7466

# Ant. Pituitary Changes in Adult Male Rats Following Thyroxin Injections or Thyroid Feeding.*

A. E. SEVERINGHAUS, GEORGE K. SMELSER† AND HELEN M. CLARK.

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

The authors are not aware of any literature which describes cytological or even histological changes in the anterior pituitary due to thyroid feeding or injections. That such changes should occur might be anticipated from reported structural changes in the pituitary following thyroidectomy[1] and also from the few reported instances of pituitary weight changes after thyroxin administration. Even these reports are contradictory. A further indication that structural changes may occur in such pituitaries is found in the reports that hyperthyroid rats show an increased sex-stimulating potency.[2, 3] Weichert[4] demonstrated a prolonged dioestrus in rats after thyroid administrations, and in a subsequent work demonstrated prominent persistent functional corpora lutea.[5] All of these data refer to female rats. The present paper deals with cytological changes in the adult male rat and will be supplemented by a subsequent description of the female, which we now have reason to believe will show differences. The pituitaries of 36 adult albino male rats, purchased at Cambridge, England, which had been made hyperthyroid by injections of sodium thyroxin (British Drug House, London) or by feeding desiccated gland (Burroughs, Wellcome & Co. "Tabloids"), were studied. The thyroid tabloids were powdered on a glass plate and thoroughly mixed with a few cc. of thick, sweetened, condensed milk. The rats were observed until they finished eating the mixture, which they did avidly, and we believe that all of the thyroid was ingested. The manufacturers state that a tabloid has the equivalent of .324 gm. of fresh tissue. Each rat received one tabloid daily for 30 days. Those rats which were made

* Aided by a grant from the Committee for Research in Problems of Sex, the National Research Council, administered by Dr. P. E. Smith.

† National Research Fellow.

1 Trautmann, A., *Frankf. Zeit. f. Path.*, 1916, **18**, 173.

2 Evans, H. M., and Simpson, M. E., *Anat. Rec.*, 1930, **45**, 215.

3 Van Horn, W. M., *Endoc.*, 1933, **17**, 152.

4 Weichert, C. K., *Physiol. Zool.*, 1930, **3**, 461.

5 Weichert, C. K., and Boyd, R. W., *Anat. Rec.*, 1933, **58**, 55.

hyperthyroid by injection received varying doses of from .028 to .28 mg. of sodium thyroxin daily for 30 days (Smelser).

In addition to these experiments, a series of 6 rats from our Long-Evans strain were fed a total of from 1440 to 1840 mg. of dried Armour's thyroid over a period of from 16 to 23 days (Clark) and a second series of 20 rats from this strain was injected similarly to those described above (Smelser). All animals showed distinct but varying loss in body weight, and the accessory reproductive organs were atrophic or castrate in type. Some of the rats had been unilaterally castrated before thyroid administration. The pituitary changes of such rats are similar to those of treated normals. The pituitaries of the unilateral castrates, uninjected, used as controls, cannot be distinguished from the normal reference control.

The anterior pituitaries showed structural changes consistent in all hyperthyroid animals. These changes were briefly as follows:

The basophiles are of maximum size, markedly increased in number, and castration cells are numerous. Augmentation of the basophiles with few castration changes follows the administration of smaller thyroid doses.

The basophilic changes are in almost all respects similar to those of the castrate both progressively and in the final stage assumed. In the Helly-fixed pituitaries of the British series (all others fixed by the method previously described by Severinghaus[6]) the colloid-like substance of the basophilic castration cells has a tendency to clump into large irregular masses. The mitochondria seem larger and more numerous than in the previously studied cells of castrate male rats.

The acidophiles of treated animals average larger, stain more brilliantly than those of the normal, and show marked hypertrophy of the Golgi and mitochondrial components of the cytoplasm. In several instances, numerous acidophiles had deeply chromatic and pyknotic nuclei. These changes are in direct contrast to acidophilic changes in the castrate rat[7] where the acidophiles decrease in size and prominence.

The chromophobes appear reduced in amount, possibly due to the prominence of the increased basophilic and acidophilic areas. No cell counts have been made, many of the changes described above being of such order of magnitude that the pituitaries of the thyroid

[6] Severinghaus, A. E., *Anat. Rec.*, 1932, **53**, 1.

[7] Severinghaus, A. E., *Anat. Rec.*, 1933, **57**, 149.

treated animals may be readily differentiated from the controls even by examination with low power of the microscope.

7467

## Ant. Pituitary Changes in the Adult Male Rat Following Thyroidectomy.*

A. E. SEVERINGHAUS, GEORGE K. SMELSER† AND HELEN M. CLARK.

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

The authors, in the preceding paper, have reported changes in the anterior pituitary of the adult male rat following administration of thyroid. The present paper deals with the changes which occur after thyroidectomy.

The literature is replete with descriptions of pituitary changes following thyroidectomy. Numerous workers have reported that hypertrophy of the pituitary follows ablation of the thyroid. Simpson and Hunter[1] and Marine[2] review these findings, and Hammett[3] has confirmed them. The effect of thyroidectomy upon the gonad-stimulating potency of the pituitary has also received attention. Smith and Engle[4] and Van Horn[5] found no change in this potency although Evans and Simpson[6] reported a decrease. Histological studies of the pituitary after thyroidectomy have also been numerous. Trautmann,[7] in his admirable treatise on pituitary changes in the goat, fully reviews previous literature. Bryant[8] described in the rabbit a decrease in eosinophiles and a degenerated vacuolated hypertrophy of the chromophobes indicating a state of decreased secretion, while Kojima[9] reported that thyroidectomy, like castration, results in an increase in basophiles in the anterior pituitary of the rat, some of which are colloid filled.

* Aided by a grant from the Committee for Research in Problems of Sex, the National Research Council, administered by Dr. P. E. Smith.

† National Research Fellow.

1 Simpson, S., and Hunter, A., *Quart. J. Exp. Physiol.*, 1911, **4**, 257.

2 Marine, D., *Physiol. Rev.*, 1922, **2**, 521.

3 Hammett, F. S., *Am. J. Anat.*, 1923, **32**, 37.

4 Smith, P. E., and Engle, E. T., *Anat. Rec.*, 1930, **45**, 278.

5 Van Horn, W. M., *Anat. Rec.*, 1931, **51**, 38.

6 Evans, H. M., and Simpson, M. E., *Anat. Rec.*, 1930, **45**, 215.

7 Trautmann, A., *Frank. Zeit. f. Path.*, 1916, **18**, 173.

8 Bryant, A. R., *Anat. Rec.*, 1930, **47**, 131.

9 Kojima, M., *Quart. J. Exp. Physiol.*, 1917, **11**, 319.