Ogonji, G.O. Howard University, Washington, D.C. Genetic control of the octanol dehydrogenase isozymes in D. albirostris.

The existence of octanol dehydrogenase (ODH) in multiple molecular forms in D. melanogaster was reported by Courtright, Imberski, and Ursprung (1966). Since then, the genetic control of ODH in D. metzii and D. pellewae has been studied by Pipkin (1968, 1969a, 1969b). Using an agar gel electrophoresis method, true breeding ODH isozyme variants were extracted from polymorphic strains of D. albirostris from El Valle, Panama (Fig. 1); Darien, Panama; Summit Gardens, Panama; Rio Raposo, Colombia; and Leticia, Colombia. The isozyme patterns of the extracted variants were of three main types: A, B, and B^1. The A type variants from Leticia and Summit Gardens, designated L-A and S-A, respectively, always possessed an isozyme at position 3 and occasionally additional isozymes were seen at positions 5 and 7, or 5,6, and 7. These positions are marked relative to those of extracted variants of D. metzii and D. pellewae, which belong to the same subgroup of the tripunctata species group as D. albirostris (see Fig. 1 of Pipkin, this issue of DIS). The two B type variants, designated EV-B4 and EV-B13 from El Valle, Panama, always possessed an isozyme at position 4.5 or 5 and 6, but differed in the manner in which they reacted in interstrain hybrids. The B^1 type

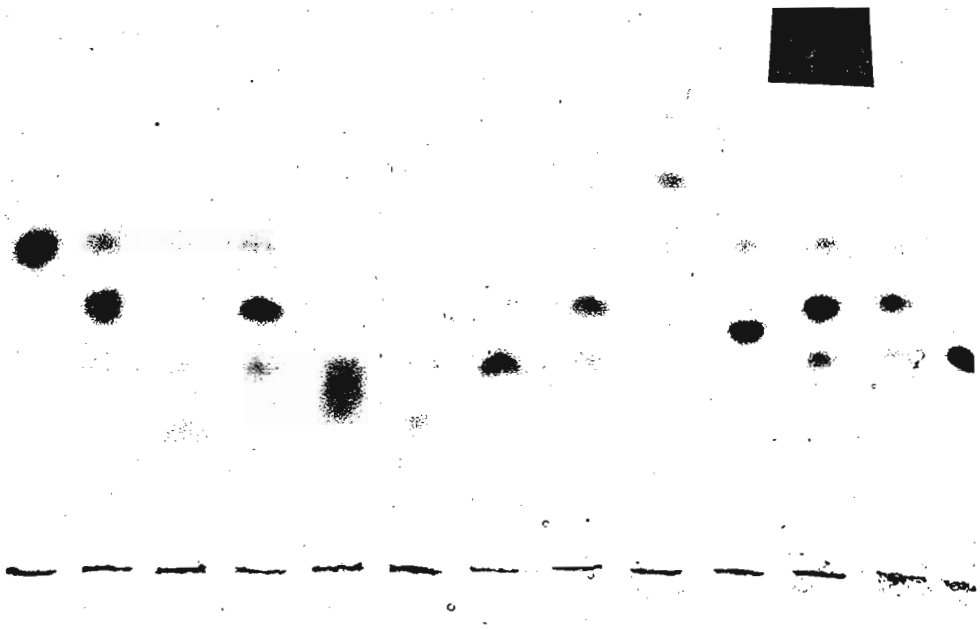

Fig. 1. ODH isozyme patterns of single adult females of D. albirostris, El Valle, Panama strain.

variant extracted from Darien, Panama, possessed a single isozyme at position 5. However, the B^1 variant extracted from the Rio Raposo, Colombia strain had an isozyme at position 5 and often at either 6 or 7. The F_1 hybrids between distinct variants usually displayed a triplet isozyme pattern in 8 day old adult females. A/B hybrids possessed a 3,5,7 pattern; A/B^1 hybrids, a 3,4,5 pattern; and B/B^1 hybrids, a 5,6,7 pattern. The frequencies of parental and heterozygote isozyme patterns occurring in F_2, backcross, and outcross progeny indicate a monofactorial inheritance. The A,B, and B^1 variants are believed to differ in multiple alleles of a single locus. The multiple allele interpretation is borne out by the ODH isozyme patterns of the segregating progeny of the outcross EV-B13/S-A x $D\text{-}B^1$. The parental pattern EV-B13 appears in Fig. 2a; that of $D\text{-}B^1$, in Fig. 2b; and S-A, in Fig. 2c. Among the outcross progeny, Fig. 2d, e,f,h,i,k show individuals with the triplet pattern 5,6,7 characteristic of $EV\text{-}B13/D\text{-}B^1$ heterozygotes; and Fig. 2g and j show individuals with the triplet pattern 3,4,5 typical of $D\text{-}B^1$/S-A heterozygotes.

An unusual single isozyme pattern was observed where triplet pattern was expected in certain progeny from crosses of both EV-B13♀ x S-A♂ and EV-B4♀ x L-A♂. Among the F_1 progeny from the EV-B4 x L-A cross, Fig. 3a,c,e,g,h,i,and j show individuals with the expected 3,5,7 pattern characteristic of EV-B4/L-A heterozygotes. Fig. 3b,d, and f show individuals with the aberrant single isozyme pattern 3 which suggests that mechanisms controlling synchronous

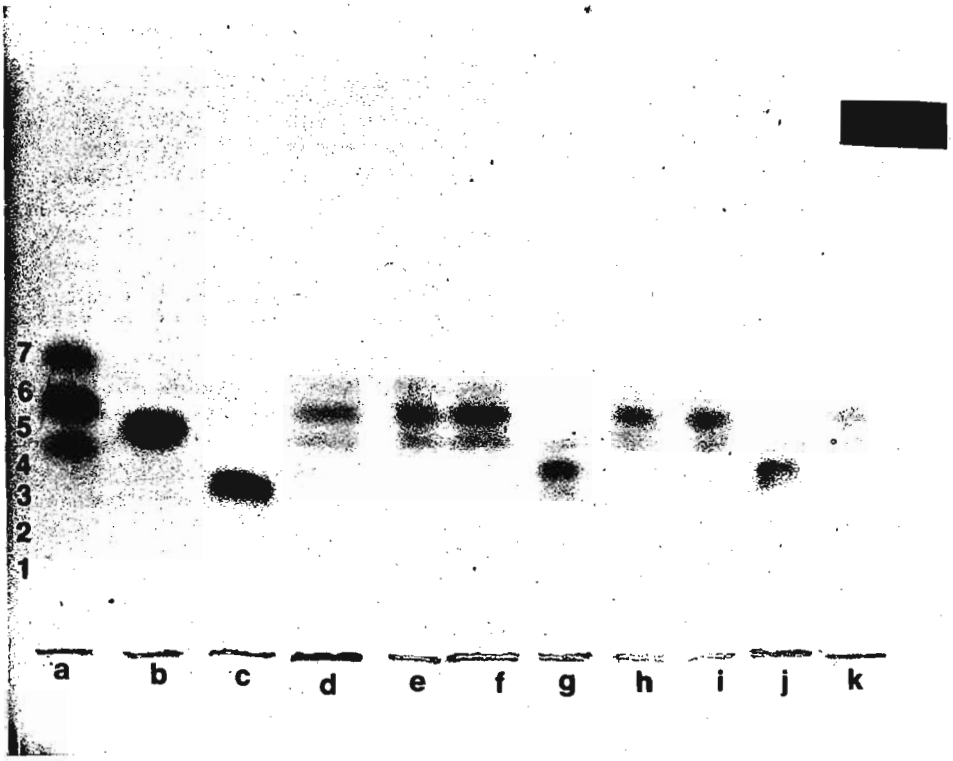

Fig. 2. Parental strain ODH isozyme patterns and patterns of the progeny of the cross EV-B13/S-A x D-B^1: parental strains: a, EV-B13; b, D-B^1; c, progeny: d,e,f,h,i,k, patterns of EV-B13/D-B^1 heterozygotes; g,j,3,4, 5 pattern of D-B^1/S-A heterozygotes.

activity of the maternally derived allele may break down occasionally as Pipkin and Bremner (this issue of DIS) have found for interspecific hybrids of D. metzii and D. leticiae.

According to developmental studies, D. albirostris embryos have in addition to adult isozyme patterns, slowly migrating ODH isozymes at positions 2,1,0^1, and 0^2. Furthermore, embryos of B and B^1 types of extracted lines possessed an isozyme at position 3 which is not detectable in imagines. This is taken as evidence that two structural genes code for sub-

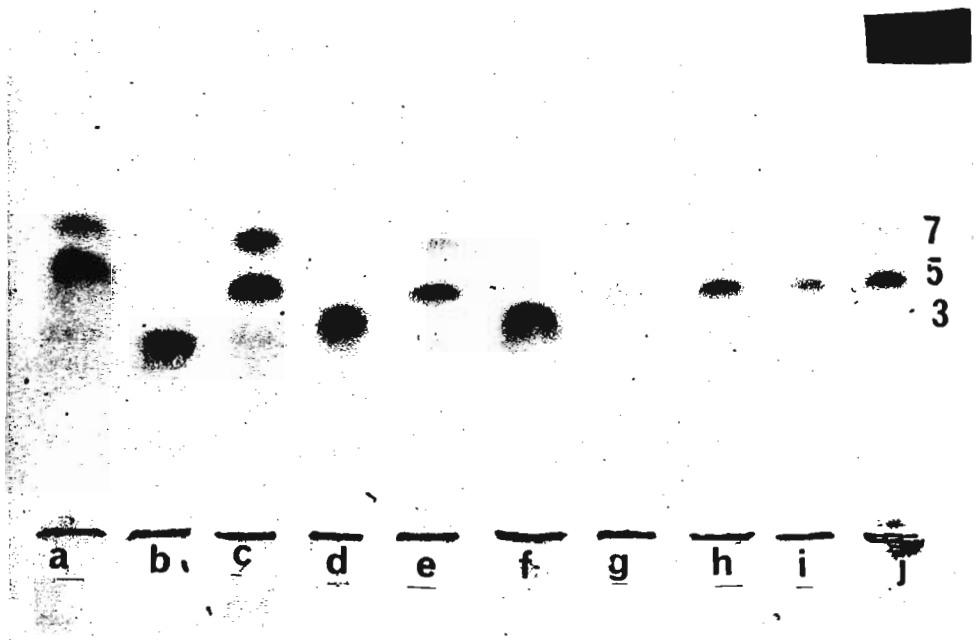

Fig. 3. F_1 progeny of the cross EV-B4 x L-A: a,c,e,g,h,i,j individuals with the expected 3,5,7 ODH pattern; b,d with the aberrant single isozyme at position 3.

units that may be present in isozymes at positions 3 to 7. Preliminary studies on heat lability of embryonic isozymes indicate that when treated with 50°C for 30 minutes, isozymes at positions 5,6,7 were heat labile, but those at positions 3,2,1,0^1, and 0^2 were still enzymatically active. This is further evidence that more than one structural gene codes for subunits that form the isozymes at positions 3 to 7. The three extracted variant types are considered to be regulatory variants that control the rate and/or time of subunit synthesis by structural genes, similar to the lactate dehydrogenase variant studied in mouse erythrocytes by Shows and Ruddle (1968).

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References: Courtright et al. 1966, Genetics 54: 1251-1260; Pipkin, S.B. 1968, Genetics 60: 81-92; 1969a, DIS 44: 59-61; 1969b, in press, Oct. issue Genetics; Pipkin, S.B. and Bremner, T.A. this issue DIS; Shows, T.B. and Ruddle, F.H. 1968, Proc. Nat. Acad. Sci. (U.S.) 61: 574-581.

Bairati, A. and M.E. Perotti, University of Milan, Italy. Occurrence of a compact plug in the genital duct of D. females after mating.

Some experiments have been performed to control the previously reported assumption (1) that the ejaculatory bulb secretion is injected with sperms into the female genital duct during mating. Females (10 for each interval) have been separated from males at various intervals from the beginning of mating. Their genital apparatus has been dissected in saline isotonic solution and observed with dissection, phase contrast and electron microscopes.

The following results have been obtained: 1) during the first 5 minutes from the beginning of mating no material is observed in the female genital duct. 2) between 5 and 7 minutes a compact plug appears filling the uterus lumen. It is cylindrical and made up of a homogeneous, thick and translucent substance. Before the appearance of the plug no sperms are present in the uterus and at about 7 minutes only few sperms have been observed in the most caudal portion of the female genital duct. 3) at 10 minutes, the mass acquires its largest size and many sperms appear within the uterus beyond the plug. Furthermore, some sperms are observed beating between plug surface and uterus walls. 4) at 12 minutes a very large number of sperms is assembled in the cephalic portion of the uterus. Some sperms are present also in the ventral receptacle. Within 14 minutes the sperms fill the receptacle and the spermathecae. 5) the plug is visible in the uterus since 5-7 minutes up to 6 hours - 6 hours and 30 minutes from the beginning of mating and disappears after the first egg has been laid.

Histochemical stainings demonstrated that both the bulb secretion and the plug inside the uterus possess the same staining properties, viz.:i) they stain with Sudan III and Sudan Black. ii) they reduce and osmium tetroxide solution, acquiring a deep dark coloring. iii) the material can be extracted and staining prevented when the material is treated with fat-dissolving solutions. iv) PAS staining is not positive. The foregoing findings further substantiate the assumption that the plug which is found inside the uterus after mating is formed by the secretion produced by the ejaculatory bulb. As to the nature of such a secretion, it may be assumed to consist mostly of fatty material; in point of fact, in view of the viscosity and compactness of the secretion, the latter may be presumed to be of a waxy nature. As to the functional interpretation of the plug, its homegeneousness and compactness would suggest a mechanical kind of function in the first place. If the plug were formed at the end of the mating, after the sperms have been introduced, the most obvious supposition would be that of the plug acting as an obstacle to the outflow of the sperms. As, however, it is found before sperms are introduced, its function is likely to be that of a factor favoring the travel of the sperms from the vagina to the spermathecae and to the seminal receptable. The fact should be remembered that Drosophila sperms are very long cells endowed with a spiral motion. A likely assumption is that the waxy plug works as a central axis which aids the sperm progress, forcing the sperms to swim between the surface of the plug and the walls of the uterus. Besides, by causing the uterus to dilate, the plug helps the sperms to reach the opening of the storage organs. The foregoing hypothesis is backed by observations performed with electron microscopy on uteri of females that had been separated 10 minutes after the beginning of mating. The electron microscope pictures demonstrated that bundles of sperms were located between the uterus walls and a homogeneous granular mass which fills the central portion of the uterus cavity. As far as the chemical function of the plug is concerned, no data are available at present that may either substantiate or rule out the