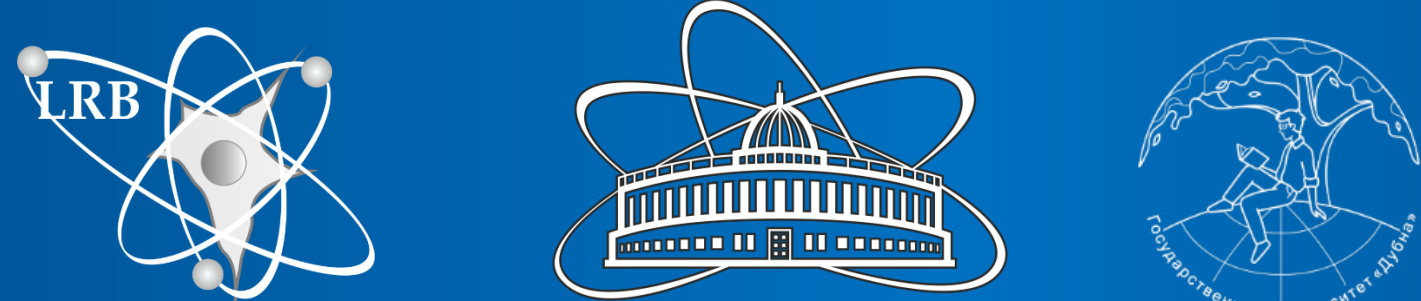


The influence of total gamma radiation on behavior and brain changes of aged mice



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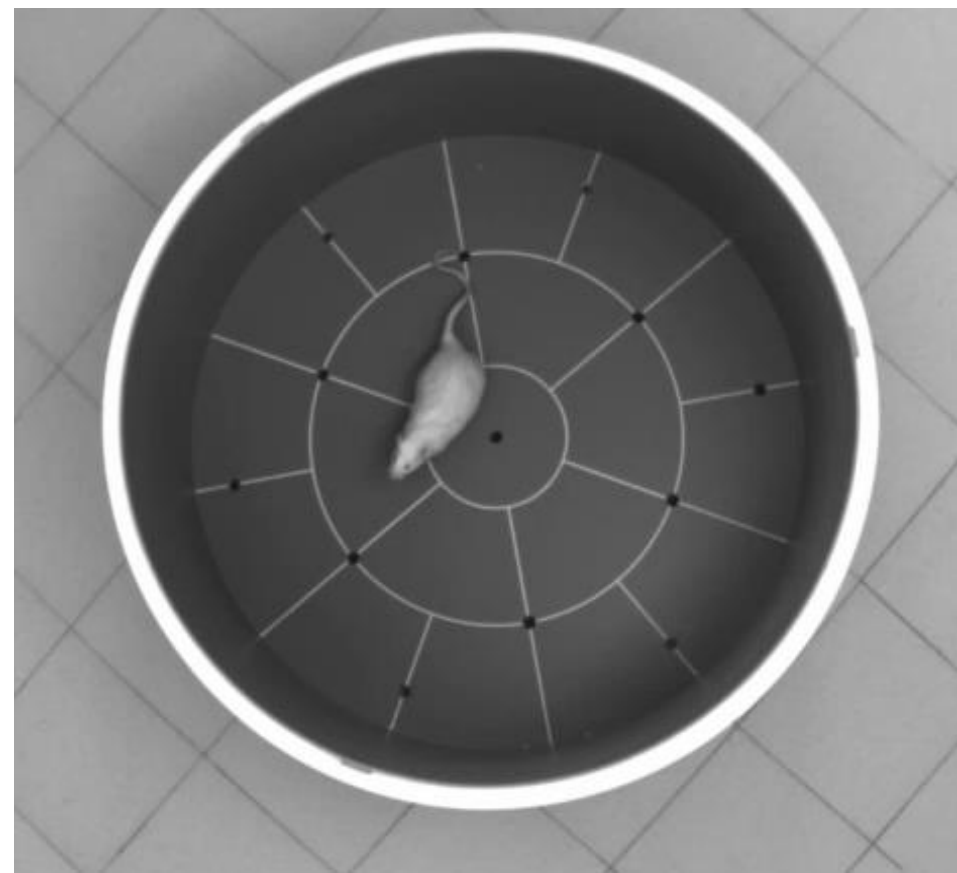
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At present time, it is important to study the effect of ionizing radiation on the central nervous system with both different physical characteristics and different age categories of experimental animals. The purpose of the experiment was to study changes in the behavior of aged mice after irradiation with gamma rays on the 30th day.



Materials and methods: The experiment was conducted on males of the ICR line, seven months old. The animals were irradiated totally, by using the Co⁶⁰ gamma quanta at a dose of 2 Gy, dose rate of 0.505 Gy / min, isodose of 90%, RIP = 75 cm at the Rocus-M facility, JINR medical-technical accelerator complex. The experimental mice were divided into two groups: irradiated and intact control.

The effect of radiation on the behavioral status of animals

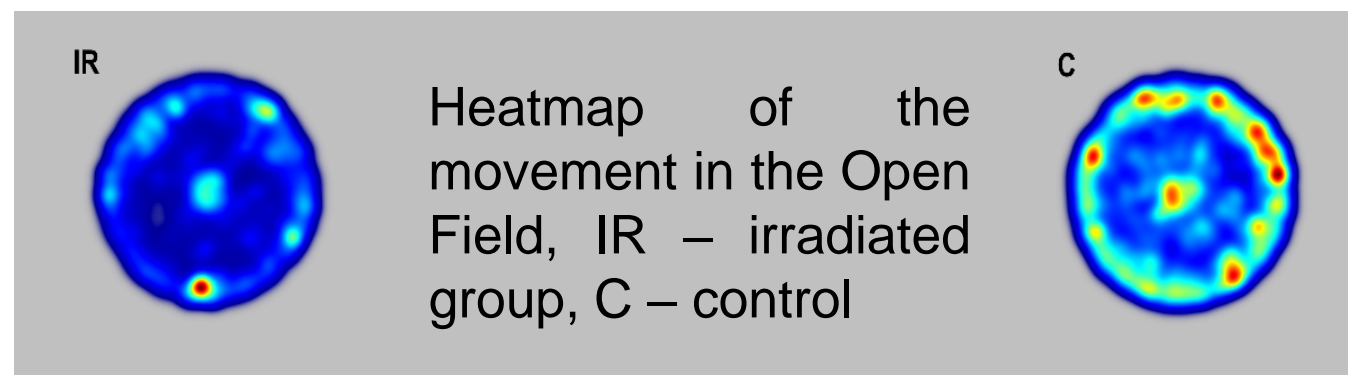
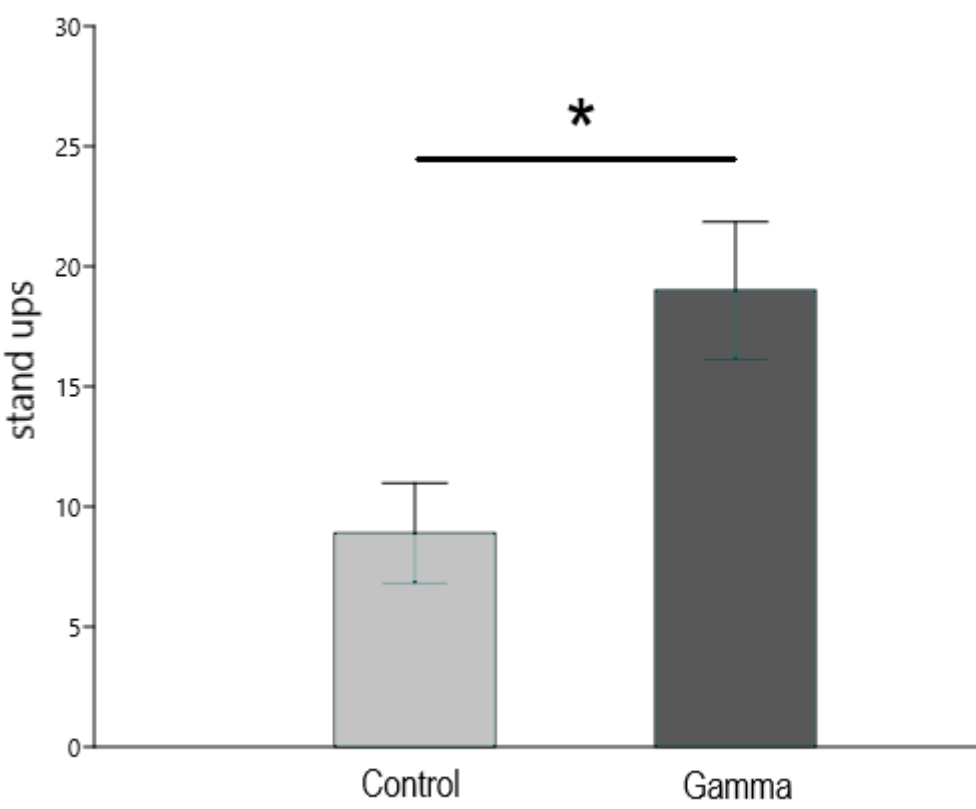
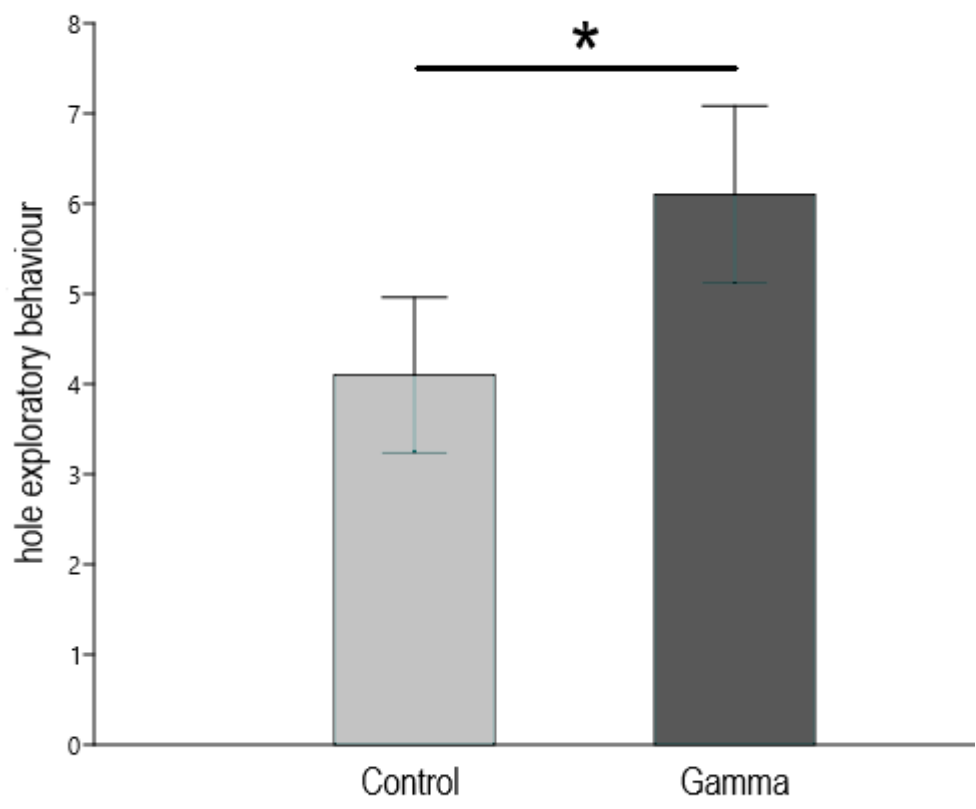


Open Field test

<u>3 min</u>	Grooming	Sectors crossings	Center entrance	Stand ups	Hole dipping	Freezing
<u>Control</u>	1.1±0.5	92.8±35.5	3.8±2.5	7.2±5.9	4.1±2.0	0.2±0.5
<u>Irradiated</u>	1.3±0.6	73.4±29.7	3.4±1.9	11±5.9	6.1±2.2*	0.1±0.2
<u>6 min</u>						
<u>Control</u>	1.3±0.6	65.2±30.1	3.6±2.3	8.9±4.7	3.0±1.3	0.9±0.9
<u>Irradiated</u>	0.8±0.5	56.1±31.3	4.3±2.9	19±6.5*	4.6±3.1	0.4±0.4

Table 1. Behavioral reactions of mice on the 30th day after γ-irradiation in the Open Field

* - statistically significant differences with the intact control group;
p ≤ 0.05, Pairwise Mann-Whitney comparison. Mean ± Standard error



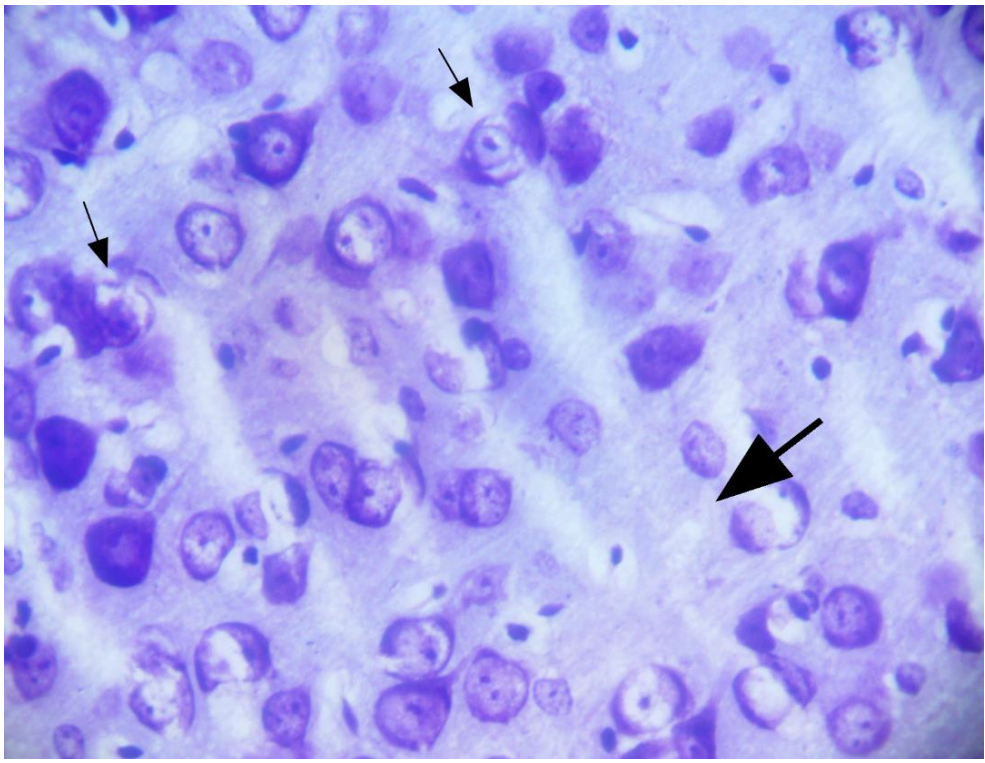
Movement across the arena was more varied in the control group. The irradiated animals generally preferred to be in the periphery and stayed in a state of freezing longer. The behavior of the irradiated animals deteriorated in comparison with control.

Radiation influence on morphological changes in the central nervous system

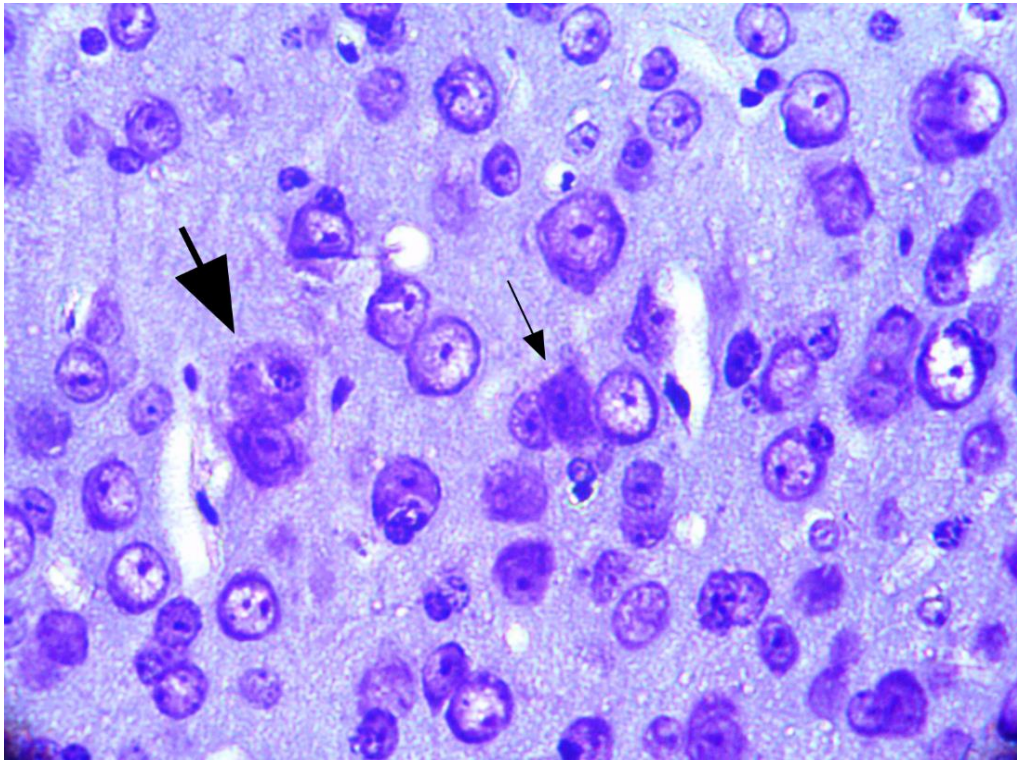
SMC neurons (%)			
No	healthy	altered	degenerated
1 control	20.4±8.85	66.9±12.0	10.1±3.97
2 irradiated	14.8±4.62	68.2±3.91	15.7±4.57*

Table 2. Quantitative analysis of morphological changes of neurons in the cerebral cortex in mice 30 days after γ-irradiation vs. control

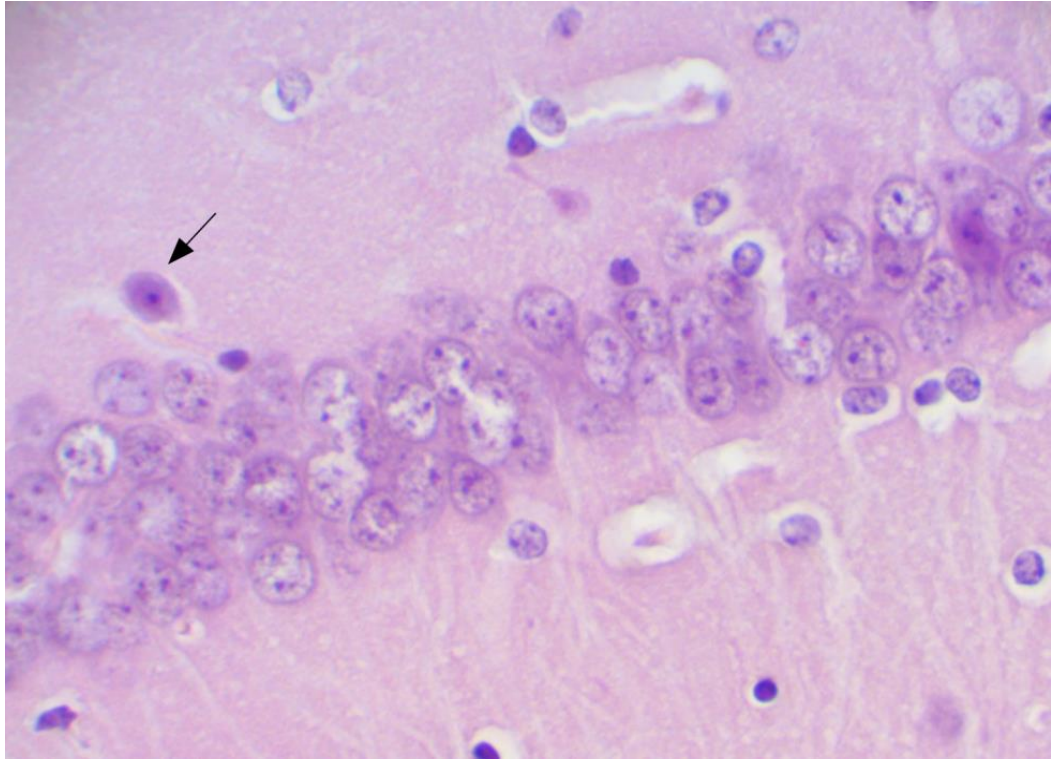
* - p < 0.05, Pairwise Mann-Whitney comparison. Mean ± Standard error



Visualization of the SMC cells, Cresyl Violet staining used (x400).
The big arrow indicates the local foci of deposition in tissue. The small arrows indicate dystrophically altered neurons



Visualization of the SMC cells, Cresyl Violet staining used (x400).
Arrows - degenerative neurons. Large arrow-cell-shadow.



Visualization of the hippocampus cells, H&E staining used (x400).
Pericellular edema of a degenerative neuron. A clear change in the size of the cell visible: dispersion of the basophilic substance in the nucleus and cytoplasm.

Conclusion

Our data show that total irradiation of Co60 at a dose of 2 Gy after a month of the post-radiation period has a damaging effect. This is manifested by the results of behavioral examination of rodents in the "Open Field" maze, as well as the results of the morphological analysis of nerve cells in the SMC and hippocampus of the brain. The experiment showed an increase in indicators of some types of behavioral activity and an increase in the number of neurons with destructive disorders in the SMC in irradiated mice. Thus, it can be concluded that radiation exposure to γ-quanta at a dose of 2 Gy a month after exposure, causes changes in different systems of the body.