

CHANGES IN RADIOSENSITIVITY OF SPERMATOGENIC EPITHELIUM IN SEVERAL GENERATIONS OF MICE KEPT AGAINST A HIGH RADIATION BACKGROUND

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The reaction of germinal epithelium is often used as a sensitive test of the prolonged action of radiation [1-4, 6]. However, the important problem of the state of spermatogenesis in several generations of mice living in conditions of increased radiation has not been studied.

In the present investigation a cytologic study was made of the spermatogenic epithelium of eight successive generations of mice kept against a high radiation background.

EXPERIMENTAL METHOD

Experiments were carried out on 373 male albino mice. The experimental animals were kept for six months exposed to the constant action of γ -rays from CO^{60} (20 mR/day). Since a histologic study of the spermatogenic epithelium in 108 mice of six generations not exposed to additional irradiation revealed no significant changes, the reaction of the spermatogenic epithelium of such mice to a further dose of radiation was studied. After chronic exposure to irradiation, the mice were irradiated once with x-rays (400 and 600 R to the whole body). The controls were mice of the corresponding generations irradiated with the same doses of x-rays but not exposed to preliminary action of γ -rays. The animals were sacrificed on the 6th, 14th and 30th days of radiation sickness. The numerical data were analyzed by the method of Fogg and Cowing [5].

EXPERIMENTAL RESULTS

Cytologic investigation of 149 mice of generations I-IV revealed no significant differences in the reaction of the spermatogenic epithelium to additional irradiation in the experimental animals on either the 6th or the 14th days compared with the controls. The study of the spermatogenic epithelium of 116 mice of generations I, II, V, VI, and VIII on the 30th day of radiation sickness, i.e., in the period of commencing recovery, showed changes in the degree of repair in chronically irradiated animals.

As Table 1 shows, statistically significant differences in the number of tubules containing spermatogonia were found in the experimental animals of generations I, II, and VIII.

To obtain fuller details of the process of regeneration in the animals of generations I, II, and VIII the mean number of spermatogonia present per tubule among 20 examined was calculated (Table 2).

The process of regeneration was retarded in the experimental mice of generation I compared with the controls, as shown by a decrease in the number of tubules containing spermatogonia and in the absolute number of these cells per cross section of tubule. In generation II, judging by these criteria, more rapid regeneration took place in the experimental animals. In generation VIII marked depression of regenerative processes was observed in the epithelium.

The differences in the processes of regeneration in the experimental mice reflect changes in radiosensitivity of spermatogenesis arising under the influence of the high background of γ -radiation. In generation I the radiosensitivity was increased, but in II and V it was decreased, and in generation VIII it was considerably increased.

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TABLE 1. Number of Seminiferous Tubules Containing Spermatogonia and Spermatocytes in Mice of Several Generations on 30th Day of Radiation Sickness ($M \pm m$)

Generation	Dose of add. radiation (in R)	Group of animals	No. of mice	No. of tubules containing spermatogonia (in % of 50 examined)	P	No. of tubules containing spermatocytes (in % of 50 examined)	P
I (I series)	600	Control	5	80,8 \pm 0,8	<0,01	60,8 \pm 5,1	>0,05
		Exptl.	6	68,4 \pm 5,0		53,4 \pm 7,0	
I (II series)	400	Control	14	89,9 \pm 9,7	>0,05	76,2 \pm 2,5	<0,01
		Exptl.	14	85,2 \pm 2,6		50,4 \pm 3,9	
II	600	Control	10	53,4 \pm 5,0	<0,01	64,6 \pm 6,4	>0,05
		Exptl.	19	75,0 \pm 3,2		59,8 \pm 2,8	
V	600	Control	11	41,4 \pm 6,2	>0,05	33,9 \pm 5,4	>0,05
		Exptl.	11	55,0 \pm 5,0		35,3 \pm 3,3	
VI	600	Control	8	46,0 \pm 4,3	>0,05	41,5 \pm 6,8	>0,05
		Exptl.	8	40,0 \pm 5,7		38,8 \pm 5,2	
VIII	400	Control	6	85,0 \pm 4,4	<0,01	49,9 \pm 5,6	>0,05
		Exptl.	4	49,0 \pm 5,0		34,0 \pm 6,4	

TABLE 2. Number of Spermatogonia in Seminiferous Tubules of Mice on 30th Day of Radiation Sickness ($M \pm m$)

Generation	Group of animals	No. of mice	No. of spermatogonia per cross section of tubule	P
I	Control	5	7.6 \pm 1.7	> 0.05
	Exptl.	6	4.6 \pm 1.1	
II	Control	10	2.7 \pm 0.8	<0.01
	Exptl.	19	9.9 \pm 1.1	
VIII	Control	6	50.5 \pm 10.2	<0.01
	Exptl.	4	17.8 \pm 1.4	

Hence, the investigation showed certain differences in the reaction of the spermatogenic epithelium to the action of large doses of radiation in mice exposed to the prolonged action of small doses, compared with animals kept against a normal radiation background.

LITERATURE CITED

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