

EXPERIMENTAL BIOLOGY

THE EFFECT OF SEXUAL STIMULATION ON REGENERATION AND COMPENSATORY HYPERTROPHY IN THE MOUSE OVARY

N. F. Artemeva

From the Laboratory of Growth and Development, (Head — Prof. L. D. Liozner),
Institute of Experimental Biology (Director — Prof. I. N. Maisky) AMN SSSR, Moscow

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We showed in 1952 that complete regeneration of mammalian ovaries is possible only under certain conditions. Regeneration always occurs after removal of one entire ovary and half of the other. The remaining half ovary regenerates to form a complete and functional gonad. We also showed that administration of bromine and caffeine affects the compensatory hypertrophy and regeneration, evidently as a result of the action of these drugs on the central nervous system.

G. V. Kharlova showed in 1956 that mechanical stimulation of the conducting pathways caused regeneration of rat ovaries.

Thus, ovarian regeneration and hypertrophy depend on the condition of the animal and its different organs. An investigation is therefore required to find the effect of various substances' function, on ovarian regeneration and hypertrophy. In particular, it is essential to discover the effect of sexual stimulation.

For this purpose, the following experiments were carried out.

The mice were divided into two sets. Each set consisted of two experimental and one control group. The first group consisted of normal unoperated mice. The second group consisted of mice from which the left ovary had been removed in order to obtain compensatory hypertrophy of the right ovary. The third group was composed of mice from which the whole of one (and half of the other) ovary had been removed.

The first set of mice, apart from the operations described above, were not given any experimental treatment.

In the second set, the mice of all three groups were stimulated sexually by placing them in a cage together with male mice, but separated from them by a wire mesh partition (Fig. 1).

The experiment lasted for six weeks. The results are shown in the table.

In the experiments in which females were kept together with the males, the nonoperated normal mice showed an increase in both absolute and relative ovary weight from 4.3 mg (0.019%) in the control mice to 5.2 mg (0.021%) in the stimulated animals. Histological investigation showed an increase in the number of ripening follicles and corpora lutea in comparison with the controls in whom no reduction in the primary follicles was observed.

Thus, the presence of males on the other side of the wire partition induced an effect in the ovaries.

After removal of one ovary there was a greater compensatory hypertrophy in females kept with males than in the controls. In the stimulated animals, the ovary weight reached 9.5 mg (0.043%), that is, an increase of two times; in females segregated from the males, the weight of the remaining ovary reached only 3.1 mg

(0.034%), i. e., it exceeded the weight of a nonoperated mouse by 70%. Histological investigation showed that there was compensatory hypertrophy in mice of both sets, but that it was more clearly shown in those animals which had been kept together with the males. In these latter animals there was an increased ripening of follicles and formation of corpora lutea, which filled almost the whole of the ovary. There was also a small increase in the number of primary follicles.

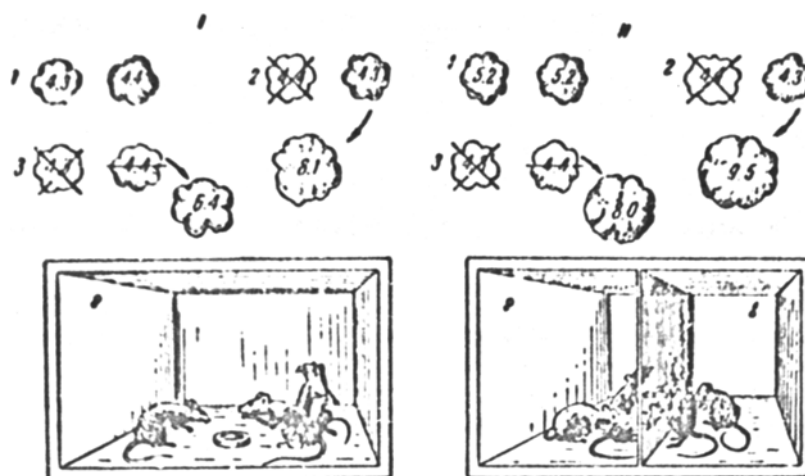


Fig. 1. Arrangement of experiments on regeneration of mouse ovaries with (II) and without (I) sexual stimulation.

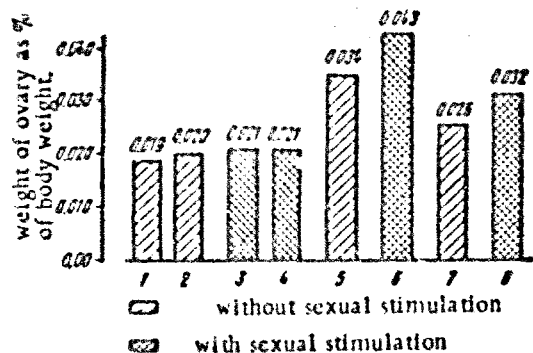


Fig. 2. The effect of experimental conditions on regeneration and compensatory hypertrophy of the ovary: with and without sexual stimulation.

nonoperated animal. A histological investigation of the regenerating ovaries showed an increase in the number of corpora lutea and a normal number of follicles.

It can be seen by comparing the increase in weight in the nonoperated animals in the two sets that the presence of the males stimulates ovarian proliferation. In addition it can be seen that compensatory hypertrophy and regeneration are also stimulated. These two processes are better shown in the second set of mice, kept with the males, as can be seen by comparing the relative increase in ovary weight in the second and third groups with that in the first.

From these results it can be seen that sexual stimulation causes an increase in ovarian compensatory hypertrophy.

In mice of the third group, in whom one whole and one half ovary had been removed, there was a complete regeneration of the remaining half ovary in both the first and the second sets of mice.

In the first set of mice, kept separate from the males, the relative weight of a single entire ovary was 0.020%, while that of the residual portion of the left ovary was 0.026%, i. e., 30% higher.

In the second set of mice, kept with the males, the regeneration of the traumatized ovary was more rapid. At the end of the experiment the weight of the residual portion of the left ovary had attained a weight of 8 mg (0.032%), i. e. It exceeded by one and a half times the weight of an ovary of a

TABLE

Ovary Weight in Sexually Stimulated Mice (Kept Together with Males and Separated by a Wire Partition)

Group	No stimulation						Sexual stimulation						Probabil. of Chance occurrence of diff. between stim. and unstim. groups.
	No. of mice	Average wt. of mice in mg.	Average wt. of ovary in mg.		Ovary wt. as % of body wt.		No. of mice	Average wt. of mice in mg.	Average wt. of ovary in mg.		Ovary wt. as % of body wt.		
			Right	Left	Right	Left			Right	Left	Right	Left	
First group - normal mice	20	21 500	4.3	4.4	0.019	0.020	22	20 900	5.2	5.2	0.021	0.021	0.027
Second group - left ovary removed	19	23 200	8.1	—	0.034	—	18	22 168	9.5	—	0.043	—	0.002
Third group - right ovary and half left ovary removed	20	22 620	—	6.4	—	0.026	18	22 450	—	8.0	—	0.032	0.012

We may thus conclude that in mice kept with males ovarian compensatory hypertrophy and regeneration proceed more intensively.

SUMMARY

Sexual stimulation, which consists in the influence of males on females which are separated by a wire partition, affects the process of growth of the ovaries in mice, as well as their compensatory hypertrophy and regeneration. Compensatory hypertrophy and regeneration of half of the ovary which remained intact after complete removal of the other, is more intensive when females are in one cage with males.

LITERATURE CITED

- [1] N. S. Artemeva, Byull. Eksptl. Biol. i Med., 33, No. 5, 66-74, 1952.