Straughn and Walter Jones. Yeast contains guanase but not adenase or xanthoöxidase. "Further Studies on the Use of the Fermentation Tube in Intestinal Bacteriology," by A. I. Kendall. Explanations of commonly observed discrepancies in the study of intestinal flora by means of the fermentation tube. "The Metabolism of Man during the Work of Typewriting," by Thorne M. Carpenter and Francis G. Benedict. Estimations of oxygen consumption, carbon dioxide exhalation and heat production show that the energy transformation during the work of typewriting is less than that occurring in ordinary walking.

SPECIAL ARTICLES

A SUCCESSFUL OVARIAN TRANSPLANTATION IN THE GUINEA-PIG, AND ITS BEARING ON PROBLEMS OF GENETICS[1]

Transplantation of the ovary from one animal to another has often been attempted, and with varying degrees of success. The object has usually been to observe the effects of the transplantation upon the animal into which the foreign ovary was introduced. Recently, however, the experiment has been repeated by students of genetics, to discover, if possible, what the effect would be upon the germ-cells, of a transfer from their normal environment to the body of a different individual. The most noteworthy results thus far[2] reported are those of Guthrie on hens, and of Magnus[3] on rabbits. Each apparently working without knowledge of the other's work has obtained what seems to be a modification of the coloration of the offspring, due to influence exerted by the foster-mother upon the germ-cells liberated within her body from the introduced ovary. But in the work of neither of these experimenters does the nature of the result obtained preclude the possibility that the ova liberated may have come from regenerated ovarian tissue of the mother herself rather than from introduced ovarian tissue. The theoretical importance of this point led us about a year ago to plan experiments which should not be open to the objection which we have stated. We therefore undertook the transfer of ovarian tissue from a Mendelian dominant to a Mendelian recessive individual. For if in such a case germ-cells were liberated which bore the dominant character, we should know that they could have come only from the introduced tissue, since recessive individuals are themselves incapable of liberating dominant germ-cells.

We are now able to report partial success. The ovaries were removed from an albino guinea-pig about five months old, and in their stead were introduced the ovaries of a black guinea-pig about one month old. The albino upon which the operation had been performed was then placed with an albino male guinea-pig, and six months later bore two black-pigmented young.

In all recorded observations upon albino guinea-pigs, of which we have ourselves made many hundred, albinos when mated with each other produce only albino young. Accordingly there seems no room for doubt that in the case described the black-pigmented young derived their color, not from the albino which bore them, but from the month-old black animal which furnished the undeveloped ovaries, for transplantation into the albino. As regards the important question whether, in such an experiment as this, the germ-cells are modified in character by the changed environment within which they are made to grow, our results are at variance with those of Guthrie and Magnus. *We can detect no modification.* The young are such as might have been produced by the black guinea-pig herself, had she been allowed to grow to maturity and been mated with the albino male used in the experiment.

We have now under observation about seventy-five other guinea-pigs, as well as a number of rabbits, upon which similar operations have been performed. From some of these we hope to obtain further results.

[1] Contributions from the Laboratory of Genetics, Bussey Institution, Harvard University, No. 1.

[2] *Journal of Experimental Zoology*, Vol. 5, p. 563, June, 1908.

[3] *Norsk magazin for lægevidenskaben*, No. 9, 1907.

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THE PECULIAR INHERITANCE OF PINK EYES AMONG COLORED MICE[1]

READERS of SCIENCE are well acquainted with the fact that color-inheritance in mice presents many difficult problems. To one of these problems we are hopeful that we have found a solution. Mice occur in the same fundamental color-varieties as guinea-pigs, most of which are found also among rabbits.[2] These color varieties occur in two series, one the usual or intense series, the other a dilute or pale series. Bateson (1909) considers the pale series a quantitative modification merely of the intense series, but there are some reasons for regarding it as a qualitative modification. But whichever it may prove to be, the dilution is demonstrably interchangeable from one color variety to another, so that it may conveniently be treated as due to an independent factor.

Mice are peculiar in that they possess another series of color varieties, or really two other series, as we shall try to show, not found in mammals generally.

In this series the eye is apparently pink, but in reality, as Miss Durham has shown, it is very slightly black or brown pigmented. Further, black or brown pigments of the coat, if present, are pale in pink-eyed mice.

We find, however, that the paleness of the pigments in such cases is not commonly due to the same factor as the paleness of coat in the dilute series having dark eyes, but to a different factor which may or may not be associated with the dilution factor and which we regard as a *quantitative* modification of the pigmentation, while the dilution may be regarded as a *qualitative* modification of it.

We recognize, accordingly, four series of color varieties among mice, two dark-eyed and two pink-eyed. Dark-eyed and pink-eyed may each occur in an intense series and in a dilute series. The reason that they have not been recognized sooner is that the intense pink-eyed animal is really less heavily pigmented than the dilute dark-eyed animal of the same color-type, and so *all* pink-eyed animals have been considered *dilute*. But that such is not the case is shown by the following experiment. If a pink-eyed gray (intense) animal is mated with a dark-eyed pale cinnamon (dilute) the young are all both dark-eyed and intense; namely, the color of wild house-mice (gray).

Now if such grays are bred together they produce: (1) grays (both intense and dark-eyed); (2) blue-grays (dilute and dark-eyed); (3) pink-eyed grays (intense but with reduced amount of pigment), and (4) pink-eyed pale-grays (dilute and with reduced amount of pigment). Manifestly this is a case of Mendelian dihybridism, in which the pigmentation has been modified in two different ways. Each modification affects the fundamental color-factor, *C*, and may be transmitted through albinos, or from one color variety to another. For convenience of reference we place in a table the names of the four series of color-varieties which we recognize. Most of these have already been identified but there is still uncertainty about a few of them. In the table p. means pink-eyed as well as "paucity" of black or brown pigment in the coat.

The albinos being wholly unpigmented are indistinguishable in the several series except by breeding tests.

A specific experiment illustrative of the foregoing account, though involving a greater number of factors, is the following.

[1] Contributions from the Laboratory of Genetics, Bussey Institution, Harvard University, No. 2.

[2] See SCIENCE, January 25, 1907; August 30, 1907; August 21, 1908.

[3] The coat looks to the unaided eye very similar to that of the dark-eyed pale cinnamon.

[4] This variety has a coat much less heavily pigmented than the dark-eyed blue, but if crossed with cream it produces black and gray young, not blue and blue-gray.