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USNA. Mapping of tuh-3 between pbx and fl in D.melanogaster.

The tumorous-head mutant gene (tuh-3) was mapped in partial aneuploids and by recombination studies distal to pbx (3.58.8+) and presumably is one of the most posterior bithorax-complex genes (Kuhn et al. 1981; Kuhn and Woods 1982). These studies did not tell us how distal tuh-3 was to pbx. We report here the results of our mapping tuh-3 between postbithorax (pbx) and fluted (fl). We mapped fl to 3-59.7+. Female tumorous-head flies were mated to sbd^2 bx^3 pbx fl/ TM1 males. F_1 females were backcrossed to sbd^2 bx^3 pbx fl/ TM1 males. Male offspring that were fl only were isolated for further testing. Twenty males were shown to carry a 3rd chromosome in which a cross-over occurred somewhere between pbx and fl. Identity matings were necessary to determine presence or absence of tuh-3. From sbd^2 bx^3 pbx tuh-3^+ fl/ sbd^+ bx^+ pbx^+ tuh-3 fl^+ females, cross-over bearing males that were either tuh-3 fl or tuh-3^+ fl were selected. The recombinant chromosomes were balanced over TM1.

Table 1. Localization of tuh-3 by analyzing cross-overs between pbx and fl in 3R.

Strain	Tumorous-head defect				Male genital disc defect			
	with	without	total	% penetrance	with	without	total	% penetrance
pbx tuh-3^+ fl / X → pbx^+ tuh-3 fl								
pbx^+ tuh-3 fl^+								
#3	65	38	103	63.1	32	70	102	31.4
#6	74	28	102	72.5	78	25	103	75.7
#11	69	30	99	69.7	80	21	101	79.2
#17	54	51	105	51.4	36	66	102	35.3
#23	83	20	103	80.6	55	70	125	44.0
#25	59	38	97	60.8	85	19	104	81.7
#26	67	32	99	67.7	24	83	107	22.4
#47	74	34	108	68.5	35	64	99	35.4
#49	76	51	127	59.8	54	47	101	53.5
#50	61	18	79	77.2	2	37	39	5.1
#81	70	46	116	60.3	59	42	101	58.4
#86	93	9	102	91.2	53	49	102	52.0
#90	47	16	63	74.6	72	55	127.	56.7
#92	68	36	104	65.4	42	68	110	38.2
#94	74	26	100	74.0	59	48	107	55.1
Totals	1034	473	1507	68.6	766	764	1530	50.1
pbx tuh-3^+ fl / X → pbx^+ tuh-3^+ fl								
pbx^+ tuh-3 fl^+								
#10	0	100	100	0.0	0	100	100	0.0
#21	0	111	111	0.0	0	118	118	0.0
#57	0	108	108	0.0	1	44	45	2.2
#73	0	102	102	0.0	0	106	106	0.0
#96	0	131	131	0.0	0	101	101	0.0
Totals	0	552	552	0.0	1	469	470	0.2

#57/Df(3R)P9 uncovers tuh-3

Two different genetic tests were needed to detect presence of tuh-3. The mutant gene acts as a semidominant in the presence of an X-linked maternal effect gene, symbolized tuh-1h, to cause growths of abdominal and/or genital tissue in the head. Tuh-3 acts as a simple recessive in the presence of a second maternal effect gene, symbolized tuh-1g, which causes the defect to switch from the head to the posterior of the fly where internal and external genitalia may be completely absent. The maternal effect genes tuh-1h (head defects) and tuh-1g (genital defects) are naturally occurring alleles. The semidominant head defect phenotype was detected among F_1 progeny resulting from mating males of each cross-over strain to females that carried an attached X-chromosome homozygous for tuh-1h and a 3rd chromosome gene that enhances the penetrance and expression of the head defects. The recessive phenotype was found by mating the appropriate males to females possessing an attached X-chromosome homozygous for tuh-1g and backcrossing the attached X-chromosome bearing female offspring to the males from each strain being tested.

Table 1 shows that 15 of the 20 cross-overs between pbx and fl occurred distal to or right of tuh-3. The remaining 5 cross-overs were between pbx and tuh-3. Tuh-3 was mapped much closer to pbx at 58.8+ than to fl at 59.7+. This places tuh-3 at about 59.0+. However, it must be emphasized that an exact placement of tuh-3 was not possible because the viability of flies with recombinant chromosomes was quite low. A total of 93 males was originally selected as potential cross-over types. Of these, 40 either were sterile or did not survive even light etherization. The 15 tuh-3 fl cross-over types showed both the head defect with tuh-1h and the genital defect with tuh-1g. The tumorous-head phenotype was seen in 68.6% of the flies examined with average penetrance ranging from a low of 51.4% to a high of 91.2%, while the genital disc defect was found in 50.0% of the males examined with a low of 5.1% penetrance to a high of 81.7% penetrance. The five tuh-3^+ fl strains of flies lacked a mutant phenotype when confronted with either maternal effect gene. Strain #57 had 1 of 45 males showing the trait. However, when the tuh-3^+ fl chromosome was made hemizygous for tuh-3^+ by placing it with Df(3R)P9, which uncovers tuh-3, none of the 100 males tested showed the phenotype.

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References: Kuhn,D.T., D.F.Woods & D.J.Andrew 1981, Genetics 99:99; Kuhn, D.T. & D.F. Woods 1982, DIS 58:96.

Larochelle, C., J.Côté, and F.Garcin. Laval University, Quebec, Canada. The ethanol metabolic pathway in D.melanogaster and D.simulans.

The two cosmopolitan sibling species D.melanogaster and D.simulans are able to use environmental ethanol as source of energy; however, D.melanogaster exhibits better capacity to handle high ethanol concentrations than D.simulans (Parsons et al. 1979).

This differential tolerance to ethanol could be explained at the biochemical level by a much higher alcohol dehydrogenase (ADH) activity in D.melanogaster than in D.simulans. Nevertheless the ADH-mediated oxidation of ethanol generates acetaldehyde, a highly toxic product. For fly survival it is essential that acetaldehyde be rapidly oxidized into acetate.

In most animal species this critical step involves and NAD^+-dependent aldehyde dehydrogenase (ALDH). In Drosophila, aldehyde oxidase (ALDOX) a flavine enzyme using many aldehydes as substrates, was assumed to be the active enzyme (see Courtright 1967; Dickinson 1970, 1971). Recently we have provided evidence that ALDH is present in Drosophila and that its physico-chemical properties are very similar to those of other animal species (Garcin et al. 1981,1983).

In these experiments we have carried out a comparative study of ADH, ALDH, and ALDOX activities in D.melanogaster and D.simulans. We show that ADH and ALDH activities are directly correlated with the level of tolerance to ethanol and acetaldehyde whereas ALDOX activities are inversely correlated.

Drosophila melanogaster collected from Colmar (France) and Drosophila simulans collected from Villeurbanne (France) were kindly made available by Prof. J. David Laboratoire de Biologie et de Genetique Evolutive Gif-sur-Yvette (France). The flies were grown in low density populations on Drosophila medium (Carolina medium 4-24) and maintained in an incubator providing a constant temperature (25±1°C) and an 18 hr light/6 hr dark photoperiod with fluorescent light. Adult flies, 5 to 6 days old were frozen in liquid nitrogen, homogenized and centrifuged as described in Garcin et al. 1983. The resultant supernatants were kept