

THE EFFECT OF IODINE AND IODOTHYRIN ON THE
LARVÆ OF SALAMANDERS.

IV. THE RÔLE OF IODINE IN THE INHIBITION OF THE METAMORPHOSIS
OF THYMUS-FED SALAMANDERS.

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In previous papers I have shown that feeding thymus gland to the larvæ of salamanders retards or completely inhibits metamorphosis^{1,2} as well as growth.³ It was also demonstrated² that the inhibition of both growth and metamorphosis is not caused by specific growth-inhibiting substances contained in the thymus, but by a deficiency of the thymus in certain substances which are necessary for growth and metamorphosis. Later I suggested that these substances might be identical with iodine.⁴

Recently, however, I found⁵ that inorganic iodine even when administered in excessive quantities does not accelerate either growth or metamorphosis of salamander larvæ. Although this result does not necessarily mean that salamander larvæ can grow and metamorphose in the complete absence of iodine, the correctness of my assumption that inhibition of growth and metamorphosis of thymus-fed salamander larvæ may be caused by a deficiency of the thymus in iodine, became doubtful, and special experiments were carried out to test this assumption. In the light of these experiments which will be briefly reported below, it appears that the substances which are deficient in the food of thymus-fed salamander larvæ are not identical with iodine.

¹ Uhlenhuth, E., *Proc. Soc. Exp. Biol. and Med.*, 1917-18, xv, 37.

² Uhlenhuth, E., *J. Gen. Physiol.*, 1919, i, 305.

³ Uhlenhuth, E., *J. Exp. Zool.*, 1918, xxv, 141.

⁴ Uhlenhuth, E., *J. Gen. Physiol.*, 1919, i, 473.

⁵ Uhlenhuth, E., *Endocrinology*, 1922 (In press); *Biol. Bull.*, 1922 (In press).

Of three series of larvæ of *Ambystoma maculatum* from the same brood, Series 1 was fed earthworms and kept in iodine-free water, Series 2 was fed thymus and kept in iodine-free water, Series 3 was fed thymus and kept in water to which, from the 26th day on, 1 drop of a 1/20 M solution of inorganic iodine per 1000 cc. of water had been added.

Growth began to decrease in both thymus-fed series at an age of 19 days and practically ceased at an age of 26 days. From this time on inorganic iodine was administered to Series 3 as stated above, but did not improve the growth of this series at all. At the 54th day both thymus-fed series were divided into two lots and, in order to make sure that the ineffectiveness of the iodine was not due to a loss of the ability to grow, earthworms were fed instead of thymus. The result was as follows: In Series 2 the larger and stronger larvæ were continued on thymus; they did not grow, and finally died at an age of 82 days. The smaller larvæ received earthworms instead of thymus; they immediately began to grow, reached a normal size and finally metamorphosed. In Series 3 to which the iodine was administered the smaller larvæ received earthworms instead of thymus; this change of the diet again resulted in vigorous growth and in metamorphosis. The larger larvæ were continued on thymus, but in spite of the administration of iodine did not grow at all, until, at the 82nd, day, earthworms were used as food instead of thymus. This diet again resulted in normal growth and metamorphosis.

The objection could be raised that the amount of iodine was too small to permit of growth and metamorphosis. It is possible that the concentration of iodine was not high enough to permit of normal growth and metamorphosis. If, however, a lack of iodine had anything to do with the inhibition of growth and metamorphosis, even the slightest amount of iodine should have produced an improvement. Since even no improvement could be obtained by iodine-administration, but immediately followed the administration of earthworms, the conclusion seems to be justified that the inhibition of growth and metamorphosis of thymus-fed salamander larvæ is not caused by a deficiency of the thymus in iodine, but by a deficiency in certain substances, as yet unknown, which are contained in the earthworm.