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ASSESSMENTS OF RADIONUCLIDES INFLUENCE ON WISTAR RATS' HEMATOPOIETIC SYSTEM USING CELL CULTURE *IN VIVO*

The influence of environmental factors, such as sources of external and internal radiation, can cause disorders in the functioning of hematopoietic system as one of the most radiosensitive in the mammalian organism. Today, there is a significant amount of technogenic radionuclides in the environment, in particular, strontium-90 and cesium-137. Some radionuclides can accumulate in tissues and organs, for example, strontium-90 – in bone tissue and iodine-131 in the thyroid gland. Therefore, it is important to investigate the effect of radionuclides on hematopoiesis, primarily on the level of stem and progenitor cells. Clonogenic assays *in vitro* and *in vivo* allow assessing functional activity of these cells and evaluating the consequences of ionizing radiation action.

The aim of this work is determination of the influence of radionuclides strontium-90 and iodine-131 on the hematopoietic system of Wistar rats, after single and long-term internal exposure to ionizing radiation.

The study was conducted on Wistar rats, which were internally exposed to the solution of radionuclides either once or during a long period of time. Strontium-90 was administered once with an activity of 50 kBq, and long-term administration was with an activity of 5 kBq per day [1]. This model of irradiation was developed at the R. E. Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology, NAS of Ukraine. Iodine-131 was administered once with an activity of 300 kBq, and long-term administration was with an activity of 30 kBq per day [2]. This model of irradiation was developed at the Institute for Nuclear Research, NAS of Ukraine.

Cultivation of rat hematopoietic cells was carried out *in vivo* using gel diffusion chambers. To obtain bone marrow cells, rat femurs were removed and their contents were washed with cultural medium. Cell suspension was prepared by mixing it with fetal calf serum, L-glutamine, antibiotics, and agar and injected into diffusion chambers. The recipient animals of the diffusion chambers were CBA mice pretreated with cyclophosphamide and

anesthetized. Cultivation of rat bone marrow cells in this system *in vivo* lasted for 18 days.

Thus, we performed the analysis of internal ionizing radiation influence on hematopoietic system of laboratory animals. To investigate functional activity of bone marrow stem and progenitor cells under exposure to radionuclides, colony-forming efficiency was assessed in cell culture in diffusion chambers *in vivo*.

Analysis of the data obtained during the cultivation of hematopoietic cells showed a clearly pronounced inhibition of colony forming in irradiated animals compared to control. After long-term irradiation of Wistar rats with iodine-131, decrease by a third was observed in the number of bone marrow colony-forming units compared to control. At the same time, in the group of acute iodine-131 irradiation, complete inhibition of the functional activity of bone marrow cells was revealed, i.e., colony forming was practically absent. Along with that, long-term exposure to radionuclide strontium-90 resulted in a twofold inhibition of colony forming compared to the control group of animals. However, a single administration of strontium-90 caused a decrease in the functional activity of bone marrow cells only by a third compared to the control.

Thus, the obtained results indicated that colony-forming efficiency of hematopoietic stem and progenitor cells in rats was suppressed after exposure to radionuclides in different doses, both after single and long-term administration. The consequences of strontium-90 and iodine-131 influence on hematopoietic system of Wistar rats are comparable with the data obtained earlier concerning the impact of ionizing radiation on the functioning of the primary departments of human hematopoiesis [3]. These indices can be used in further interpretations of hematopoiesis state of the individuals living in the areas contaminated with radionuclides.

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