enzyme systems are in complete contradiction to this interpretation. The first three enzymes in orotate synthesis are reduced by various of the alleles of rudimentary (Ralws and Fristrom 1975) and the last two by rudimental (Lastowski, pers. comm.). None of these mutations show a black phenotype, nor does suppressor of rudimentary which blocks the first step in uracil catabolism (Stroman et al. 1973). Therefore, if the black lesion does occur in the pathway via uracil, it must affect either of the final enzymes; hydropyrimidine hydrase or beta-ureidopropionase.

We have assayed hydropyrimidine hydrase EC 3.5.2.2. which catalyzes the conversion of dihydrouracil to beta-ureidopropionate. The spectrophotometric method described by Dudley et al. (1974) was used except that buffer was substituted for ethanol to attain better solubility of the substrate. Protein was determined by the method of Lowry et al. (1951). Canton-S was used as the wild type control and the black strain was back bred to Canton 11 times prior to the assays.

The results given in Fig. 1 fail to show any difference in activity between black and wild type for this enzyme. Whild beta-ureidopropionase remains to be tested, it appears more likely that black is a lesion in aspartate decarboxylase. Jacobs (1974) found a slight but significant decrease in $^{14}CO_2$ excretion from black flies injected with labeled aspartate. Since a heterozygous deficiency of the wild allele also produces a black phenotype (Lindsley et al. 1972) suggesting that black homozygotes could have enzyme levels as high as 50% or more than wild type; and the available black alleles are leaky, homozygotes producing as much as 50% of normal levels of beta-alanine (Hodgetts 1972); more definitive results might be obtained with a direct in vitro assay for aspartate decarboxylase using either stronger black alleles or flies that are heterozygous for black and a deficiency of the wild allele. While the pathway through uracil is capable of compensating for black when supplied with exogenous substrates, it appears that the increased amounts of beta-alanine needed during puparium formation and eclosion are normally supplied by aspartate decarboxylase.

This research was supported in part by George Mason University Research Grant to A.F.S. The authors wish to thank Dr. George Andrykovitch, Ms. Martha Corjay, Mr. Thomas Hundley and Ms. Nancy Meinecke for their expert advice and assistance.

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Hartmann-Goldstein, I.J. Sheffield University, England. DNA-content of Malpighian tubule nuclei from white-variegated larvae.

In D. melanogaster the main segment of larval Malpighian tubules consists of two readily distinguishable cell types (Wessing and Eichelberg 1978): the numerous type I cells are relatively large, yellow in w^+ tubules and in white-variegated strains may be colorless; the small and flattened type II cells are colorless, generally occur singly, and tend to decrease in number towards the proximal end of the segment. To establish whether there are consistent differences in the degree of polyteny in these cell types, I used a Barr and Stroud GN2 integrating microdensitometer to measure the Feulgen-DNA content of formalin-fixed cells in one anterior tubule from each of four female $T(1;4)w^{m258-21}$ prepupae reared at 14°C. In the squash preparations used, the relative positions of the cells in the tubule were largely preserved. Of 384 nuclei measured (Fig. 1; Table 1) all but 12 fell into 3 discrete DNA classes, with mean values of approximately 9, 36 and 70 arbitrary units. Presumably the class with the smallest mean differed from the other two classes by two and three replication steps respectively. The remaining 12 nuclei (shown on the histogram as unshaded areas, and not included in the tables) were, with only one exception, grouped between the two smaller classes and had a mean value of 19.2; they may represent the "missing" replication step.

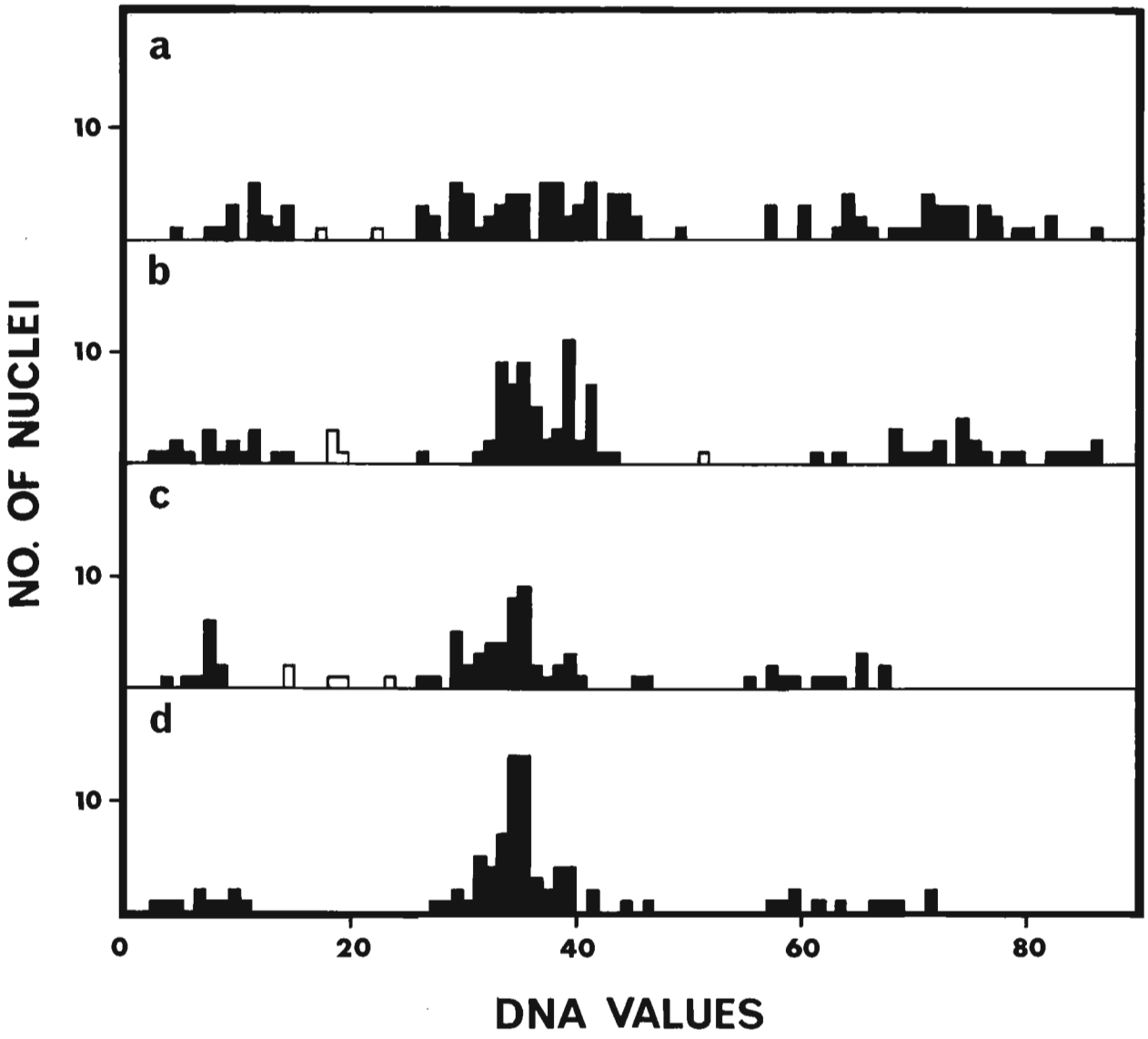
Nuclei falling into the lowest DNA class were usually distributed singly and were somewhat more numerous toward the distal end of the tubule. It seems probable, therefore, that they belong to type II cells. Nuclei in the highest class were most numerous in the proximal regions while those in the next lower class predominated near the distal end. In the intermediate regions these two classes were represented in approximately equal numbers, and nuclei

Table 1. Mean Feulgen-DNA values, in arbitrary units, of Malpighian tubule nuclei in three DNA classes.

Prepupa	N	$\bar{M}$	SE
a	17	11.40	± 0.65
	59	36.96	± 0.76
	40	71.03	± 1.15
b	18	8.28	± 1.03
	58	37.31	± 0.45
	25	75.92	± 1.40
c	13	8.69	± 0.86
	49	34.73	± 0.61
	13	63.0	± 1.26
d	10	7.40	± 0.86
	59	35.86	± 0.45
	11	64.64	± 1.57

Table 2. Comparison of mean Feulgen-DNA values in pigmented and unpigmented cells.

Prepupa	N	$\bar{M}$	SE
c unpigmented	13	8.69	± 0.86
	27	32.93	± 0.72
	3	64.0	± 3.0
c pigmented	-	-	-
	22	36.96	± 0.81
	10	62.70	± 1.45
d unpigmented	10	7.40	± 0.86
	24	35.13	± 0.48
	5	61.0	± 0.89
d pigmented	-	-	-
	35	36.37	± 0.67
	6	67.67	± 2.11



of a given class occurred either singly or in groups of two or three. This distribution pattern is reminiscent of white-variegation, since those type I cells which are colorless usually occur singly or in small groups, and are frequently more common towards the distal than the proximal end of the tubule.

Two of the tubules (c and d in the illustrations) had been pre-fixed in 2% mercuric chloride (which preserves the pigmentation and improves the contrast between pigmented and unpigmented cells), and photographed before being fixed and stained. The DNA-content of individual cells could therefore be correlated with presence or absence of pigment. To investigate the possibility that degree of polyteny and variegated position effect are related, the DNA-content of pigmented and unpigmented cells was compared (Table 2). Cells with the lowest DNA content were always unpigmented, confirming the conclusion that they are of type II; the absence of pigment in this cell type is not related to variegation, since type II cells are colorless even in wild-type strains. All 12 unclassified nuclei belonged also to unpigmented cells, which suggests that they too may be of type II. The nuclei in the two highest DNA classes were found in similar proportions in pigmented and unpigmented cells; in neither tubule was the difference statistically significant (χ^2 = 0.421 and 0.086 respectively in c and d). Thus in larval Malpighian tubules the absence of pigment associated with variegated position effect does not appear to be related to degree of polyteny.

Reference: Wessing, A. and D. Eichelberg 1978, in: The Genetics and Biology of Drosophila (Ashburner, M. and T.R.F. Wright, eds., Academic Press) Vol. 2c:1-41.

Heed, W.B. University of Arizona, Tucson, Arizona. Central and marginal populations revisited.

D. mojavensis appears to be an exemplary species with which to study the ecology and life history strategies of populations containing substantial amounts of inversion heterozygosity ("central populations") and those with little or none ("marginal populations") chiefly because the geographic areas containing each kind of population are approximately equal in size and the host plants are well known in each case. Furthermore, detailed field studies may be accomplished on a year-round basis.

Central populations are considered by many investigators to be (1) geologically older and to live under conditions considered to be (2) spatially more heterogeneous and (3) temporally more predictable. The question arises whether all three conditions are necessary for the origin and maintenance of inversion heterozygosity. Our preliminary studies are demonstrating that increased trophic resource predictability is a characteristic feature of areas in which D. mojavensis maintains inversion heterozygosity while increased niche diversity or breadth is not immediately evident. The question of geologic age is at least not disputed.

D. mojavensis spends its entire life cycle on chiefly two host plants. In Baja California, the islands in the Gulf and in the Desemboque Region of Sonora, mojavensis utilizes agria cactus, while in the remainder of Sonora and in northern Sinaloa and southern Arizona, the species switches to the organ pipe cactus. Of special interest is the fact that all inversion heterozygosity on chromosome 2 (4 common gene arrangements and 3 rare gene arrangements) and the major portion of the heterozygosity on chromosome 3 (2 gene arrangements) are restricted to populations living in agria cactus. Furthermore, while there are areas in Baja California which have lower heterozygosities than other areas, none of the more than 30 localities sampled were completely monomorphic for gene arrangements. By contrast populations living in organ pipe are invariably monomorphic in the northern half of their distribution and three localities where heterozygous in chromosome 3 in the south. In general then, and as a first approximation, populations living in agria cactus are considered to be central or subcentral while those living in organ pipe are called marginal or submarginal populations. The data on the inversions was kindly supplied by William R. Johnson.

Trophic resource predictability is being measured by three different methods: (1) surveys of the host plant density and density of the necrotic tissue, (2) correlations of the variation in biotic and abiotic factors in the necrotic tissue and (3) comparison of yeast species diversity in both host plants. A total of 13 plant censuses have been conducted throughout the Sonoran Desert to date. Nine of these were made in agria cactus and four were made on organ pipe cactus (data kindly supplied chiefly by Robert L. Mangan, Jean S. Russell and William T. Starmer). The areas surveyed varied in size from 3 to 62 acres. In one area of 54 acres both agria and organ pipe were scored. The mean number of organ pipe plants per