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Higher brain functions of the offspring of irradiated animals

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Purpose of work

To study the psychophysiological development of the offspring of the first and second generations of non-sterilizing doses irradiated male rats whose sex cells were at different stages of spermatogenesis.

Work tasks

- To evaluate cognitive brain function of offspring of two generations of male Wistar rats exposed to acute gamma irradiation in different doses;
- To study the features of the nervous organization of the descendants of irradiated males on the test of behavior in the open field;
- To conduct a comparative analysis of the nature and severity of radiation effects depending on the absorbed dose and stages of spermatogenesis at the time of radiation exposure to male parents;
- To evaluate on one of the effective doses the preferred method of transmission of negative effects of radiation;
- Determine the "threshold" of harmful ontogenetic effects of radiation on the studied texts.

Materials and methods

To solve the set tasks was used about 2,900 of Wistar rats.

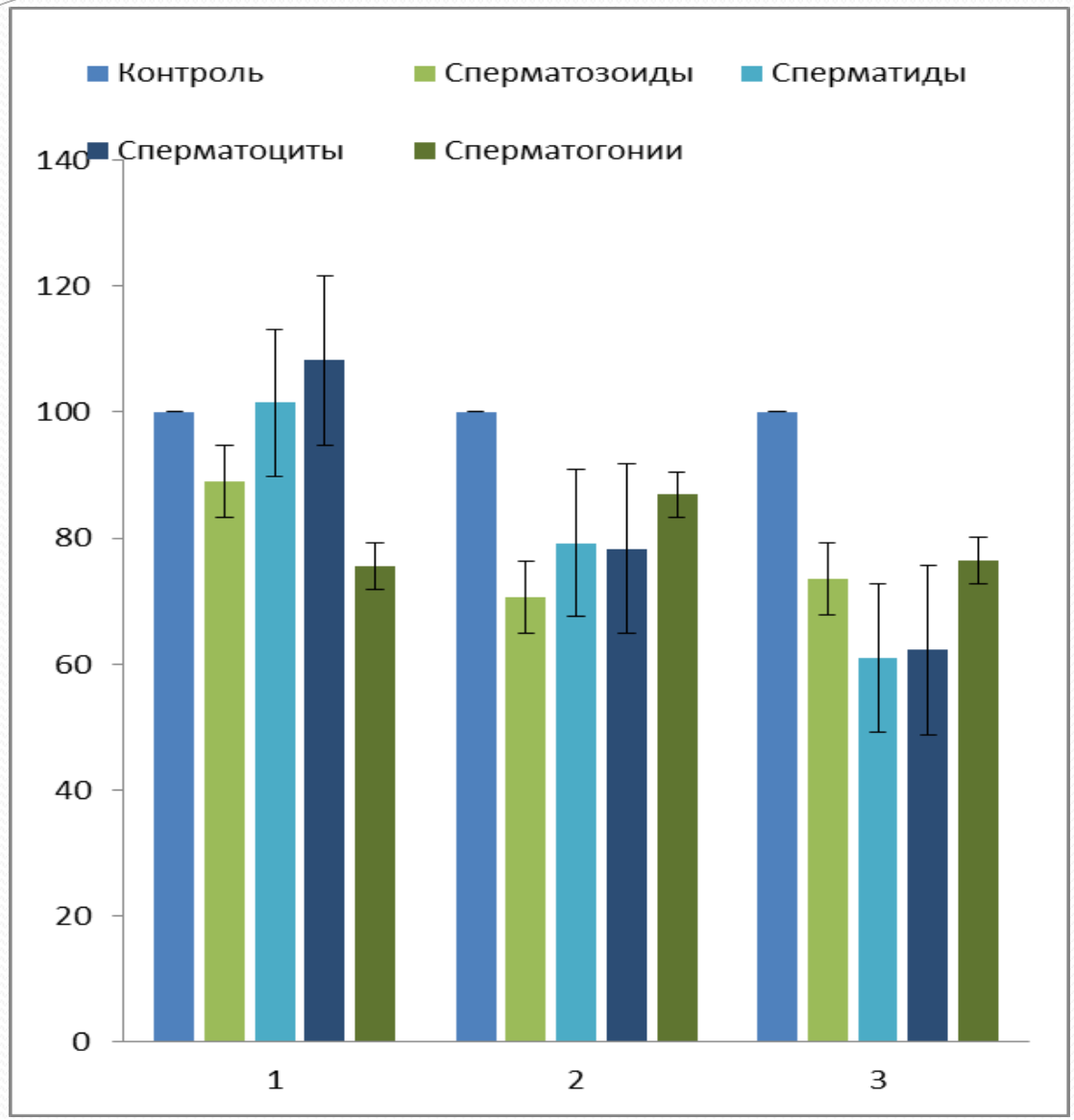
Mature male Wistar rats (F0) were irradiated at the gamma-ray unit at a dose rate of 20.0 Gy/h, at doses of 0.5, 1.0 and 1.5 Gy.

To obtain the first generation offspring (F1), F0 males were mated with intact females at different intervals after irradiation (so that the germ cells irradiated at different stages of spermatogenesis participated in fertilization).

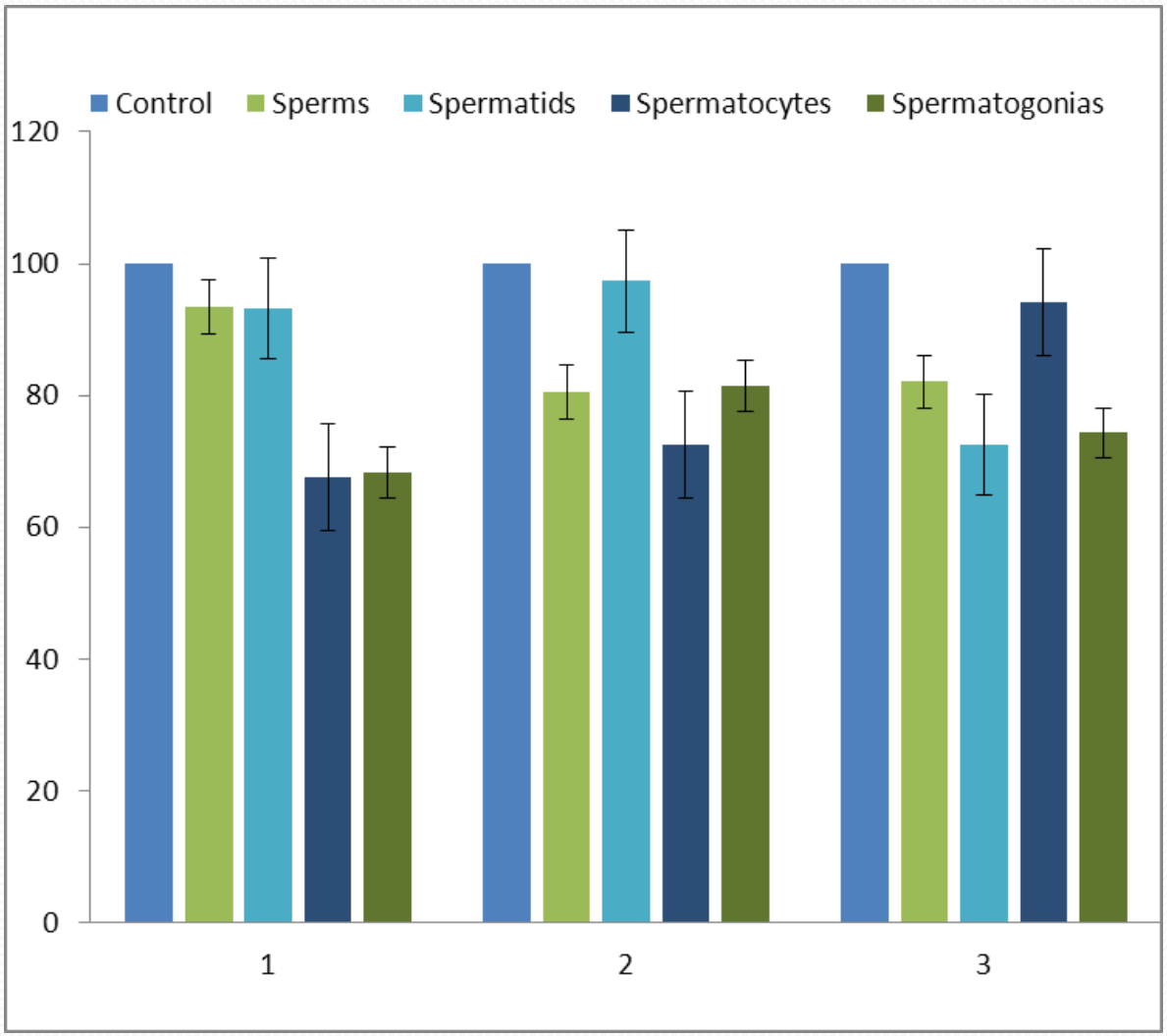
To obtain the offspring of the second generation (F2), three variants of crossing were used: 1) females of the first generation were mated with intact males, as a result they received offspring F2 on the maternal line; 2) males of the first generation were mated with intact females, as a result they received offspring F2 on the paternal line; 3) females of the first generation were mated with males of the first generation, as a result they received offspring F2, both parents of which descended from irradiated fathers.

Materials and methods

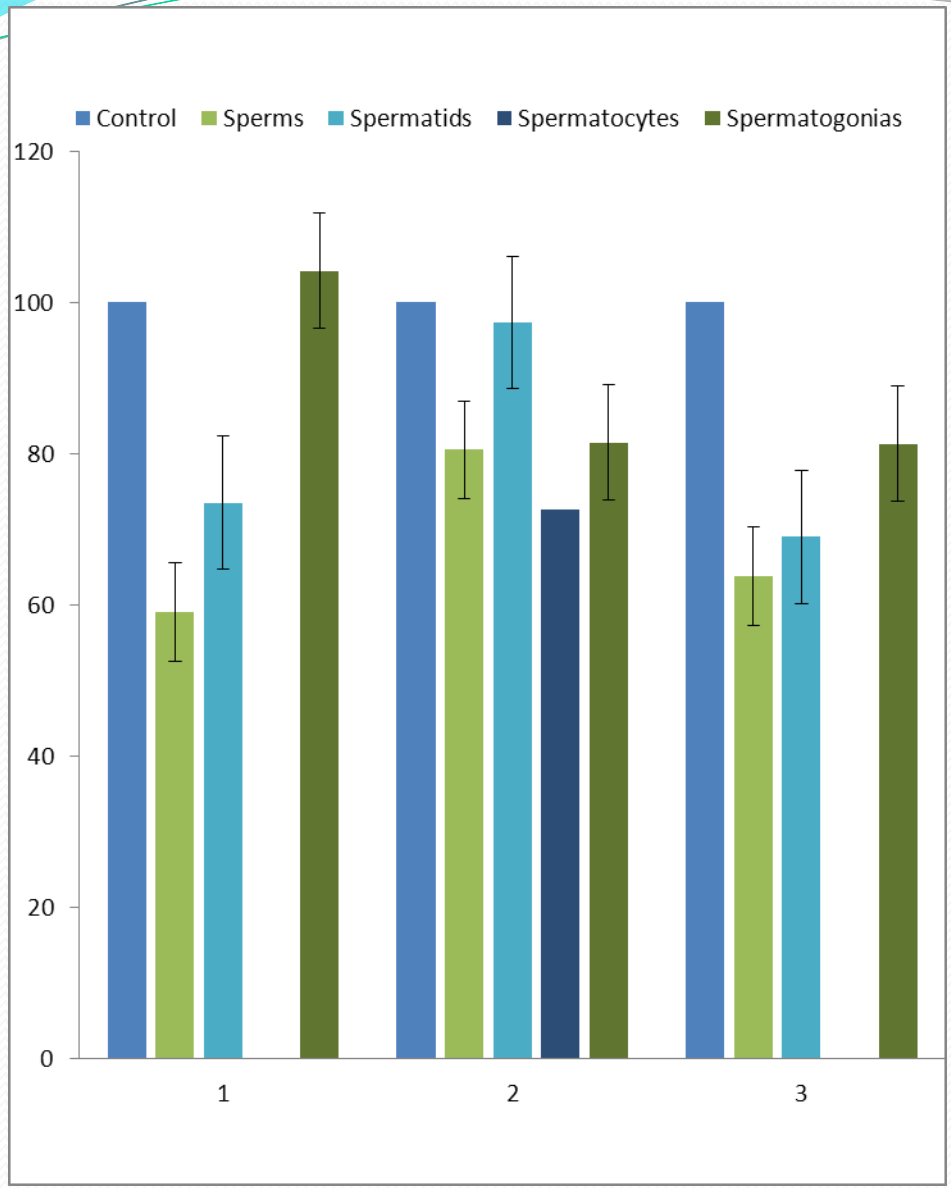
Cognitive (memory) functions of the brain were evaluated by the ability to develop and reproduce the conditioned reflex of avoidance. The experiments used a standard method of training rats in Shuttle - box .



The number of URI produced in rats-descendants of irradiated males of the first generation.
1 - radiation dose 0.5 Gy
2 - dose of 1 Gy
3 - radiation dose 1.5 Gy



The number of URI produced in the offspring rats of second-generation irradiated males.
1 - radiation dose 0.5 Gy
2 - dose 1 Gy
3-radiation dose 1.5 Gy



The number of URI produced in rats-offspring irradiated at a dose of 1 Gy males of the second generation.

1 – father's line

2 – mother line

3 – line both parents

Summary:

- It is established that acute gamma irradiation in non-sterilizing doses (0.2, 0.5, 1.0, 1.5 Gy) has a negative impact on the psychophysiological development of the offspring of the first generation of irradiated male rats, which is expressed in violation of the production, consolidation and subsequent reproduction of the conditioned reflex of avoidance.

- Moreover, for the manifestation of hereditary effects of radiation effects on males, along with the absorbed dose of radiation, the stage of spermatogenesis at the time of radiation exposure is of fundamental importance.

Summary:

- According to our data, the dose of acute single gamma irradiation of 0.5 Gy is close to the minimum effective effect on the higher functions of the Central nervous system in the descendants of irradiated animals.

- Signs of negative effects of irradiation on the second generation offspring from irradiated males, less pronounced than in the offspring of the first generation, were found.

- The data obtained suggest that there is a summation of the negative effects of radiation in the second generation, if both parents are descendants of irradiated males.