A Mutant Genoid in *Drosophila* Sensitive to Carbon Dioxide

SENSITIVITY to carbon dioxide in *Drosophila melanogaster* is believed to depend on the presence in the cytoplasm of an agent which has been called a 'genoid'. As established by L'Héritier and Teissier[1], males of the standard sensitive stock transmit genoids, therefore sensitivity, to a variable but important fraction of their progeny. Sensitive females transmit it to all their offspring.

This rule is usually observed in stocks which are made sensitive by injection of hæmolymph from sensitive flies of the standard stock, or by grafting ovaries from resistant larvæ into sensitive ones[2]. However, a stock carrying the sex-linked gene *white*, made sensitive by injection of hæmolymph from sensitive flies, was found to have a different pattern of inheritance of sensitivity. Progeny of females of this stock were always sensitive, while progeny of sensitive males were rarely so. Experiments were undertaken to see whether this pattern of transmission of the genoid was due to an influence of the genotype of the *w* stock upon the genoid, or to a mutation of the genoid, rendering it unable to infect the male germ.

Females from the standard sensitive stock (called $\sigma - e$)—the stock previously called *ebsBs* which contains the gene *ebony*—were crossed with males from the *w* sensitive stock (called $\sigma - w$) and, reciprocally, $\sigma - w$ females were crossed with $\sigma - e$ males. *F*1-sensitive females of the two lines were back-crossed to wild-type resistant males, and the back-crosses repeated during nine generations. In each generation, the capacity of males to transmit sensitivity (that is, their 'valence') was determined. It was found that, in the line started with $\sigma - e$ females, the males maintained a high valence (between $54{\cdot}5 \pm 0{\cdot}4$ and $80{\cdot}5 \pm 0{\cdot}4$) during the nine generations, while in the line started with $\sigma - w$ females, the valence remained very low (between $0{\cdot}11 \pm 0{\cdot}05$ and $8{\cdot}0 \pm 0{\cdot}3$). This result rules out the possibility of an immediate influence of the genotype of the *white* stock upon the genoid.

As it has been shown elsewhere[3], exposure of sensitive flies to high temperature (30° C.) can, in certain conditions, 'cure' their germ cells. It is thus possible to obtain a genoid-free stock from any sensitive stock. Using the transplantation technique of Ephrussi and Beadle[4], larval ovaries free of genoid, from 'cured' $\sigma - e$ stock, were implanted into sensitive larvæ of the $\sigma - w$ stock and, reciprocally, ovaries from cured larvæ of the $\sigma - w$ stock implanted into sensitive larvæ of the $\sigma - e$ stock. Likewise, larval ovaries from a wild-type resistant stock were grafted into the two types of sensitive hosts, $\sigma - e$ and $\sigma - w$.

The valences of males descended from each type of grafted ovaries were determined. A very striking fact appeared: males whose genoid comes from the $\sigma - e$ host had, whatever their genotype, a high valence ($21{\cdot}4 \pm 2{\cdot}7$ and $29{\cdot}0 \pm 6{\cdot}8$), whereas males whose genoid comes from the $\sigma - w$ host had always a very low valence ($0{\cdot}66 \pm 0{\cdot}05$ and $3{\cdot}5 \pm 3{\cdot}4$). Since this situation persisted in the following generations, it was possible to establish two strains of $\sigma - e$, one with high-valence males and another with low-valence males; and similarly two strains of $\sigma - w$, with the same characteristics.

The fact that two types of males may be obtained in any stock was verified by building up several similar pairs of sensitive stocks, from strains carrying the genes *sepia*, *eyeless* and *yellou*. In each pair, one stock has high-valence males, the other low-valence males; and this difference was found to persist through many generations.

These facts are best interpreted by the assumption that the genoids present in the $\sigma - w$ stock have undergone a mutation limiting strongly their capacity to infect the male germ.

A full account of these experiments and a discussion of a possible mechanism of a fortuitous selection of mutant genoids will be published in the *Bulletin Biologique France Belgique*.

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Mechanism of Nitrogen Assimilation from Amino-Acids by Yeast

EHRLICH[1] showed, in general, that an α-amino-acid if supplied to yeast as its sole source of nitrogen undergoes deamination, since the corresponding higher alcohol can be recovered from the fermented medium; he inferred that the ammonia simultaneously liberated is utilized for the synthesis of cell proteins. Coupled with the known fact that fusel oil (a mixture of these higher alcohols) is produced during the fermentation by yeast of natural substrates such as beer wort, the primary source of nitrogen of which consists of a complex mixture of α-amino-acids, this work of Ehrlich initiated the widespread view[2] that deamination of α-amino-acids is the normal mechanism of nitrogen assimilation by yeast. It is a corollary of this view that no amino-acid could be superior to ammonia as a nitrogen nutrient for yeast. While this is generally true when single amino-acids are used as the nitrogen source[3] (deamination being obligatory in such cases), it is demonstrably false when the nitrogen is supplied as a mixture of many amino-acids. I have shown that approximately half the assimilable nitrogen of beer wort is assimilated by yeast fully five times faster than ammonia nitrogen.

An entirely reasonable hypothesis to account for this behaviour is that, when all the amino-acids needed for the production of yeast proteins are present in the medium, they do not undergo preliminary deamination but are integrated intact into the protein structures. Deamination may be presumed to occur only so far as may be necessary to furnish ammonia for the synthesis of amino-acids in short supply or absent from the medium—and for the synthesis of other types of nitrogen compounds required by the cell.

Some deductions from this hypothesis which have been experimentally confirmed are as follow. (1) The superiority of amino-acid mixtures over ammonia increases with increasing complexity of the mixtures. (2) The assimilation of intact amino-acids results in more of the carbohydrate of the nutrient medium being available for fermentation than would otherwise be the case. (3) If, as there was reason for thinking, pyridoxine is involved in the deamination of amino-acids[4], it will be more dispensable with complex amino-acid mixtures, as well as with ammonia, than