Moyer, S.E. and S.P. Stepak. Northeastern University, Boston, Massachusetts. Inheritance of trident and its role in detecting ebony heterozygotes in D. melanogaster.

Bridges and Morgan (1923, Carnegie Inst. #327) describe some experiments conducted by Morgan during 1910-11 on inheritance of gradations of the trident pattern which he named "with" or "super-with". They could not clearly judge whether the trait was inherited as a dominant or a recessive. The mutant tri is credited to Plough and Ives (1934) by Lindsley and Grell (1967) and is described as "semidominant" on chromosome II.

The strains used in the present study were: 1. Nearly non-trident: very low frequency of tridents for at least two years. Homozygous for vestigial wing (vg) and resistant to 8% NaCl in the medium (vg S)

2. Partially trident: Moderate frequency of tridents. Homozygous vg and maintained on normal medium (vg N)

3. Ebony: Homozygous for ebony (e) and resistant to .70g/100cc H_2O of commercial 50% wettable DDT powder in the medium (e D)

All matings were single pairs, unless specified otherwise. Scoring of pigmentation was made after newly emerged flies were aged for at least one day. Temperature was controlled at about 21°C.

Matings of non-trident x non-trident produced different results depending on whether parents were taken from the vg S or vg N stock. F_1 progeny were all non-trident if both parents were from vg S. If one or both parents were from vg N, the F_1 progeny were mostly a darker class of non-trident plus an appreciable frequency of tridents. F_2 samples resulted in an increased frequency of tridents, presumably due to new combinations of modifiers. In a notable number of rare cases when one phenotypically non-trident parent was taken from vg N, nearly equal numbers of trident and non-trident F_1 progeny were produced. That is, these pairs seem to be a testcross of an impenetrant dominant factor for trident of the type Tt x tt.

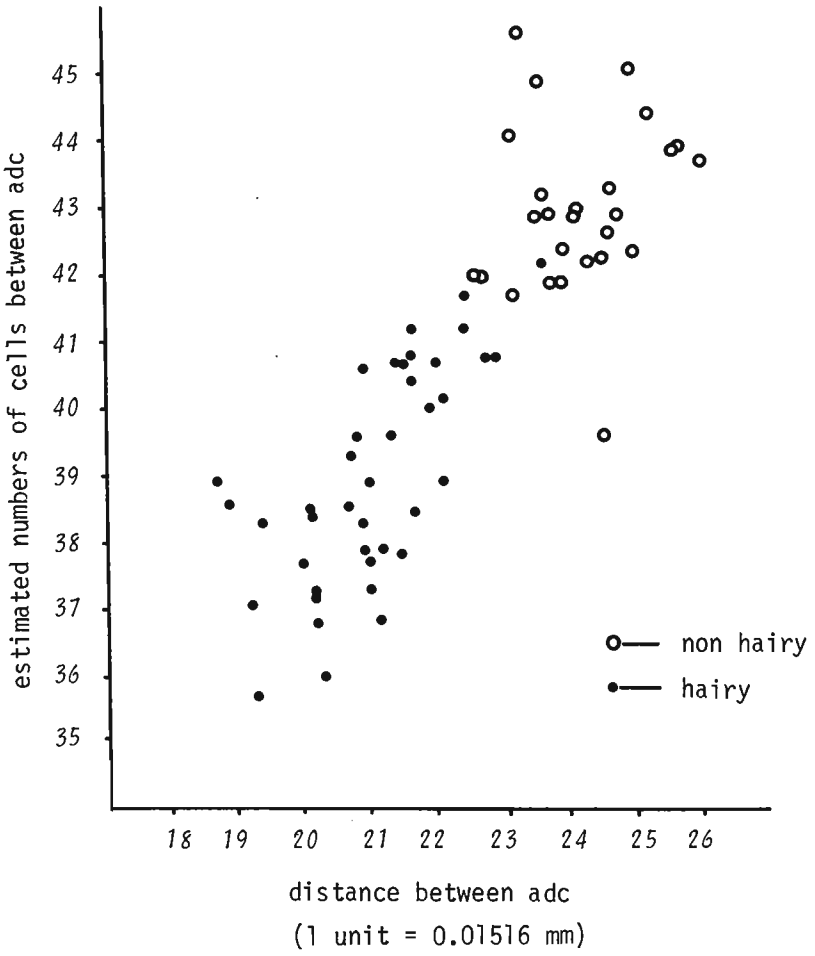
Matings of trident x non-trident produced mostly two types of F_1 results as if it depended on whether the trident parent was homozygous or heterozygous for a dominant factor for trident. However, a general conclusion of the inheritance of trident probably depends on the source of the material.

The main purpose of this study was to determine whether the trident factor is expressed independently of a dark marking on the thorax due to slight partial dominance of ebony in heterozygotes. Mass crosses were made with 100 pairs of parents between e D x vg S. All vg S parents were carefully examined to select light non-tridents. In the F_2, random samples of non-ebony males were scored for trident type and testcrossed singly with ebony females. One-third of the F_2 males tested (54/167) were non-trident and 2/3 were trident, as might be expected. Only seven of the 54 non-trident were heterozygous for ebony and two of the trident males were, in fact, not heterozygous for ebony. If trident was a second chromosome dominant, crosses between trident-bearing ebony and true non-trident, non-ebony could produce an F_2 ratio among the non-ebony progeny of 1/12 non-trident : 11/12 trident. This apparently is not the case in our material.

An immediate application of the above result is the general use of the trident marking for detecting heterozygotes of ebony in estimation of gene frequency. In the F_3 and F_4, there was also good agreement between trident scores and test cross results from populations cultured on normal food. Replicate populations cultured in food having a concentration of .30g. DDT/100cc had a selective disadvantage against genotypes lacking e-bearing chromosomes. Again, tridents were good indicators of heterozygotes and non-tridents were good indicators of non-e homozygotes. In this sense, the trident mark may be at least as useful for detecting ebony heterozygotes as electrophoretic techniques for detecting isozyme genotypes.

Claxton, J.H. University of New England, Armidale, N.S.W., Australia. Cell numbers and acrostichal row numbers in hairy and non-hairy flies.

D. melanogaster normally has eight acrostichal rows of microchaetes running longitudinally between the anterior dorsocentral bristles (adc) on the dorsal mesothorax. It has been suggested that the hairy wing (Hw) mutant, which, among numerous effects, adds extra acrostichal rows, achieves this result by providing extra space near the mid dorsal line, thereby permitting "enlargement of the prepattern (determining) the distribution of chaete for this new



region" (Gottlieb, 1964). This followed the discovery that Hw is partially non-autonomous in Hw mosaics. It would seem reasonable to hypothesize, therefore, that this is a type of secondary non-autonomy whereby an undisturbed prepattern determining mechanism operating over an enlarged field, produces a greater-than-normal number of prepattern elements, each corresponding with an acrostichal row.

Hairy (h) mutants which also commonly have one extra acrostichal row on both sides of the mid dorsal line, provided a simple check on the generality of this hypothesis. In small samples of hairy and non-hairy flies, the numbers of hypodermal cells between adc were estimated. For this purpose, the numbers of cell hairs (and, therefore, cells) were counted in a narrow rectangular area which stretched between the adc, and which had a width 1/10 of its length. Making the assumption that all hypodermal cells are regular hexagons, and that all fit together with no spaces between, it was calculated that the square root of the product (8.66 x number of cells counted) was the maximum number of cells which could lie in a straight line between adc.

With these methods the average estimated numbers of cells between adc was 39.00 (s.d. = ±1.64) in hairy mutants (N = 40), and 42.99 (s.d. = ±1.26) in non-hairy flies (N = 26). From these results there is clearly no evidence that the hairy mutants which had extra acrostichal rows, also had larger than normal numbers of cells between adc.

Generally those hairy flies examined were smaller than the non-hairy individuals. The differences in cell numbers between adc appear to be strongly related to body size. Combining results for both mutant and non-mutant flies, and using (a) the distance between adc, and (b) length x breadth of the scutellum, the numbers of cells between adc was positively correlated with both these parameters [(a) r = +0.86, (b) r = +0.65]. Further, it is apparent (Figure I) that a single regression line relates cell number between adc and distance between adc for both the hairy and non-hairy samples. In these samples then, the numbers of cells between adc has no determinitive influence on the hairy/non-hairy difference in acrostichal row number.

This preliminary comparison anticipates a study of the autonomy (or otherwise) of hairy (with respect to extra acrostichal rows) in non-hairy/hairy mosaics. In this context, the foregoing conclusion might also have important interpretive significance.

Reference: Gottlieb, F.J., 1964 Genetics 49: 739-760.