ules. During 2 more weeks the eggs disappear completely, the ovogonia being the only germ cells spared from degeneration.

Immediately after the differentiation of further ovocytes has come to an end, the medullary part of the ovaries starts to grow rapidly. Within a few weeks the ovarial sac *(rete ovarii)* transform into a typical rete testis, vasa efferentia and seminiferous tubules. At first the latter lack completely any germ cells. However, sooner or later the ovogonia migrate from the cortex to the medulla, and after having entered the seminiferous tubules transform into spermatogonia.

Thus the experiment leads to the total reversal of sex of the females. The normal controls consisted of 100 females and 96 males. The experimental group contained no typical females after the 2nd week of rise in temperature; but between the 15th and the 33rd day 53 females in different stages of sex transformation and 62 typical males were preserved.

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## Interrelation of Pituitary and Thyroid in Metamorphosis of Neotenic Amphibians.

W. R. INGRAM. (Introduced by W. W. Swingle.)

*From the Zoological Laboratory, State University of Iowa.*

While it has been known for some time that transplants of anterior lobe of the pituitary of adult frogs would cause accelerated growth in small tadpoles[1] no attempt has been made to show the relation of this gland to the condition of partial neoteny existing in some anurans. Neotenic amphibians exhibit prolonged retention of larval form. Total neoteny, of which the Mexican axolotl is an example, is characterized by the failure of such animals to metamorphose spontaneously. Among the anurans *Rana catesbiana* and *Rana clamata* show greatly prolonged larval stages which mark them as partially neotenic types. In the totally neotenic axolotl, metamorphosis upon injection of anterior lobe extracts has been reported by some workers[2, 3] and denied by others.[4]

[1] Allen, B. M., *J. Physiol. Zool.*, 1928, i, 153.

[2] Hogben, L. T., *Proc. Roy. Soc. B.*, 1923, xciv, 204.

[3] Uhlenhuth, E., *Brit. J. Exp. Biol.*, 1927, v, 1.

[4] Smith, P. E., *Brit. J. Exp. Biol.*, 1926, iii, 239.

The anterior lobe of adult *Rana pipiens* was transplanted intraperitoneally into *Rana clamata* larvae of various stages of limb development—up to a hind-limb length of 5 mm. Three transplants were made at weekly intervals into 35 tadpoles, allotted according to size into cultures of 5. Controls of approximately the same development were injected into bits of muscle. After the 2nd transplant marked limb growth was noted; the general growth being accelerated to any extent only in the smaller tadpoles.

After the 12th day following the first transplantation marked metamorphic signs appeared, and in from 25 to 33 days forelimbs began to break through and tail atrophy was observed. Most of the experimental animals were killed when they showed practically complete metamorphosis and the thyroids removed for examination. The control animals exhibited only a slight normal growth and development and in no case showed any signs of metamorphosis.

Pronounced development of the thyroids of the treated animals was found—in some cases their diameter was twice that of the control glands. Sections of the control glands displayed large, colloid-filled follicles with walls composed of flat, inactive-appearing cells. The thyroid of treated animals, on the other hand, showed considerable loss of colloid substance from the follicles with collapse of some of the latter, and extreme activity of the cells which were greatly elongated, with proportionate thickening of the follicle walls. Freeing of colloid and heightened activity were evidently effects of the anterior lobe transplants.

The histological picture approximates that found by Uhlenhuth[5] in the thyroids of normally metamorphosing salamanders and in the case of one axolotl treated with anterior lobe powder.

The evidence would indicate that the neotenic condition in certain anurans depends upon a defective relationship between the anterior lobe of the pituitary and the thyroid. Whether this depends upon a retarded anterior lobe development or upon a failure to release the anterior lobe active principle may be shown by subsequent experiments.

[5] Uhlenhuth, E., *Roux' Arch. Entw.*, 1927, cix, 671.