Tobari, I. National Institute of Radiological Sciences, Japan. Effects of temperature on the pre-adult viability of lethal heterozygotes in D. melanogaster.

With the aim of clarifying the mechanism through which deleterious genes are retained in natural populations, viabilities of heterozygotes for lethal genes were examined under different temperatures.

Three hundred fifty-five second chromosomes were extracted at random from a laboratory population which had been kept in a constant temperature room at 25°C for about one year before the experiment. Cy/Pm viability test showed that of these 355 chromosomes 15.5 percent were lethal, 8.7 percent semi-lethal, 9.9 percent subvital and 65.9 percent normal. The allelic rate of the lethal chromosomes was 8.8 percent and the number of nonhomologous lethal chromosomes was 24.

Pre-adult viabilities of lethal heterozygotes relative to normal heterozygotes were tested at three different temperatures (17°C, 25°C and 29°C) by using the 24 lethals obtained and 31 normal chromosomes taken at random. Every lethal chromosome was tested in combination with 10 different normal chromosomes. The testing scheme employed is as follows:

P	Cy/l_k♀♀	N_i/N_i	Cy/N_j♀♀	N_i/N_i
F_1	Cy/N_i	l_k/N_i	Cy/N_i	N_j/N_i
Frequency	$(1-q)$	q	$(1-q')$	q'

1: lethal chromosome N: normal chromosome
k = 1,2, ···· 24. j = 1,2, ···· 15. i = 1,2, ····10.

The relative viability (v) of a lethal heterozygote is estimated by $q(1-q')/q'(1-q)$ and the selection coefficient for viability by 1-v.

The mean selection coefficients obtained for 17°C, 25°C, and 29°C were 0.0245, 0.0253 and - 0.0148 respectively. These figures indicate that lethal heterozygotes are at a selective disadvantage at 17°C and 25°C, but they are selectively favoured at 29°C on the average.

From the result of analysis of variance for selection coefficient, it can be seen that the effect of temperature is significant at the 5% level. The effect of interaction between lethals and temperatures is also significant. These results show that the degree of dominance of lethal genes are highly dependent on the temperature at which flies are cultured.

Nagle, James J. North Carolina State. Studies on experimental sympatry between two sibling species.

The effects of experimental sympatry involving the sibling species D. arizonensis and D. mojavensis baja were studied. Five population cages were analyzed. Cages 1 through 4 were initiated with equal numbers of males and females of both species. Cage 5 was initiated with male and female interspecific F_1 hybrids. Cages 1, 2, and 5 were analyzed cytologically using salivary gland chromosomes, and Cages 3 and 4 were analyzed by use of mutant eye markers.

In Cages 1 through 4 both species coexisted for the duration of the experiment (approximately 11 generations). Only in Cage 1 did a trend toward replacement seem imminent. The dominant species was baja, which represented 90.8% of the population.

Interspecific F_1 hybrids and recombinant backcross types were produced in low frequencies in the mixed populations, even though a choice of mates was available. However, a hybrid swarm was not produced. This is attributed to a lack of luxuriance in the hybrids. Hence, a non-coadapted hybrid complex was in competition with the coadapted complexes of the parental species. This non-coadapted hybrid complex obviously had a lower adaptive value than either parental complex.

In Cage 5 a "hybrid" population flourished for more than 12 generations. It is hypothesized that heterosis exists in certain recombinant types which, once formed, constitute the initiators of a hybrid swarm such as that demonstrated by Mettler (1957) using different races of the same two species.

Sterility and semi-sterility were found to exist among the males of F_1 hybrids. This reduced reproductive capacity is no doubt a contributing factor to the low adaptive value of the hybrids when they are competing with the parental species.

It is further hypothesized that the heterosis which would lead to the production of a hybrid swarm is functional only in those recombinant types which do not also contain poorly adapted combinations in other parts of the genotype (such as factors affecting fertility). As a result, the probability of obtaining "good" male and female recombinant types in a population consisting predominantly of the parental species is very low. This is thought to be due to (1) the low frequency of interspecific hybrids (2-3% of the population), (2) the low adaptive value bestowed upon these types by their non-coadapted gene complex, and (3) the greatly reduced fertility of hybrid males.

Thus, a reproductive barrier exists between the parental species beyond the one dealing with the initial production of F_1 hybrids. If the second barrier (production of highly fit heterotic recombinants) is hurdled, the production of a hybrid swarm, or more correctly an introgressed population, would result.

Paik, Y. K., and J. S. Geum. University of Texas. Distribution of natural lethal genes on the second chromosome of D. melanogaster.

Twenty-nine lethal genes extracted from Korean natural populations were localized by use of three recessive marker genes. The distance between marker genes and lethal genes was adjusted by Kosambi formula. The results are as follows:

Collection	Non-allelic loci	Distribution		
		Left	Middle	Right
S62	17	4	11	2
K62	12	2	5	5

It can be seen that the lethal genes of S62 population are distributed in the central region (X^2 = 10.0, d.f. = 2, P = 0.01 - 0.001). However, the lethals of K62 population seem to be randomly distributed (X^2 = 1.5, d.f. = 2, P = 0.3 - 0.5).

Browning, L. S., and E. Altenburg. University of St. Thomas, Texas. A comparison of the sterilizing effect of X-rays, quinacrine mustard and azaserine on Drosophila males.

Males of Muller's Maxy stock were treated with X-rays, quinacrine mustard and azaserine and individually mated (in vials) to Maxy females (2 to 3 per male). The males were transferred to new food vials with fresh virgins every third day for several such broodings. The dose of X-rays was 3000r or 5000r and that of the quinacrine sufficient to give a 2 to 3% lethal rate in mature sperm. The azaserine was weakly mutagenic (about 1% lethal inducing). In the present experiments, the X-rays produced a drastic drop in fertility in the third brood (8-10 days after treatment) from which there was a large measure of recovery in the fourth brood. In the case of chemical treatments, there was no such definite brood pattern. The effect of the three agents on the fertility of the Maxy males is shown in the following table:

Agent	Brood (and days)	No. ♂♂	No. Fertile Cultures	Percent
X-rays	1 (1-4)	793	739	93
	2 (5-7)	748	633	85
	3 (8-10)	712	208	29
	4 (11-14)	635	470	74
Quinacrine	1	721	332	46
	2	507	201	40
	3	279	127	46
	4	191	109	57
Azaserine	1	432	241	55
	2	388	237	61
	3	252	202	80
	4	214	74	35