

ESTIMATION OF MINIMALLY EFFECTIVE DOSES γ - IRRADIATION ON RAT PERIPHERAL BLOOD REACTION

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"Wistar", with a body weight of 230-250 g at the age of 2.5-3 months. Prolonged irradiation of animals was carried out on the installation of a panoramic type "Experiment" (Russia) with a source of γ -radiation ¹³⁷Cs in three modes of exposure. In the first mode, under continuous exposure conditions for 20 hours, the total absorbed dose was 4.8 mGy with an absorbed dose rate of 4 µGy/min. The second experimental group consisted of animals exposed to ionizing radiation at a dose of 3.3 cGy with an absorbed dose rate of 27.5 μ Gy/ min. As a comparison group, we used rats that received the lowest possible exposure level in our conditions, which was an order of magnitude lower - 0.48 mGy over 20 hours. The number of animals in the groups was 30-45 taking into account repeated replications. Analysis of the acid resistance of erythrocyte membranes (P) and the activity of the enzymatic antioxidant system in the same rats was performed before exposure, as well as at different times after the end of irradiation by maximum single blood loss did not exceed 3% of the circulating blood volume.

Research results. According to our results, prolonged γ -radiation at low doses (dose rate 4 μ Gy/min, total dose 4.8 mGy) under continuous irradiation conditions (20 hours) caused unidirectional changes in irradiated animals, the maximum severity of which recorded at the end of the first day. At the same time, young physiologically defective cells with lower hemolytic resistance and decreased activity of the main antioxidant enzymes entered the blood from the organs of erythropoiesis (table 1). The detected effect was recorded up to 3 weeks of observation.

Increasing the radiation dose to 3.3 cGy (absorbed dose rate 27.5 μ Gy/min for 20 hours in continuous mode) caused pronounced and long-lasting changes in the physiological state of red blood cells, affecting the parameters of the antioxidant defense system.

Method of research. The experiments were conducted on rats (142 males) Table 1 – The main indicators of acid resistance and activity of antioxidant enzymes of peripheral blood erythrocytes in rats irradiated at a dose of 4,8 mGy for 20 hours with continuous exposure

	The term of the study after exposure (days)							
Indicator	Initial	1	3	8	11	24	30	
	value							
Р	630 ± 16	$546 \pm 12^*$	$548 \pm 12^*$	$572 \pm 16*$	$583 \pm 16*$	571 ± 17*	589 ± 26	
superoxide dismutase,	728 ± 49	$534 \pm 1.2^*$	$561 \pm 50^*$	692 ± 46	838 ± 58	772 ± 53	770 ± 23	
pg/erythr								
Catalase, pg/erythr	$39,6\pm0,8$	30,6 ±1,2*	31,4 ±1,0*	31,9 ±0,7*	$40{,}0\pm0{,}9$	$39{,}8\pm0{,}7$	$38,9\pm0,5$	
P < 0.03 by student's t criterion when compared with the original value.								

In the group of animals irradiated at a dose of 0,48 mGy (table 2), on the 3rd day after the end of irradiation, only a short-term decrease in the activity of superoxide dismutase is recorded, whereas in animals irradiated at a dose of 4.8 mGy, the maximum changes in most erythrocytes were found.

spectrophotometry on a UNICO 2804 spectrophotometer (USA). The Table 2 - The main indicators of acid resistance and activity of antioxidant enzymes of peripheral blood erythrocytes in rats irradiated at a dose of maximum single blood loss did not exceed 3% of the circulating blood 0,48 mGv for 20 hours with continuous exposure

Indicator	Initial value	The term of the study after exposure (days)						
		1	3	6				
Р	557±13	563±16	554±12	558±14				
Superoxidedismutase pg/erythr	871±51	750±59	670±51*	877±110				
Catalase, pg/erythr	40,0±1,2	39,5±1,0	36,8±1,4	39,8±1,3				
P < 0.02 by student's t-criterion when compared with the original value								

Conclusion The cumulative analysis of the results we obtained shows that the minimum "threshold" doses of radiation that cause systemic reactions of hemopoesis are very low and are in the range of units of milligrays.