Sobels, F.H. University of Leiden, The Netherlands. The viability of II-III translocations in homozygous condition.

For insect irradication programs, the possible advantage of partial sterility resulting from translocations (over complete sterility, as achieved by the sterile male technique) are now being considered. Since in these species, inversions for balancing translocations are not readily available, large scale breeding of individuals with translocations depends on their homozygous viability. With the exception of Ytterborn's (DIS 45:158, 1970) data, little is known about the viability of translocations in homozygous condition.

For that reason homozygous viability of a number of translocations that had been obtained in experiments on the interaction of breaks induced in different stages of spermatogenesis was determined. Males heterozygous for a II-III translocation and the markers bw and st p^p were mated to females of the genotype yw^- spl sn^2;Lyu/TM3 Sb Ser. The presence of p^p in TM3 enabled recognition of the desired genotypes, so that flies heterozygous for the translocations and the third-chromosome balancer could be mated to each other. In total 256 different translocations were tested, out of which only 135 could be bred through the successive generations required for the test. Out of these, 84, that is 62.2%, were lethal when homozygous. The weighted mean for the induced translocation frequency in these experiments was 7.0%. On the basis of earlier results (Sobels, Mutation Res. 8:111, 1969) this translocation frequency would correspond to 7% recessive sex-linked lethals, and it is assumed that about four times as many lethals are induced in the major autosomes. This would mean then that about 28% of the lethality can be attributed to recessive lethals in the second and third chromosomes and little over one half of the total lethality observed, results from the translocations per se. This observation suggests that either deletions, or breaking up the contiguity of gene clusters or linked genes and relocating them to different sites, results in some kind of recessive lethal position effects (Muller and Altenburg, Genetics 15:28, 1930). These findings correspond remarkably well to those obtained by Ytterborn after an exposure of sperm to 2000 R, which induced a comparable frequency of translocations as observed in our experiments. Ytterborn noted that out of 35 translocations, 66% were lethal in homozygous condition. Assuming that 27% results from recessive lethals, 53% of the total lethality can be ascribed to that of translocation per se.

For the possible applications of induced translocations it is of interest to conclude that at doses inducing 6.5 - 7% II-III translocations, about 53% are sufficiently fertile to be of further use and that out of these roughly 36%, or about one fifth of the total number of induced translocations, are viable in homozygous conditions.

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Miklos, G.L.G.* University of California, San Diego, La Jolla, California. Properties of males homozygous for Segregation-Distorter.

There are a number of potentially interesting problems associated with SD/SD males which have not been reported on in the past. They are presented here in case they merit sufficient interest for further pursuit by others.

1. Segregation ratios from X/y^+Y;SD-72/SD bw males. It has been found on two separate occasions that this genotype yields high recoveries of the y^+Y chromosome. The SD-72 chromosome is a standard highly distorting element used routinely, and SD bw is a highly distorting derivative of SD-72 obtained by recombination between SD-72 and cn bw. The y^+Y is also a standardly used chromosome which possesses L(L)J1$^+$ y^+ac^+ and In(1)sc^8 heterochromatin. The X's used here were structurally normal run of the mill chromosomes from shelf stocks.

The recovered gametic arrays obtained from X/y^+Y;SD-72/SD bw, X/Y;SD-72/SD bw and X/y^+Y; SD-72/In(2LR)Cy males raised at 25 and 18 degrees are shown in Table 1. At 25 degrees, the recoveries of the y^+Y in two different experiments were 0.68 and 0.72. These findings could perhaps be dismissed without much introspection were it not for the following: the original experiment was repeatable; the X chromosomes used in the two experiments were from different laboratory stocks; the same genotype was constructed using different crossing programmes; the tester females in the second experiment were of a different genotype to those in the first;

the abnormally high recoveries of the y^+Y were abolished at 18 degrees, and a high recovery of the Y was not observed in X/Y;SD-72/SD bw males.

From Table 1 it can be seen that a non-distorting X/y^+Y;SD-72/In(2LR)Cy genotype does not produce abnormal gametic arrays at 25 or 18 degrees, the recoveries of the y^+Y being 0.53 and

Table 1. Gametic arrays from homozygous SD males.

Genotype	X;SD-72	X;SD bw	y^+Y;SD-72	y^+Y;SD bw	Total progeny	Temperature
X/y^+Y;SD-72/SD bw	0.16	0.16	0.31	0.37	1573	25°
X/y^+Y;SD-72/SD bw	0.15	0.13	0.37	0.35	1377	25°
X/Y;SD-72/SD bw	0.24	0.21	0.29	0.26	916	25°
X/Y;SD-72/SD bw	0.22	0.24	0.27	0.27	6273	25°
X/y^+Y;SD-72/DS bw	0.25	0.30	0.23	0.22	3083	18°
X/Y;SD-72/SD bw	0.31	0.28	0.20	0.21	3256	18°
Genotype	**X;SD-72**	**X;Cy**	**y^+Y;SD-72**	**y^+Y;Cy**	**Total**	**Temperature**
X/y^+Y;SD-72/Cy	0.22	0.25	0.25	0.28	5012	25°
X/y^+Y;SD-72/Cy	0.24	0.28	0.24	0.24	6246	18°

0.48. Similarly, in the X/Y;SD-72/SD bw case, the recoveries of the Y are 0.55 and 0.54. At 18 degrees, the recoveries of the y^+Y and the Y are slightly depressed, and are at 0.45 and 0.41 respectively.

The combined results of these experiments indicate that it is quite possible to produce abnormal gametic recoveries by combining two bivalents each of which alone yields gametic recovery ratios near one to one. Furthermore, whatever causes the observed perturbations, utilises in some way the genetic material from the X chromosome which is present on the tip of the y^+Y. The y^+Y element in certain situations, thus possesses properties not expected from an inocuous marked Y. Whether this phenomenon occurs with other marked Y derivatives remains for future investigations.

2. Progeny to sperm ratios from SD bw/SD bw males. Progeny to sperm ratios from SD/SD^+ males have been extensively treated in the literature and arguments concerning the efficiency of sperm usage by the female, selection of sperm by the female and the presence or absence of different sperm types in an ejaculate has provided the basis for much discussion.

These experiments were designed to answer the question of whether dysfunctional sperm were present in an ejaculate. SD bw/In(2LR)Cy individuals were mated to each other, and SD bw /SD bw and SD bw/In(2LR)Cy sibs were produced and kept as virgins for 3 days and then mated singly to a y female. All matings were monitored and upon separation of partners the males were removed by suction and most were discarded. Some were retained and dissected to check for their residual sperm content. Half the females were dissected after 3 hours or so and the sperm heads stained and counted under phase optics. The remainder were allowed to lay eggs with several accompanying changes of food in order to minimise larval crowding.

The results are shown in Table 2. Experiment 1 depicts the results of a small pilot experiment in which SD bw/SD bw males were mated to cn bw/cn bw females. Although the average

Table 2. Progeny to sperm ratios from SD bw/SD bw and SD bw/In(2LR)Cy males.

	Genotype	Sperm/ Female	No of Females Dissected	Progeny/ Female	No of Females Tested	Progeny/ Sperm	Genotype of Female
Exp 1	SD bw/SD bw	144	9	4.5	8	0.03	cn bw/cn bw
Exp 2	Sd bw/SD bw	120	49	1.4	54	0.01	y/y
	SD bw/In(2LR)Cy	365	47	263	43	0.72	y/y

number of sperm transferred and stored was large, the number of resultant progeny was very low by comparison. An over-whelming proportion of the ejaculate consisted of dysfunctional sperm. The females were dissected at the end of their egg laying period and less than 5 percent of originally transferred sperm had been retained. Dissection of the males revealed that they too contained sperm.

Experiment 2 shows that the progeny to sperm ratio from SD bw/In(2LR)Cy males mated to

y/y females is 0.72. Hence the female could be utilising sperm with an efficiency near 70 percent. However, the ratio from homozygous SD bw fathers is 0.01, and if the efficiency of sperm usage remains unchanged, then most of the ejaculated sperm are dysfunctional.

This is in contrast to the results from SD/SD$^+$males for the following reasons. It is known that the lifetime productivity of SD/SD$^+$ males is about half that of SD$^+$/SD$^+$ controls and that the progeny to sperm ratios from these two genotypes are similar. If it is assumed that the efficiency of sperm usage is female determined and is constant between SD/SD$^+$ and SD$^+$/SD$^+$ males (as indeed seems to be the case), and if females use sperm of different genotypes at random, or nearly so, then an SD/SD$^+$ male must transmit mainly SD sperm, in order to satisfy the above experimental data. That this is in fact the case is known from the work of Tokuyasu, Peacock and Hardy (in prep) who have demonstrated that much sperm breakdown (of the SD$^+$ class presumably) occurs within the male, and consequently most ejaculated sperm are SD bearing.

The results that most ejaculated sperm from SD/SD$^+$ males are nondysfunctional, whereas most sperm from SD bw/SD bw are dysfunctional need not necessarily be at variance with each other. A probable explanation may be that when the proportion of dysfunctional sperm in a male is very high, as is the case in SD/SD males where almost all sperm are destined to be dysfunctional, the mechanisms for sperm retention become inefficient, and dysfunctional sperm become included in the ejaculatory contents. The males are literally unable to contain themselves.

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Morphological differences between a pair of sibling species - melanogaster and simulans.

Adults of these two species are morphologically very similar, adult females cannot be distinguished from each other while adult males may be differentiated on the basis of external male genitalia. The posterior process of the genital tergite is rounded in simulans and hook-shaped in melanogaster (Sturtevant, 1920, Genetics 5: 488). Current investigations reveal that pupae and third instar larvae of both the sexes in these two sibling species can be distinguished from each other in several respects. (1) Pupal pigmentation: The pupae of simulans are more heavily pigmented than those of melanogaster. Pupae of simulans appear moderately brown while those of melanogaster only lightly brown. (2) Setae: The two species can be differentiated both on the basis of distribution and size of the setae. Setae were examined on the dorsal side of the pupae. As the outer pupal case is identical with the cuticle of the last larval instar, the following description holds for the third instar larvae. Each segment is incompletely divisible into an anterior part and a posterior part by a system of ridges that run across each segment. The partition separating the anterior and posterior parts shifts posteriorly as it approaches the mid-dorsal line. This posterior shift is in general more pronounced in melanogaster than in simulans. Most of the setae are present in the posterior part and all are pointed posteriorly. The setal band is broader laterally and narrower medially. The narrowing of the setal band is more pronounced in melanogaster. Few setae are present in the anterior part and they appear to be directed randomnly. More setae are present in the anterior part of the simulans than in that of melanogaster. Regarding size, setae in simulans are distinctly larger than those in melanogaster. (3) Intersegmental groove: This also was examined in the pupae. The walls of the groove are thicker in simulans, while the space in the middle is wider in melanogaster.

F_1 pupae (both males and females) obtained in crosses between the two species are more like simulans pupae. To see if mutations affecting bristle morphology in the adult also affect setae in the larva, spineless (ss) pupae were examined. The setae are rudimentary. Setal morphology is now being examined in other groups of sibling species and in other bristle mutants. Setal patterns in melanica and robusta are different from each other and from that in melanogaster. Setal morphology can, therefore, be a useful character in systematics.