchatov Institute, Moscow, 123182 Russia

**e-mail: Moskaleva_EY@nrcki.ru*

A culture of neural stem cells/neural progenitor cells (NSC/NPC) was obtained from the murine brain. NSC/NPC irradiation at a dose of 0.1 Gy did not cause changes in the cell cycle, in the apoptosis level, or in cell survival. A decrease in the NSC/NPC clonogenic activity by 50% was observed after γ-irradiation at a dose of 1.2 Gy. Irradiation of NSC/NSP at doses 1–4 Gy caused a block of the cell cycle in the G_2/M phase after 24 hours a prolonged block (about 72 hours) at G_0/G_1-phase and prolonged increase of the apoptosis level. The DNA double-strand breaks (DSB) formation, which was measured as the level of histone γH2AX or as γH2AX foci one hour after irradiation at doses of 0.1–4 Gy, was proportional to the dose. The DSB repair was slow if cells were exposed to low (0.1 Gy) and intermediate (1 Gy) doses and completed only 48 hours after irradiation. It is shown that NSC/NPC retain the ability to differentiate into neurons and astrocytes after irradiation at doses of 1 and 2 Gy but neuron and astrocyte formation decreases by 70 and 48% respectively after irradiation at a dose of 4 Gy. This data demonstrates that neurogenesis is more sensitive to the radiation impact compared to astrocytes formation. Low level of DSB repair may be one of the reasons for high radiosensitivity of NSC/NPC.

Keywords: neural stem cells, neural progenitor cells, radiosensitivity, double-strand breaks, DNA repair, γH2AX foci, differentiation, neurons, astrocytes, cell cycle, gamma radiation