

Pituitary Acidophile Cells After Excision of the Superior Cervical Sympathetic Ganglia in the Rat.

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Studies of the pituitary following thyroidectomy in young rats¹ have been reported, describing the appearance of large numbers of basophilic cells containing hyaline material, as a constant feature in all rats in which thyroidectomy was adequate, as evidenced by retardation of body growth, of kidney growth and alterations in the ratios of gonads and adrenals to kidney growth.² During these experiments a puzzling feature was the variation in the acidophile loss. In some cretin pituitaries, all acidophiles had disappeared, while in others there was a moderate or slight reduction in number. It was thought that perhaps a factor in the disappearance of the acidophiles might be some incidental trauma to nerves in the course of the thyroidectomy,³ as recent work had suggested a nervous control of the anterior pituitary through the cervical sympathetic nerves. Collin and Hennequin⁴ had found in male adult rabbits that ablation of one of the superior cervical sympathetic ganglia resulted in vasodilation of the pituitary and a rapid loss of acidophiles in 5 hours to 7 days. On the 7th day the pituitary was composed chiefly of chromophobes. Stimulation of the central end of the cervical sympathetic caused an increase in the granules and numbers of acidophiles in one-half to three-quarter hours. That nervous stimulation of the pituitary may occur is indicated by the fact that Friedgood and Pincus⁵ found that stimulation of the cervical sympathetic nerves in adult female rabbits resulted in extensive maturation of the ova and in some cases ovulation.

In performing thyroidectomy in young rats the cervical sympathetic fibres could be traumatized inadvertently, as the thyroid is bound laterally closely to the carotid artery region. The superior cervical sympathetic ganglia lie high above the level of the thyroid and deep beneath the carotid artery so that direct trauma to them in

¹ Zeckwer, I. T., Davison, L. W., Keller, T. B., and Livingood, C. S., II, *Am. J. Med. Sci.*, 1935, **190**, 145.

² Zeckwer, I. T., *Proc. Am. Physiol. Soc., Am. J. Physiol.*, 1936, **116**, 166.

³ Zeckwer, I. T., *Proc. Phila. Physiol. Soc., Am. J. Med. Sci.*, 1936, **191**, 872.

⁴ Collin, R., and Hennequin, L., *Compt. rend. Soc. de biol.*, 1936, **121**, 81.

⁵ Friedgood, H. B., and Pincus, G., *Endocrinology*, 1935, **19**, 710.

the course of thyroidectomy would be impossible. To be sure, occasional rats showed closure of one eye, but this had been thought due to inflammation rather than to section of cervical sympathetic fibres. In order to rule out the possibility that trauma to cervical sympathetic fibres at the level of the thyroid was a factor in our experiments, sympathetic nerves in rats were severed with and without thyroidectomy. Since the fine nerve fibres are difficult to identify with certainty in young rats, in a number of experiments one or both superior cervical sympathetic ganglia were easily identified and removed so as to interrupt the fibres with certainty. The consequent permanent almost complete closure of the corresponding eye and enophthalmus proved the adequacy of the operation. In some experiments the region near the carotid arteries was stripped of all fibres except the vagus. In other operations laryngeal nerves were severed. Both sexes of rats were used, 54 varying in age from 28 to 39 days, and 9 from 65 to 96 days of age. The operations included the following: (1) bilateral excision of superior cervical sympathetic ganglia without thyroidectomy in 10 rats; (2) bilateral excision of superior cervical sympathetic ganglia with thyroidectomy in 5 rats; (3) excision of one superior sympathetic ganglion in 7 rats; (4) excision of one superior cervical sympathetic ganglion with thyroidectomy in 1 rat; (5) both recurrent laryngeal nerves cut in 4 rats; (6) both recurrent laryngeal nerves cut with thyroidectomy in 5 rats; (7) other nerve trauma in neck in 17 rats; (8) the same with thyroidectomy in 3 rats; and (9) as controls, thyroidectomy without trauma to nerves in 11 rats which were littermates of the others and were killed at varying time intervals corresponding to the rats with nerve trauma. Intervals after operation of 1 to 34 days were studied.

In no case did severance of nerves without thyroidectomy result in any extensive loss of acidophiles. Counts were not made but this loss after thyroidectomy is so obvious that no counts were necessary. After trauma with thyroidectomy, the pituitary presented exactly the same histological picture as after thyroidectomy without trauma. In order to permit legitimate interpretation of loss of acidophiles, histological sections of several different pituitaries were always mounted on the same slide, so that they would be stained in an identical manner with Mallory's acid fuchsin anilin blue orange G stain after fixation in Helly's fluid. In one cat experiment, also, unilateral excision of one superior cervical sympathetic ganglion resulted in no obvious loss of acidophiles in 33 days.

Species differences in endocrine reactions makes it unwise to assume that the findings of one species will apply to another. The

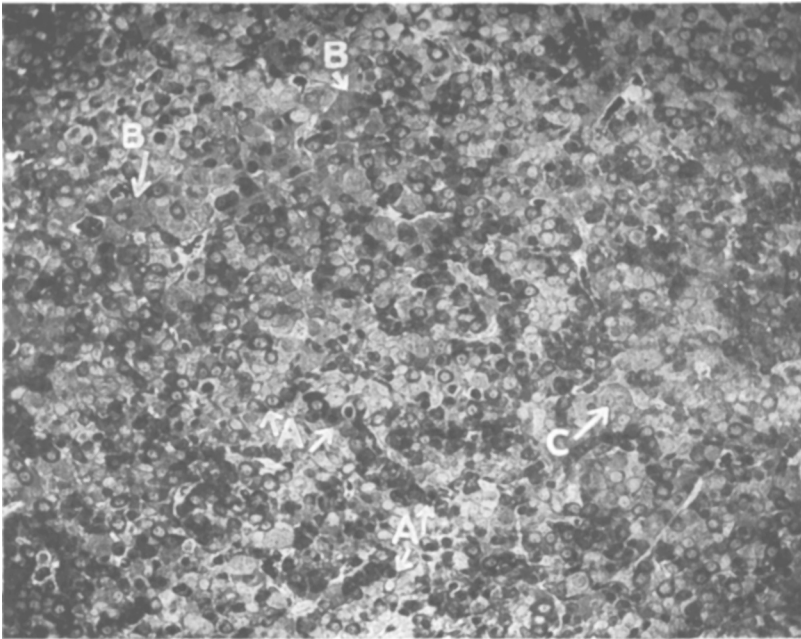


FIG. 1.

A representative field of the pituitary of a rat 4 days after bilateral excision of superior cervical sympathetic ganglia showing a normal number of acidophile cells. (a) acidophile, (b) basophile, (c) chromophobe. The smallest darkest cells are acidophiles, and constitute about 50% of all cells in the field.

experiments of Collin and Hennequin were on rabbits and these animals differ from others in such endocrine reactions as their manner of ovulation. The changes in the rabbit pituitary following thyroidectomy, as described by Bryant⁶ and Marine, Rosen and Spark,⁷ are quite different from the changes we observe constantly in rats, cats and dogs. The time intervals of the present experiments were in many cases longer than those of Collin and Hennequin because we are concerned only with long continued changes in relation to thyroidectomy.

Summary. Excision of superior cervical sympathetic ganglia and severance of other nerves in white rats did not result in any obvious decrease of acidophiles in the pituitary in 1 to 34 days. When such operations were combined with thyroidectomy, the changes in the pituitary were exactly the same as the changes caused by thyroidectomy alone.

Variations in the degree of acidophile loss after thyroidectomy in rats, therefore, can not be attributed to nerve trauma.

⁶ Bryant, A. R., *Anat. Record*, 1930, **47**, 131.

⁷ Marine, D., Rosen, S. H., and Spark, C., *Proc. Soc. Exp. Biol. and Med.*, 1934, **32**, 803.