al and th (decreases the number of aristal filaments and the number of claws on the prothoracic legs) and "leg" mutations d and fj (decreases the number of tarsal segments on the prothoracic legs) at 16°C and 29°C in D. melanogaster, we found the appearance of essential signs of non-homoeotic mutations on the corresponding homoeotic structures (Kaurov et al. 1976, 1978). In addition, in double mutants pb ss^a we observed a special manifestation of mutation ss^a on homoeotic structures, caused by the action of mutation pb (Kaurov et al. 1977). Similar effects were also observed by other authors (Brown 1940, Ouwenell 1970, Lewis 1963, Stepshin and Ginter 1972).

On the basis of the data obtained I suggest defining the notion "field gene activity" as a totality of cells of definite determination, specific for manifestation of activity of a given gene, to which a definite phenotype of definitive structures corresponds. The consequences include application for definition of gene activities, morphogenetic relationship of normal and homoeotic structures and gene activity after the appearance of cells of definite determination, independently of its origin in ontogenesis and localization.

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Kaurov, B.A. Institute of Medical Genetics, AMS USSR, Moscow, USSR. Mutation aristapedia causes the transformation of distal segments of antennae to five-segmented tarsi in D. melanogaster.

Despite the fact that homoeotic mutation causing the transformation of distal segments of antennae to the distal structures of mesothoracic legs has been discovered by Balkaschina in 1928 in D. melanogaster, there was no information concerning the number of tarsal segments in the homoeotic tarsus up to now. This number is considered to be equal to four and to correspond to Ta2-Ta4 of the tarsus, which are homologous to AIY-AY of the antenna; Ta1 of the tarsus is homologous to AIII of the antenna (Postlethwait and Schneiderman 1971). So, the appearance of leg bristles on AIII and four tarsal joints on the homoeotic tarsus will indicate the presence of Ta1 on it.

Studying the different alleles of the aristapedia locus (ss^{ak}, ss^{ax} and ss^{a40a}) in D. melanogaster at 16, 25 and 28°C, we observed the appearance of four tarsal joints on homoeotic tarsi in the mutants ss^{a40a} at 16°C and between Ta1 and Ta2 (Kaurov and Ivanov 1977). The tarsal joints in the mutants ss^a at this locus have been observed by other authors (Mglinetz 1974). In addition, we observed leg bristles on AIII. The mean number of these bristles varied depending on the temperature (16, 25 or 28°C) and the genotype (ss^{ak}, ss^{ax} or ss^{a40a}) from 1.5±0.1 to 7.4±0.4. It can be noted that leg bristles on AIII in different mutants ss^a reacted to the change in temperature, as well as the bristles reacted to Ta2-Ta5 of homoeotic tarsus. At 16°C the number of leg bristles on AIII in the mutants ss^{ak} and ss^{ax} was increased, while in the mutants ss^{a40a} it was decreased in comparison with 28°C.

So, the data obtained show that the homoeotic mutation aristapedia causes the transformation of AIII-AY of the antenna to Ta1-Ta5 of the tarsus, i.e., the formation of five-segmented homoeotic tarsi.

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Kidwell, M.G. Brown University, Providence, Rhode Island. The use of pupation height as a method for distinguishing between the sibling species D. melanogaster and D. simulans.

Although males of the sibling species D. melanogaster and D. simulans may be readily distinguished by examination of their external genitalia, separation of females is difficult on the basis of morphological differences. We have found that pupation height in shell vial cultures provides a quick and reliable means of preliminary separation for females of the two species without time-consuming microscopic examination of male progeny.

Fig. 1. Typical shell vial cultures showing a high frequency of pupation above the medium level in D. melanogaster (left) but not in D. simulans (right).

During the 1977 and 1978 summer seasons, Drosophila collections were made at a number of North American locations in order to establish isofemale lines of D. melanogaster from widely dispersed geographical areas. The frequency of D. simulans at several locations was high, but after some practice it was possible to separate individual female cultures of the two species with a high degree of accuracy according to their pupation pattern in shell vials. It was observed that a majority of melanogaster larvae pupated at a level clearly above that of the food medium while simulans pupae were only occasionally seen above this level. Typical examples of these two distinct patterns are illustrated in Fig. 1. The fact that similar differences were observed in flies collected in Rhode Island, New Hampshire and Texas suggests that species differences rather than strain differences are involved.

An experiment was designed in order to quantify the observed variation in pupation site. An equal volume of a standard cornmeal-molasses-agar medium was dispensed into sixty 8-dm shell vials and all were seeded with live yeast. The level of the medium in the vials was at a height of 2.5 cm. Into 30 of the vials were placed single gravid melanogaster females, aged 4-5 days, which were the progeny of flies collected locally in October 1978. Into the remaining 30 vials were similarly placed simulans females, the progeny of flies from the same collection. Development took place at 21° under identical humidity and lighting conditions. All pupation sites located above the initial level of the medium were marked daily on the exterior of the vials with a magic marker. The number of adult progeny were counted on the 22nd day after the start of the experiment. The mean adult production per female at 22 days was 59.3 for melanogaster but only 39.9 for simulans. The number of pupae located above the 2.5 cm level was 95.4% of the 22 day adult production for melanogaster but only 8.9% of that production for simulans. This difference in pupation behavior cannot be explained in terms of larval density, however, because the 15 melanogaster vials that were ranked lowest for adult production had a higher frequency of pupation above the 2.5 cm level than the 15 vials with the highest production. Close examination of the culture vials indicated that simulans tended to pupate on the surface of the medium itself. It was further noted that the medium in melanogaster vials was clearly more liquefied by the action of the larvae than in simulans vials. Indeed, in most cases, pupation on the surface of the liquefied medium in melanogaster vials would likely have resulted in the drowning of the pupae.

These observations of species differences in pupation height are consistent with the previously reported results of Barker (1971) and Markow (1979).

References: Barker, J.S.F. 1971, Oecologia 8:139-156; Markow, T.A. 1979, Behav. Genet. 9: 209-217.

Liebrich, W. Institut für Genetik, Universität Düsseldorf, F.R. Germany. In vitro differentiation of single cysts of spermatocytes of Drosophila hydei.

In this laboratory techniques have been developed to study the in vitro differentiation of single cysts of spermatocytes isolated from testes of Drosophila hydei (Fowler and Uhlmann 1974, Fowler and Johannisson 1976). Recently Cross and Shellenbarger (1979) showed that it is possible to obtain differentiation of isolated cysts of D. melanogaster, too.

Improvements of these culture techniques have recently been worked out. A simple culture chamber (details described below) permits the observation of the developing cells even with an oil immersion objective (100x).