

REPEATED AMPUTATION OF THE LOWER INCISORS IN RATS AND HYPERTROPHY OF THE SALIVARY GLANDS AND TESTES

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Repeated amputation of the lower incisors in rats aged 11 and 14 days causes hypertrophy of the testes only if the submandibular salivary glands are present. Bilateral removal of the submandibular and sublingual salivary glands prevents the development of testicular hypertrophy. After unilateral removal of these glands the testis increased in weight but hypertrophy did not always develop. The absence of testicular hypertrophy in the sialadenectomized animals is evidence that the growth-stimulating action of repeated amputations of the lower incisors on the testis is mediated somehow through salivary gland function.

KEY WORDS: amputation of the lower incisors; hypertrophy of the salivary glands; testicular hypertrophy.

Repeated amputation of the lower incisors in rats is accompanied by hypertrophy of the submandibular salivary glands [2, 4, 6, 7]. This operation, when performed in rats during early postnatal development, has been found to lead to hypertrophy not only of the salivary glands, but also of the testes [1].

It was accordingly decided to study whether other organs respond to amputation of the lower incisors and also whether hypertrophy of the testes after this operation is due to some effect from the hypertrophied salivary glands or whether these changes are mutually independent.

EXPERIMENTAL METHOD

To study the first problem, amputation of the lower incisors was repeated 5 times on male noninbred albino rats of various age groups (10-14 days, 25-30 days, adult), after which the testes, salivary glands, thymus, spleen, kidneys, heart, adrenals, and pituitary gland were weighed. The results were compared with the corresponding values for intact animals and for control rats undergoing alternative operations: fivefold amputation of the upper incisors or of only one lower incisor.

To study the second problem, amputation of the lower incisors was repeated 5 times in noninbred male albino rats aged 10-11 and 14 days by the method described previously [1]: in the animals of one group after bilateral removal of the submandibular and sublingual salivary glands, and in the animals of another group after unilateral removal of these glands. Sialadenectomy was performed immediately before the first amputation of the lower incisors. The animals were killed with ether, the organs fixed in Carnoy's mixture, and the usual histological processing carried out. The total number of rats used was 175. The numerical results were subjected to statistical analysis by the Fisher-Student method.

EXPERIMENTAL RESULTS

Fivefold amputation of the lower incisors in rats of all age groups was accompanied by a regular increase in weight of the submandibular salivary glands by 50-80%, a decrease in the body weight by 10-15%, and

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TABLE 1. Body Weight and Weight of Testes and Submandibular Salivary Glands in Albino Rats after Fivefold Amputation of the Lower Incisors ($M \pm m$)

Group of animals	Number of animals	Body weight at end of experiment, g	Weight of one testis, mg	Weight of one salivary gland, mg
Control	7	$31,0 \pm 3,0$	$63,0 \pm 1,3$	Not weighed
Experimental: bilateral sialadenectomy	11	$24,9 \pm 1,6$	$62,8 \pm 4,5$	—
unilateral sialadenectomy	4	$24,4 \pm 2,1$	$95,0 \pm 4,5$	Not weighed
Control	6	$44,8 \pm 1,2$	$151 \pm 9,0$	$58 \pm 2,4$
Experimental: bilateral sialadenectomy	4	$36,7 \pm 2,5$	$93 \pm 6,0$	—
unilateral sialadenectomy	14	$38,0 \pm 1,3$	$132 \pm 8,6$	$130 \pm 10,5$

a decrease in the weight of the thymus by 39-59% and of the spleen by 12-40%. In rats under 25-30 days old, this operation led to hypertrophy of the testis [1].

In some series an increase in weight of the adrenal was clearly observed, evidence of the existence of stress in the experimental rats as a result of the operation.

No regular changes in the weight of the other organs could be discovered. In the control animals after fivefold amputation of the upper incisors or of only one lower incisor the weight of the thymus was reduced by 23% and that of the spleen by 27%. The weight of the salivary glands and testes in these animals, even at the age of 14 days, was virtually the same as in the intact rats. This indicates that hypertrophy of the testes was not due to stress and that hypertrophy of the salivary glands, since it appears in animals of all age groups, arises regardless of whether the testis undergoes hypertrophy, or it differs in weight from the testis in the control.

The answer to the problem of whether hypertrophy of the testis takes place in the absence of the salivary glands was given by the second group of experiments, the results of which will be found in Table 1.

It follows from Table 1 that fivefold amputation of the lower incisors performed on rats at the age of 11 days after bilateral removal of the submandibular and sublingual salivary glands was not accompanied by testicular hypertrophy. Meanwhile, if these salivary glands were left in situ on one side, the phenomenon of testicular hypertrophy clearly appeared in one experiment, although to a lesser degree than in the previous experiments in which both salivary glands were present [1]. In the other experiment preservation of one salivary gland enabled further growth of the testes to take place and their weight was significantly higher than in the animals undergoing bilateral sialadenectomy; however, no hypertrophy of the testes was observed in the rats of this group compared with the control.

It will be noted that hypertrophy of the salivary glands after amputation of the lower incisors was much more marked (126%) after unilateral sialadenectomy than in rats with intact salivary glands. Hypertrophy of the salivary glands in the latter case did not exceed 80% [1].

Histological analysis of the testes in the experimental rats after bilateral sialadenectomy revealed no substantial abnormalities, evidently because of the short duration of the experiment. Usually changes in the structure of the gonads after sialadenectomy become clearly visible by the 3rd week after the operation [5]. The general conclusion can be drawn that the growth-stimulating effect of amputation of the lower incisors on the testes is due to some as yet unknown function of the salivary gland.

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