

Rôle of Hypophysis in the Initiation of Metamorphosis in *Bufo*.*

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The importance of the pars anterior of the hypophysis in the control of the thyroid gland has been clearly shown in many ways and by many investigators. The writer has shown that under normal conditions of iodine content in food and water, amphibian larvae fail to metamorphose in the absence of either or both of these glands. The stage at which development ceases is the same in each instance.

It is natural to inquire which of the two glands takes the leading rôle in initiating the process of thyroid secretion. A crucial experiment consists in making transplants of the hypophysis taken from tadpoles of different stages of development into a uniform stage shortly before the beginning of metamorphosis. The recipients of these transplants were selected tadpoles of *Bufo halophilus* with a total length of 25-28 mm. and a hind limb length of 1-2 mm. At the end of from 10 to 18 days they were killed and preserved for study.

The transplants were placed in pockets under the skin median and caudal to the right eye where they could be seen during the course of the experiment. At the end of the experiment they were removed and studied in order to note their condition. Certain of these transplants were sectioned and studied histologically in order

TABLE I.

Donors	Number Cases	Hind Limb Length of Recipients at End of Experiment
1. Hind limbs, 2 mm. length. (Two glands transplanted)	30	mm. 2.10
2. Hind limbs, 5-8 mm. length. (One gland transplanted)	8	2.34
3. Hind limbs, 8-9 mm. length. (One gland transplanted)	15	3.85
4. Hind limbs, 10 mm. length. (One gland transplanted)	18	5.93
5. Metamorphosis completed.	22	4.93
6. Adult. ($\frac{1}{4}$ pars anterior of hypophysis used)	10	5.69
7. Controls	14	2.29

* This work was carried on with the assistance of research grants of the University of California and of the National Research Council.

to determine their condition at the end of the experiment. Only those found suitable among the 154 tadpoles were used. These numbered 117, of which 103 received transplants and 14 served as controls.

Table I gives the results. The donor types are indicated at the left while the measure of the development induced is shown by the average hind limb length of the recipients indicated.

The duration of the experiment, 10 to 18 days, has not permitted complete metamorphosis but the tendency is quite clear as shown by the length of hind limb and is far more striking as observed in the less measurable changes of body form. The tadpoles of groups 3 to 6 have the characteristic signs of metamorphosis as bulging eyes, laterally compressed angular bodies and shortened tails.

The experiment is being repeated upon a larger scale and under more uniform conditions of date and duration of experiment in order to determine whether the hypophysis is truly more active when the donor has a hind limb length of 10 mm. than at the later period of metamorphosis and even of adult life. The point is an interesting and significant one because of the fact that this is just at the crucial period at which metamorphosis becomes most active. Hypophysectomized and thyroidectomized tadpoles of *Bufo* attain a limb length of but little less than this. Our results show that the transplants taken from donors of this stage exert a far greater effect than those taken from younger donors. Transplants from tadpole donors of 2 mm. hind limb length do not induce any tendency to metamorphosis even when transplanted in double dose and in experiments that ran the same length of time (15 days) as that of the 10 mm. hind limb donors that gave the maximum effect.

It is clear that the hypophysis plays a major rôle in initiating the activity of the thyroid gland which comes into play only when the hypophysis reaches a certain stage in its development. These facts, taken in connection with histological studies that we have under way, should give us knowledge regarding the type of cells in the pars anterior of the hypophysis that are concerned with the thyroid function.