

I used 60 guinea pigs and 24 rabbits: (1) 12 guinea pigs, original virulence tests, intraperitoneal inoculation; (2) 12 rough variants from original smooth strains, intraperitoneal inoculation; (3) 12 same as (2), intravenous inoculation; (4) 12 same as (3), rechecks; (5) 12 smooth cross-checks from original smooth strains, intravenous inoculation; (6) 12 rabbits, smooth cross-checks, intravenous inoculation; (7) 12 rabbits, rough variants from original smooth strains, intravenous inoculation..

5855

Hyperplasia of Thyroid and Exophthalmos from Treatment with Anterior Pituitary in Young Duck.*

JOSEPH A. SCHOCKAERT.† (Introduced by P. E. Smith.)

From the Department of Anatomy, College of Physicians and Surgeons, Columbia University.

It has been definitely shown that the normal structure of the thyroid gland is dependent upon an autacoid present in the anterior lobe of the pituitary gland. In amphibians its release at the time of metamorphosis stimulates the thyroid to excrete its content and induces the increased cellular activity characteristic of this period. In mammals Loeb and his coworkers^{1, 2} and Aron^{3, 4} showed that the injection of anterior pituitary extracts and emulsions produced also some characteristic changes in the thyroid suggestive of a higher activity. The follicular epithelium became higher, mitoses were present and colloid was excreted. The glands increased in size from 2 to 4 times and became more vascular. The metabolism of treated guinea pigs, as shown by Siebert and Smith⁵ was markedly increased. As previous observations⁶ had shown that young ducks were very sensitive to pituitary extracts and emulsions, it seemed

* Aided by a grant from the Special Research Fund of Columbia University to the Department of Anatomy.

† Fellow of the C.R.B. Educational Foundation.

¹ Loeb, L., and Bassett, R. B., *Proc. Soc. Exp. Biol. and Med.*, 1929, **26**, 860.

² Loeb, L., Bassett, R. B., and Friedman, H., *Proc. Soc. Exp. Biol. and Med.*, 1930, **28**, 209.

³ Aron, M., *C. R. Soc. Biol.*, 1929, **102**, 682.

⁴ Aron, M., *Revue fr. Endocrin.*, 1930, **8**, 472.

⁵ Siebert, W. J., and Smith, R. S., *Am. J. Physiol.*, 1930, **95**, 396.

⁶ Schockaert, J., *Arch. intern. Pharm. Thérap.*, 1931, **41**, 23.

worth while to investigate the possibility of inducing in this species functional and structural changes indicative of hyperthyroidism.

Forty-two young ducks weighing between 300 and 500 gm. were used: 22 of these were treated with anterior pituitary suspension, Phyone, luteinizing hormone or Prolan, 9 were injected with spleen emulsion as controls, and 9 were left untreated. The fresh, centrifuged, saline suspension of beef anterior pituitary given in a daily dosage of about half a gland per animal induced a marked and rapid increase in the size of the thyroid lobes, which reached after one or 2 weeks of treatment, 3 to 8 times the size of those of untreated or spleen-injected controls. In one case a relative increase of 20 times was observed, and in another, the thyroids reached 60 times the weight of the control thyroids.

The shorter periods of treatment (1 to 7 days) produced little change in the size of the vesicles, but colloid disappeared and the epithelium became of a higher columnar type showing often pycnotic nuclei, desquamation and mitoses, a picture entirely similar to that of some acute types of Graves' disease.

In more prolonged treatment the vesicles enlarged, the epithelium became folded and formed hyperplastic buds in the vesicles. Some colloid, which was granular and stained faintly, appeared again. At three to five weeks the treated ducks developed gradually an exophthalmos particularly noticeable when viewed laterally and inferiorly. If treatment was stopped, the bulging of the eyeballs disappeared entirely in about one week. Under ether anesthesia the bulging promptly vanished to slowly appear again when the animal awakened. It was never observed in the control animals, untreated or injected with spleen or liver suspensions.

Chemical analysis† (Pregl's method) showed that the total iodine content of the glands had dropped considerably even after a short treatment, and reached a level of 1/20 the normal content, even when new colloid had been secreted after prolonged treatments. This colloid consequently must be considered as chemically different from the colloid normally present, from which it differs also by its granular structure and its faint staining.

Prolan and luteinizing hormone (from urine of pregnant women) were found to be inactive on the duck thyroid, histologically as well as chemically.

On the other hand, the fraction which contains the growth hormone (van Dyke and Wallen-Lawrence's Phyone) induced an in-

† The chemical data secured in collaboration with Professor G. L. Foster, will be published in a joint paper to appear in the *Journal of Biological Chemistry*.

crease in weight, histological changes and a marked drop in the iodine content, though to a lesser degree than the whole suspension.

5856

**Precocious Development of Sexual Characters in the Fowl by
Homeoplastic Hypophyseal Implants. I. The Male.***

L. V. DOMM. (Introduced by Frank R. Lillie.)

From the Whitman Laboratory of Experimental Zoology, University of Chicago.

A series of light brown Leghorn cockerels ranging from 22 to 86 days in age were given daily subcutaneous homeoplastic hypophyseal implants. In the first experiment the entire hypophysis was utilized while in subsequent tests only the anterior lobe was employed. The number of daily implants per bird varied from 19 to 28. The treated birds, as well as controls, were weighed and the head furnishings measured at regular intervals, at first daily, later on alternate days. All treated individuals remained active and in excellent condition throughout the experiments so that they could not be distinguished from controls in this respect. In fact treated males were consistently somewhat heavier than their respective controls when treatments were discontinued.

One of the effects, quite apparent after 4 to 5 days' treatment, was a stimulation of head furnishings. These became turgid and reddish in color and revealed noticeable growth. In the longer treatments there was a noticeable slackening in growth toward the close of the experiment while in some of these there was a cessation followed by a slight regression in size. Bird No. 167, 59 days old when the experiment began, received 23 daily implants. On the day the experiment started its comb measured 4.7 cm. in length and 2.6 cm. in height, while 15 days later it measured 7.5 cm. in length and 4.5 cm. in height, the maximum size attained. On the day following the last implantation, 24th day of the experiment, when the bird was killed, measurements of comb were 6.8 cm. in length and 4.0 cm. in height. The best control comb showed a gradual increase during this period from 4.5 cm. in length by 2.6 cm. in height to 5.8 cm. in length by 3.5 cm. in height. Precocious sexual behavior

* This investigation was supported in part by a grant from the committee for Research in Problems of Sex of the National Research Council; grant administered by Prof. Frank R. Lillie.