the circulation of normal mice. Table II illustrates these observations.

The experience gained in study of the transmissible leucemia of mice suggests that leucemia begins with a tumor-like proliferation of lymphoid cells. Mice of any age may succumb to leucemia if leucemic cells are introduced into their body. The malignant lymphoid cells, whenever they enter the circulation, lodge and multiply chiefly in the lymphoid tissue, the blood stream being invaded only after a certain degree of hyperplasia has been attained.

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Effects of Hypophyseal Hormones Upon Amblystoma Larvae, Following Transplantation or Injection, With Special Reference to the Gonads.

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When the hypophysis of an adult western axolotl is transplanted intact into young larvae of *Amblystoma trigrinum*, 30-35 mm. in length, the graft usually establishes itself permanently. The results are soon manifested in the following order: (1) the pigmentary system responds by a gradual expansion of the melanophores and an increase in number culminating in sooty blackness; (2) a marked growth stimulation with acromegalic symptoms; (3) a hypertrophic effect upon the immature gonads, which is relatively enormous and occurs without exception in the case of the testis, but is relatively slight and frequently absent in the case of the ovary. There is a tendency to metamorphose earlier than normals reared under identical conditions of environment and nutrition.

The pigmentary reaction begins several days after implantation, and first appears as an intensification of the dark areas in the normal pattern. Soon, however, darkening of the lighter areas begins, and in 2 to 3 weeks a uniform blackness of sooty intensity is attained. This effect is attributable to the hormone produced by the pars intermedia, and is well known from the work of many, among whom may be mentioned Smith and Smith,[1] and Allen.[2] The effect upon growth is seen in a tendency to slightly greater length, greater

[1] Smith, P. E., and Smith, I. B., *Endocrinol.*, 1923, vii, 579.

[2] Allen, B. M., PROC. SOC. EXP. BIOL. AND MED., 1930, xxvii, 504.

girth, and a conspicuously enlarged head in which the ratio of width to length is noticeably increased. The growth effect and acromegalic condition are attributed to the hyperstimulative action of the pars anterior. This stimulation of growth is, conversely, to be expected from the work of Allen[3] and Smith,[4] both of whom observed retardation of growth following hypophysectomy in frog tadpoles. Also, Evans and Long[5] produced gigantism in rats by administration of an alkaline extract of the mammalian anterior hypophysis. But so far as the writer is aware, acromegaly has not previously been produced experimentally in amphibians.

The most striking effect is upon the gonads of the male. The ovaries show little or no response to this treatment. Of 7 experimental animals, 3 were males, and one killed 55 days after implantation already showed a very marked enlargement of the testes and a more advanced histological structure. The other 2, preserved after 105 days, when just entering upon metamorphosis, showed swelling of the cloacal lips, extreme enlargement of the testes with increase in volume of 600%, and almost mature spermatozoa, at a total age of 140 days. That the testes of larval Amblystoma are selectively affected is unexpected and at variance with all results obtained in mammals, where the ovary is far more responsive (the work of Smith and Engle[6] is typical).

When the procedure is varied by injection of an alkaline extract of the anterior lobe of the mammalian hypophysis, the same results obtain. In 8 experimental larvae, injected 12 times over a period of 30 days and killed at an age of 75 to 80 days, 5 proved to be males. All were positive. The least effect showed a volumetric increase of the testis of more than 200%, while the best responses were of the same degree as after implantation, although, as the animals were considerably younger, spermatogenesis was not so far advanced. In every case cloacal enlargement, a secondary sex character of the male, was marked. Thus out of 15 experimental animals implanted or injected, 8 proved to be males, and all responded without exception with a volumetric increase, varying according to age and treatment from somewhat more than 200% to more than 600%. This growth response was accompanied in the extreme cases by advanced spermatogenesis and appearance of secondary sex characters in

[3] Allen, B. M., *Anat. Rec.*, 1916, xi, 486; *Biol. Bull.*, 1917, xxxii, 117.

[4] Smith, P. E., *Anat. Rec.*, 1916, xi, 57.

[5] Evans, H. M., and Long, J. A., *Anat. Rec.*, 1921, xxi, 62; *Proc. Natl. Acad. Sci. Wash.*, 1922, viii, 38.

[6] Smith, P. E., and Engle, E. T., *Am. J. Anat.*, 1927-1928, xl.

larvae not yet metamorphosed. As stated, the effect upon the ovary is relatively insignificant.

Riddle and Flemion[7] administered fresh adult hypophysis and various extracts of beef hypophysis to young pigeons and obtained what was probably pronounced growth of the testes. However, the extreme range of variation of the controls and the very irregular response of the experimental individuals make it very difficult to estimate the degree of response or to be sure whether the response is specific. This is the only work known to the writer with results comparable to those reported here. Series of experiments are now in progress in which the parts of the hypophysis are transplanted separately, and different extracts of the hypophysis are injected.

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Development and Fate of Spermatozoa in the Epididymis and Vas Deferens in the Guinea Pig.

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(Introduced by A. M. Banta.)
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It is well known that spermatozoa in mammals attain what appears to be their full structural development while contained in the seminiferous tubules, but that they are not in a position to be discharged until they have passed through the long coiled ductus epididymidis and have reached the posterior end of the vas deferens.

There is no agreement as to the significance of this long passage through the epididymis. In earlier papers (Young[1, 2]), the suggestions were made: First, that the epididymis provides an environment in which spermatozoon development, not complete when these cells leave the testis, can continue until functional maturity has been attained, and (2) that once spermatozoa become mature, there is no influence which preserves them indefinitely in a condition for effecting fertilization.

Because this general idea has not been expressed previously, except possibly as isolated statements by different writers might be pieced together, supplementary experiments seemed desirable. In addition, the suggestion that spermatozoa age and become in-

[7] Riddle, Oscar, and Flemion, Florence, *Am. J. Phys.*, 1928, lxxxvii.

[1] Young, W. C., *J. Morph. and Physiol.*, 1929, xlvii, 479.

[2] Young, W. C., *Ibid.*, xlviii, 475.