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Inheritance of an abnormality of form in Paramecium aurelia.

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Previous studies of abnormality of form arising from unknown causes in laboratory cultures of Paramecium have tended to show that such abnormality is not inherited, *i. e.*, at the time of fission only one daughter cell receives the abnormality. Thus, Jennings[1] found, in a Paramecium which developed a spine, that only one of the daughter cells received this modification, and that animals with a truncated anterior end transmitted the truncated condition to only one of the progeny. He also found that the truncated condition was lost after a few divisions, and all of the descendants became apparently normal. Stocking[2] confirms the observations of Jennings in regard to the non-inheritance of abnormality of form.

On February 23rd, 1924, the author found, in a laboratory culture of Paramecium aurelia, a number of peculiarly truncated specimens. The truncation was so pronounced that the animals were almost exactly one half the length of a normal Paramecium, and it was only after careful study that it could be identified as belonging to this genus. One hundred and thirty of these truncated individuals were isolated during the next three weeks and pedigree cultures of the progeny were kept for varying lengths of time. The culture medium consisted of timothy hay and whole wheat boiled for five minutes in spring or pond water. Standard quantities of these substances were used in making up each lot of culture medium.

Stated briefly the results of these breeding experiments with abnormal (truncated) Paramecia were: (1) Individuals remained in the truncated condition without dividing until death occurred. The maximum recorded period of life without fission in these individuals was thirty-three days. (2) Individuals

[1] Jennings, H. S., Heredity, Variation and Evolution in Protozoa, *J. Exp. Zool.*, 1908, v, 577.

[2] Stocking, Ruth J., Variation and inheritance in abnormalities occurring after conjugation in Paramecium caudatum. *J. Exp. Zool.*, 1915, xix, 387.

became apparently normal in all respects, or divided normally by fission to give apparently normal progeny. (3) Individuals produced from the anterior end, and occasionally from the posterior end, abnormal daughter cells. Considerable variation was shown in this abnormal progeny which either gradually became apparently normal, or increased in abnormality, and finally died. (4) Individuals produced a race which shows a definite though much less prominent truncation. This may perhaps best be described as a "notched" condition. To the present date (Oct. 9) this race has remained abnormal for one hundred and ninety-six generations, and pedigrees have been kept of eighty abnormal animals at one time, all of which have been derived from one ancestor (number five of those originally isolated).

For the past eighty days (July 13 to October 9) two pedigree cultures have been carried, consisting of five lines each of "notched" Paramecia, begun from an abnormal or "notched" descendant of the original truncated Paramecium in the 112th generation. The average division rate of each culture is similar to that of the earlier pedigree lines approximating very closely to one daily division. Although there is a slight tendency for the "notched" condition to disappear thus giving apparently normal offspring, a very high percentage of abnormality is shown in each line of both cultures.

A study of the division rate curve and of stained individuals indicates that endomixis occurs in this strain of Paramecium aurelia. So far as the present study has gone, no increase nor decrease in abnormality can be noted either before or after these endomictic periods.

Cytological study of both abnormals and apparent normals shows a typical macronuclear and micronuclear structure in all cases. Other details of structure, with the exception of the abnormality of form under discussion, are similar to those found in normal strains of Paramecium aurelia.

Both in mass cultures of stock animals made (a) from apparently normal animals and (b) abnormals, specimens similar to the original markedly truncated ancestor have been and are now being obtained.

Apparent normals arising from these abnormal lines have been carried in pedigree cultures on two different culture media,

and have so far given only apparent normals. There is no marked difference in the division rate of apparent normals and of abnormals.

Further experiments on the hereditability of this abnormality of form are now in progress.

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The production of certain distinct types of reactions by the use of ovarian extracts.[1]

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The present status of our knowledge on the rôle of the ovary as an endocrine gland, and on the exact physiological effects produced by the use of ovarian preparations and extracts, is far from being satisfactory. Though the importance of the ovary as an internal gland is well recognized, there is yet much controversy regarding the interpretation of its particular functions. Some investigators consider the *corpus luteum* as the only or chief active endocrine part of the ovary, while others attribute more importance to the interstitial tissue or to the follicular complex. This divergence of opinions is partly due to the fact that the methods used for the study of this problem have been somewhat incomplete and the conclusions drawn more or less exclusive. The *corpus luteum,* for instance, has been repeatedly underestimated in its importance as an endocrine gland since no positive results have been obtained by certain investigators, who have tried several luteal preparations. The fact that one type of ovarian extract may be inactive in a case where another is active must not be taken as a proof that the former does not possess a certain hormonic action which might be detected by the use of other methods. The ovary is a complex gland and possibly secretes more than one active substance. Such a view is well

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