mation. Prolan has greater luteinizing activity, while the pituitary extract tends to cause earlier opening of the vagina.

From the above observations, the ovarian weight curve seems more satisfactory for assay of pituitary gonadotropic extract than of prolan. However, the applicability of the curves for this purpose remains to be demonstrated. The great variability of uterine response renders its curve unsatisfactory for assay.

Summary. This study demonstrates that the function of both ovarian and uterine weight response to pituitary extract and to prolan follows the same type of curve, namely, logistic curves. However, they differ from each other markedly in the numerical values of their constants, among which the value of $d + k$ is the most noteworthy. This defines the average maximum weight response attainable under the specified conditions. It is much higher in the case of ovaries, but lower in the case of uterus when pituitary extract is given, compared with prolan. The ovarian weight curve with pituitary extract may be of interest in assay.

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Growth of Ultracentrifuged Cells in Tissue Culture.*

T. J. MACDOUGALD, H. W. BEAMS AND R. L. KING. (Introduced by J. H. Bodine.)

From the Department of Zoology, State University of Iowa.

It has recently been shown that the eggs of *Ascaris suum* and *A. megalocephala* (Beams and King[1, 2]) Fucus eggs (Beams[3]), cancer cells of rat (Guyer and Claus[4]) and the cells of the adrenal cortex

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1 Beams, H. W., and King, R. L., *Science*, 1936, **84**, 138.

2 Beams, H. W., and King, R. L., *Biol. Bull.* In press.

3 Beams, H. W., *J. Mar. Biol. Assn.*, 1937, **21**, 571.

4 Guyer, M. F., and Claus, P. E., PROC. SOC. EXP. BIOL. AND MED., 1936, **35**, 468.

of rat (Dornfeld[5]) are not killed when subjected to very great centrifugal force. The significance of these experiments rests in the fact that the behavior of protoplasm to high speed centrifuging seems to differ markedly from that of many non-living colloidal systems (Svedberg[6, 7]).

In an effort to extend further these studies on the effect of ultracentrifuging upon protoplasm, the tissue culture method has been employed here. Cultures were made of embryonic chick hearts (of 9 days' incubation) by the usual Carrel hanging drop technique; 4 parts chick plasma and 3 parts embryonic extract being used as medium. The extract was in every case centrifuged twice, in order that no confusion between growth from the explanted material and growth from tissue fragments introduced along with the extract should arise. After the heart was removed, the ventricle was divided into 2 parts, one of which was placed in Tyrode solution in the rotor of the ultracentrifuge where it was centrifuged at either 150,000 or 400,000 times gravity for one-half hour; the other half being left standing in Tyrode solution at room temperature. Contamination of the experimental material was avoided by handling the sterilized rotor with a large hemostat. Cultures of both experimental and control tissue were then made at nearly the same time under identical conditions.

One hundred percent growth was obtained in both control and experimental cultures and although no quantitative determinations of actual growth were made, no difference was observed in the amount and rate of growth in the centrifuged and control material. Not only was normal mitosis apparent in the cells of centrifuged tissue, but fragments which had been centrifuged at 400,000 times gravity for one-half hour continued to pulsate up to the time of fixing (48 hours after explantation).

This study furnishes additional evidence for the fact that protoplasm is capable of withstanding very great centrifugal forces. Separation of its essential colloidal elements apparently does not take place, differing here from many non-living colloidal solutions in which separation has been beautifully demonstrated by Svedberg and others. Forces, perhaps electrostatic in nature, acting in protoplasm are possibly responsible for the failure of its structure to break down and its components to become subsequently stratified in such strong centrifugal fields.

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[5] Dornfeld, E. J., *Science*, 1937, **85**, 563.

[6] Svedberg, The., *Colloid Chemistry*, 1928, New York.

[7] Svedberg, The., *Science*, 1934, **79**, 327.