Berendes, H. D. Genetisch Laboratorium der Rijksuniversiteit, Leiden, Netherlands. The effect of temperature shocks in some related species of the genus Drosophila.

Temperature shocks are known to induce specific changes in the chromosomal puffing pattern of Drosophila hydei (Berendes et. al., 1965). These treatments were considered to produce a temporary shortage in oxygen in the extracellular and/or intracellular milieu. Arguments in favor of this interpretation were obtained by treatments which affect the oxygen uptake by the larvae (v. Breugel, 1965). It was assumed that the temporary shortage in oxygen acts in some way upon the activity of certain specific genes which may restore the normal metabolism which was disturbed by the treatment. The large number of related species of the repleta group, which differ in the banding pattern of their salivary gland chromosomes mainly by large paracentric inversions (Wasserman, 1962), offer favorable material to test the specificity of the genes involved in the reaction to temperature shocks.

Ten different species of the group were treated by transferring the larvae at a stage just before puparium formation from 25° to 35° C. The species used belonged to different subgroups. Five species, D. hydei, D. eohydei, D. neohydei, D. nigrohydei and D. bifurca belong to the hydei subgroup. This group was considered to have the most primitive banding sequence in the salivary gland chromosomes. Three species, D. mulleri, D. buzzatii and D. hamatofila belong to the mulleri subgroup. One species, D. mercatorum belongs to the mercatorum subgroup, and D. repleta belongs to the melanopalpa subgroup. The chromosomal rearrangements which have occurred during evolution of the repleta group were described in detail by Wasserman (1962) and they are all based on the banding sequence of D. repleta. Some of the rearrangements in a number of the species listed above were also described on the basis of the banding pattern of D. hydei (Berendes, 1965).

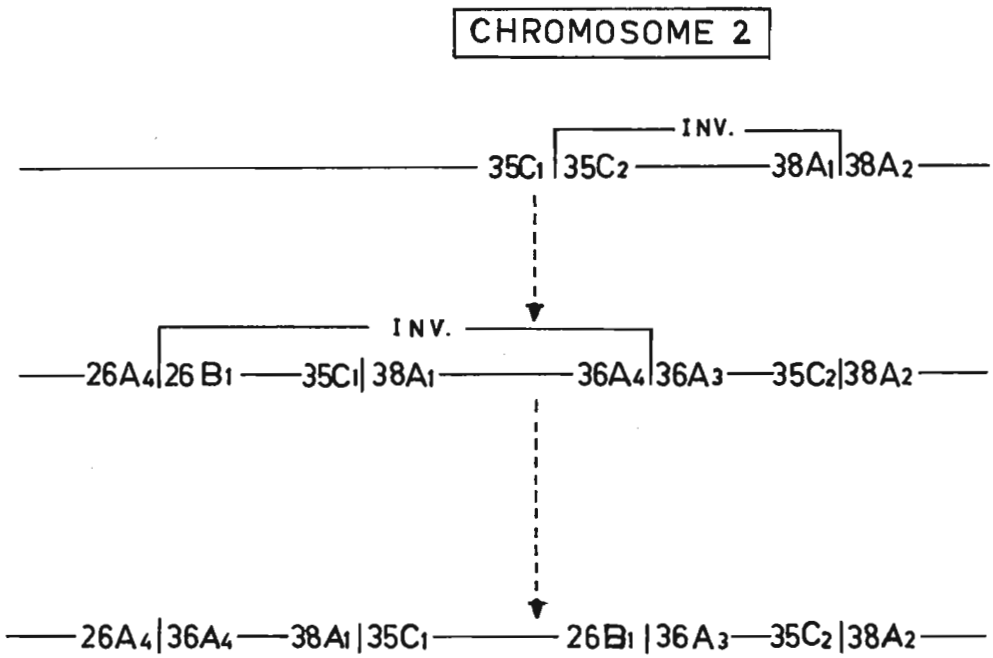
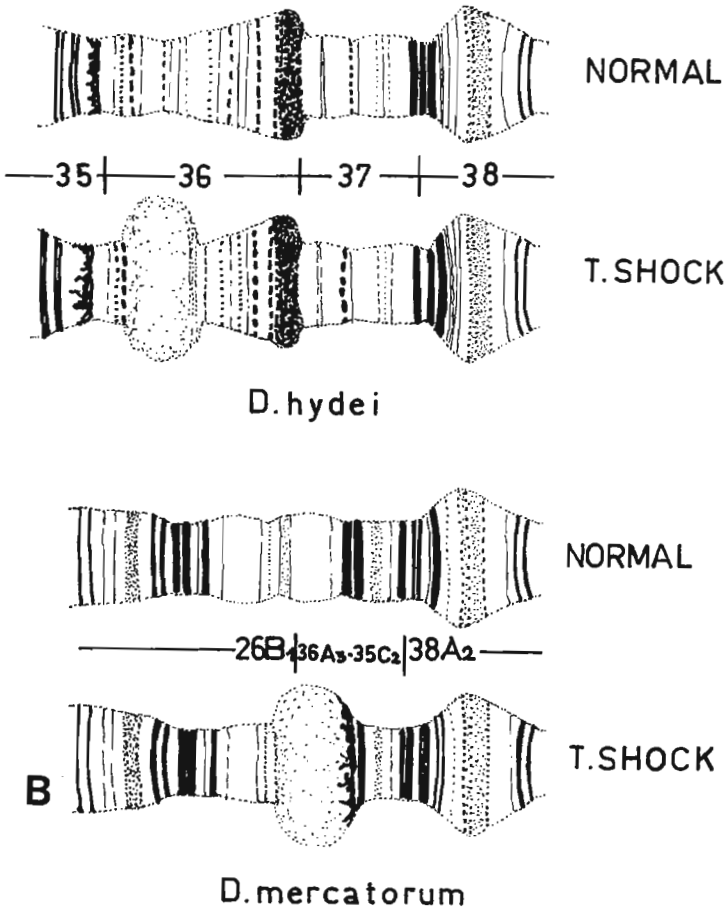



fig. 1
A

All species as far as investigated showed identical specific reactions in their puffing pattern after temperature shocks applied to larvae as well as given to salivary glands in vitro. The regions which are affected in their activity are: I 4CD, II 31C, II 32A, II 36A, II 48B, IV 81B and IV 85B.

Especially in the banding pattern of the second chromosome numerous rearrangements have occurred during evolution of the group. This has led to quite different locations of regions II 32A and II 36A in the different species as compared with D. hydei. However, the change in position of these loci, which involves the presence of different groups of genes in their neighborhood, did never change their reaction to temperature shocks. The specific reaction of the loci can even be observed when only a very small region containing such a locus is transferred to another location on the chromosome during evolution. This situation was met for region II 36A in D. mercatorum. In Fig. 1A the possible sequence




in the occurrence of two paracentric inversions in the second chromosome is shown. These inversions give rise to the banding sequence as observed in D. mercatorum when we assume that the banding sequence of D. hydei is the most primitive sequence. In addition to these two inversions there have occurred a large number of other rearrangements in this chromosome during evolution to the mercatorum sequence (Berendes, 1965). The reaction of region II 36A after a temperature shock is shown in Fig. 1B. The puffing pattern of the treated larvae of the two species can be compared with the normal state of activity in this region of the chromosome.

From the results it may be evident that the regions affected by temperature shocks are highly specific, which indicates that this treatment influences in some way a definite metabolic pathway. Moreover, the observed specificity might allow in favorable cases to conclude the homology of genes and their location in related species.

References: Berendes, H. D., Genen en Phaenen 10, 32 (1965). Berendes, H. D., F. M. A. van Breugel and Th. K. H. Holt, Chromosoma 16, 35 (1965). van Breugel, F. M. A., DIS 40, 62 (1965). Wasserman, M., Univ. Texas Publ. 6205, 63 (1962).

Duyvestyn, C. G. University of Melbourne, Australia. Wing mutant in D. robusta.

Several D. robusta lines were set up in June 1963 from pair matings taken from a single stock which had its origins in a female collected by Dr. M. Levitan at Blacksberg, Virginia in August 1962. A wing mutant was first noted in one line in October 1964 and in three other lines soon afterwards. Seven other lines as well as the parent stock have not developed the mutant.

In external phenotype, the mutant appears to be similar to the "dumpy-like" mutant reported by Levitan (DIS 26). He found the mutant character to be determined by a recessive gene and that both sexes were sterile.

The same locus was found to be involved in the mutants produced by three of the lines. The mutant from the fourth line was lost before adequate tests could be performed. The gene responsible for the abnormal wing was also found to be recessive. Mutant individuals survive for a limited time after emergence from the pupal case. Most die within a week at 25°C before reproductive activity is possible. There does not appear to be any difference in survival time at 20°C or 25°C.

Mutant females have degenerate ovaries but mutant males possess normal testes and are able to produce motile sperm if they reach sexual maturity. It is not clear whether or not they are fully fertile as copulation between mutant males and normal females was not observed nor were progeny obtained from such crosses.