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The effect of juvenile hormone analogs on mutation frequency in D. melanogaster.

Table 1. The effect of JHA (Entacon) on frequency of dominant lethal mutations.

Line	Variant	n	% mutations
LA	control	7095	1.3 ± 0.13
Canton-S	"	4267	1.0 ± 0.15
LA	treatment	974	3.4 ± 0.58
Canton-S	"	1797	4.4 ± 0.48

Table 2. The effect of JHA (Altozid) on frequency of recessive viability mutations.

Line	Variant	Chromosome	n	% Semilethals	% Lethals
LA	control	X	784	0.8 ± 0.32	0.6 ± 0.35
"	treatment	X	635	1.6 ± 0.50	0.3 ± 0.22
"	control	2	1123	12.0 ± 0.97	2.8 ± 0.49
"	treatment	2	854	21.3 ± 1.40	4.6 ± 0.72
Canton-S	control	2	988	0.2 ± 0.14	0.5 ± 0.22
"	treatment	2	934	3.5 ± 0.60	4.8 ± 0.70

The physiological hypothesis of the mutation process (Lobashev 1947) suggests that the endocrine system is able to control mutagenesis. The aim of this work was to study the effects of juvenile hormone analogs (JHA) on mutation frequency in D. melanogaster. Two strains were studied: Canton-S (wild strain) and LA. The latter line was selected for the low male mating activity and characterized by a high rate of spontaneous mutations and hypofunction of the gland corpus allatum (Sapunov and Kaidanov 1977; Kaidanov 1978; Kaidanov et al. 1978).

The analogs used were Altozid and Entacon (Zoecon Corporation). Dominant lethal mutations, effective at the end of embryogenesis, were detected by microscope as eggs which stopped development at the last stages of embryogenesis. Recessive viability mutations were checked by the method of Muller-5 (X-chromosome) and Cy/Pm (chromosome 2).

Analogs were applied in concentrations of 10% (Altozid, water solution) and 20% (Entacon, oil solution). 0.07 μ-liter was applied to pupae at age 135 hours. The data (shown in Tables 1 and 2) suggest that the LA strain has a high rate of mutability in chromosome 2. JHA has no effect on the mutation frequency in the X-chromosome of strain LA, but increased the mutability in chromosome 2 of both lines. Entacon could induce dominant mutations in both strains.

The data suggest that hormones are able to induce some types of mutations. Perhaps the endocrine system is the natural regulator of mutability in living organisms as well.

References: Kaidanov, L.Z. 1978, XIV Internat. Cong. Gen., Symposia 91-92; Kaidanov, L. Z., I.R. Pole and V.B. Sapunov 1978, XIV Internat. Cong. Gen., Contrib. Paper Sessions I:553; Lobashev, M.E. 1947, Vest. Leningrad Univ. 8:10-29; Sapunov, V.B. and L.Z. Kaidanov 1977, Vest. Leningrad Univ. 15:135-142 (Russ.)

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The effect of juvenile hormone analogs on reproductive behavior of D. melanogaster.

In some insect species the corpus allatum has been shown to affect mating behavior, while in others this gland is less important (Engelmann 1970). To test the effect of juvenile hormone (JH), the secretion of the corpus allatum, on mating behavior in D. melanogaster, we have compared the wild strain Canton-S to the LA strain, which has been selected for 10 years for low male mating activity (Kaidanov 1978). In the LA line the corpus allatum contains very small cells, suggesting that corpus allatum function might also be altered (Sapunov and Kaidanov 1977). A third stock was obtained in which the proximal part of the X-chromosome is derived from the LA, but the rest of the genome is from wild strain. This strain, L,y ct, is characterized by males with mating activity lower than of the parent LA stock.

The index of mating activity was the percent of animals engaging in copulation during 0.5 hours after contact with 3-4 virgin flies of the opposite sex. The JH analogs (JHA) Altozid and Entacon (Zoecon Corporation) were topically applied in doses of 0.07 microliter. Altozid was dissolved in water, Entacon in oil. Concentrations are given in the tables. Treatment was performed in white prepupae (Stage I), middle pupae (130-140 hours after hatching of the larvae, Stage II), and some hours (3-5) before hatching of the larvae (Stage III).

Table 1. Effects of JH analogs on male mating activity of D. melanogaster.

Line	Stage	Variant, analog, concentration %	n	% of ♂♂ engaging in copulation during 30 min.
Canton-S	-	control	86	84 ± 4.0
	III	Entacon, 20	128	81 ± 3.5
LA	-	control	1049	12 ± 1.1
	I	Entacon, 4	122	33 ± 4.2
	I	" 20	129	16 ± 3.2
	II	" 4	265	15 ± 2.1
	II	" 20	158	29 ± 3.6
	III	" 4	107	28 ± 4.3
	III	" 20	158	25 ± 3.4
	III	Altozid, 10	122	25 ± 3.9

I - white prepupae (98 hrs after hatching)
II - middle pupae (130-140 hrs after hatching)
III - old pupae (165-170 hrs after hatching)

Table 2. Effects of JH analogs on female mating activity of D. melanogaster.

Line	Stage	Variant, analog, concentration %	n	% of ♀♀ engaging in copulation during 30 min.
Canton-S	-	control	159	84 ± 2.9
	III	Entacon, 20	118	83 ± 3.4
LA	-	control	147	48 ± 2.9
	I	Entacon, 4	77	47 ± 5.7
	I	" 20	91	55 ± 5.2
	II	" 4	117	52 ± 4.6
	II	" 20	108	45 ± 4.8
	III	" 4	141	55 ± 4.2
	III	" 20	142	72 ± 3.8
	III	Altozid, 10	76	59 ± 5.5
L,y ct	-	control	207	24 ± 2.3
	III	Entacon, 20	128	66 ± 4.6

Table 1 shows that mating activity in the LA line is normally quite low--only 12% of treated imago males engaged in copulation in the half-hour test period. Seven times as many Canton-S males mated in the test period. A treatment with JHA resulted in increasing mating activity in LA but not Canton-S males. The most sensitive stage of treatment was pharate adults.

Females of the LA line also have lower mating activity than Canton-S despite the fact that the line was selected only for low mating activity in males. This trait is also very low in L,y ct flies, suggesting that genes responsible for the effect reside on the proximal part of the X-chromosome. JHA application stimulated mating activity in both LA and L,y ct lines (Table 2).

Our experiments show that mating activity can be stimulated by JHA in both males and females of a low mating activity strain.

Since the cytology of the corpus allatum is abnormal in LA strain and since JHA increased mating activity, we conclude that JH is the regulator of mating activity in Drosophila.

References: Engelmann, F. 1970, Physiology of Insect Reproduction, N.Y.; Kaidanov, L.Z. 1978, XIV Intern. Cong. Gen., Symposia 91-92; Sapunov, V.B. and L.Z. Kaidanov 1977, Vest. Leningrad Univ. 15:135-142 (Russ.)

Semjonov, E.F. and A.F. Smirnov. Dept. of Genetics & Breeding, Leningrad State University, USSR. Somatic synapsis of D. melanogaster chromosomes.

Studies on chromosomal synapses were carried out in neuroblasts of third instar larvae. Flies of Canton-S were used, and also stocks with pericentromeric heterochromatic deletions of chromosome 2 (Hilliker 1975; Hilliker and Holm 1976). Chromosome preparations were made without colchicine and hypotonic treatment. The slides were stained by the C-banding method (Patkin et al. 1978). Tight synapses of homologous chromosomes have been discovered in hetero- and euchromatic regions during interphase-mitosis (prophase-anaphase). The chromocenter-like structure has been shown for heterologous heterochromatic regions until anaphase. The disturbing influence of cochicine and hypotonic treatment has been noted in relation to somatic synapsis of chromosomes (Semjonov and Smirnov 1979). There were tight homologous synpases of chromosome 2 in Df(2R)MS-2^{10}/+, Df(2L)C'/+, Df(2R)MS-2^{10}/Df(2L)C' and In(2LR)SMI/+. However, the frequency of intimic heterozygous SMI inversion of chromosome 2 increased synapses