Table 1. Results of scintillation count of DNA isolated from the larval salivary gland of giant Drosophila melanogaster.

POSITIVE ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TIME (min.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GREEN CPM	52	63	175	108	44	37	49	51	44	52	63	37	23	72	140

Since lysis has been carried out in a neutral non-denaturing buffer and great care has been taken to avoid artefactural shearing, we have good reason to believe that the second peak corresponds to nascent DNA.

Reference: Lönn, U. 1980, Chromosoma 77:29-40.

Eggleston, P. University of Liverpool, Great Britain. Correlation in the induction and response of SF and GD sterility.

The occurrence of specific genetic aberrations in the progeny of certain outcrosses in Drosophila melanogaster is well documented. The abnormalities, which include reduced egg hatchability (SF sterility) and reduced egg production (GD sterility) have been referred to collectively as "hybrid dysgenesis." It has been argued that two independent interactive systems contribute to the hybrid dysgenesis syndrome (Kidwell 1979). These are the I-R system (usually detected by the presence of SF sterility) and the P-M system (usually detected by the presence of GD

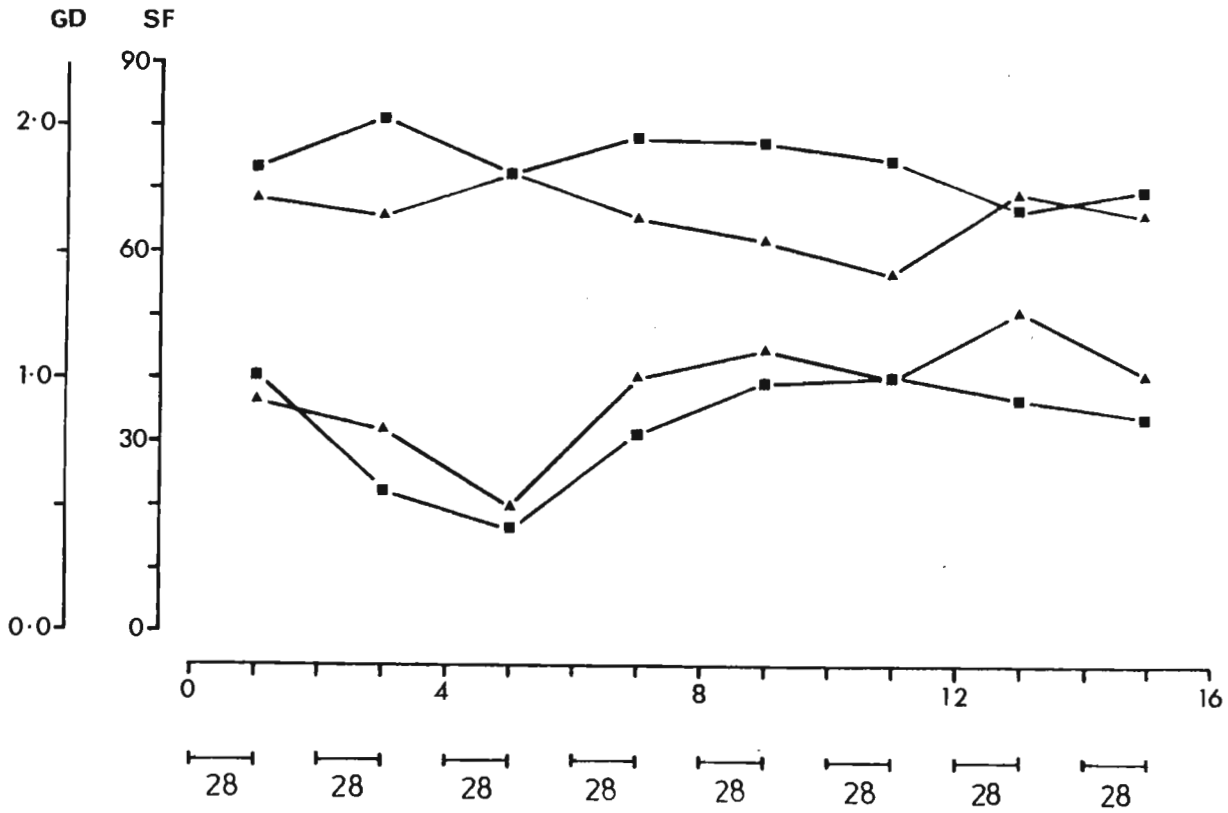

Fig. 1. Mean percentage egg hatchability or SF score (■) transformed to angles and mean egg production or GD score (▲) transformed to square roots of the number of eggs laid per female per hour for both Cross A and Cross B. The x-axis shows developmental age at 18°C and the onset and duration of the 28°C pulse treatments is indicated by the black bars.

sterility). The two systems as described, however, have remarkable similarities and there is experimental evidence to suggest that any apparent independence may well be an artefact of the measurement techniques used (Eggleston & Kearsey 1980).

Dysgenic traits tend to occur in only one of a pair of reciprocal crosses, namely that in which the female carries a specific cytoplasmic state which mobilises a family of genetic elements present within the male genome (Cross A). The subsequent transposition, excision and integration of these inducing elements is thought to be resposible for the various aberrations observed in the progeny. The reciprocal cross (Cross B) produces normal progeny. It is generally held that all dysgenic traits display a sensitivity to developmental temperature in that their expression is negligible at 18°C but maximised at about 28°C. The following experiment reveals a strong correlation in the induction of SF and GD sterility and in their response to changes in developmental temperature. The extent of this correlation suggests that the two traits are causally dependent.

Reciprocal crosses were made between a marker stock known to have a reactive cytoplasm (y bw st (A)) and a wild type inbred line from the Texas population (TEX 1) which was known to carry inducing elements. Approximately 10,000 eggs were collected from the parents of each cross over a period of a few hours in order to maximise developmental synchrony. These were transferred at a density of 100 per vial to 80 vials for each of Cross A and Cross B. All 160 vials were individually randomised and incubated at 18°C. Every two days, 10 replicate cultures were sampled from each cross and placed at 28°C for 24 hours. Afterwards they were returned to complete their development at 18°C. Each culture received only one pulse treatment so that eventually, for each cross, eight sets of 10 replicate cultures had been subjected to a 28°C treatment at successive developmental stages. The effect of this high temperature pulse on sterility induction could therefore be monitored throughout the life cycle. Upon emergence, the female progeny were assessed for egg production and hatchability as described by Eggleston & Kearsey (1980).

The response of each cross is shown in Figure 1 where mean egg hatchability (SF score) and mean egg production (GD score) are plotted against the developmental age at which the 28°C treatment was administered. As might be expected, the developing Cross B progeny were unaffected by exposure to high temperatures, returning an overall mean hatchability of 92.7% and an overall mean egg production of 2.69 eggs per female per hour. An analysis of variance revealed no significant differences between the eight sets of Cross B progeny for either trait (Table 1a,b). The response of the developing Cross A progeny, however, is evident from the substantially reduced SF and GD scores (Figure 1). It can be seen that the 28°C treatment brings about a clear reduction in the Cross A egg production and hatchability regardless of the developmental stage at which it occurs. Certain stages, however, particularly the early larval stages (days 1-5), have a higher sensitivity as indicated by the greater depression in SF and GD scores. This increased sensitivity is maximal towards the end of the second larval instar (day 5) after which it declines, resulting in a slight increase to both hatchability and egg production. Differential sensitivity throughout the life cycle is reflected in the analysis of variance which reveals highly significant differences between the eight sets of Cross A progeny for both SF and GD score (Table 1a,b).

Table 1. (a) Analysis of variance of the SF scores. The percentage egg hatchability for each replicate culture was determined from a sample of 25 eggs.
(b) Analysis of variance of the GD scores. The egg production of each of the replicate cultures was scored on two occasions.

			Cross A			Cross B		
	Item	df	MS	F	P	MS	F	P
a)	Between Sets	7	806.64	7.30	<0.001	224.68	2.04	>0.05
	Within Sets	72	110.54			109.91		
	Total	79						
b)	Between Sets	7	1.11	7.16	<0.001	0.30	1.71	>0.05
	Between Occ.	1	0.57	3.66	>0.05	0.03	0.15	>0.05
	Sets x Occ.	7	0.07	0.44	>0.05	0.23	1.33	>0.05
	Error	144	0.15			0.17		
	Total	159						

Perhaps the most striking feature of this experiment is the extraordinary similarity in the observed SF and GD scores for Cross A throughout the life cycle. The correlation between the two characters is strong (r=0.82) suggesting that, on average, 67% of the GD variance is directly dependent on the variation among SF scores (r^2=0.67). The correlation would be even stronger if the sharp increase in egg production seen during the pupal phase (days 11-13) could be excluded. This increase in egg production is not matched by an increase in hatchability and a similar effect has been reported previously (Eggleston & Kearsey 1980). It seems likely that this phenomenon is due to a temperature shock occurring during meiosis. Such shocks are known to increase both recombination and DNA replication (Grell 1972) and this may result in an increased egg production. This effect would appear to be independent of the hybrid dysgenesis syndrome since it occurs to an equal extent in the developing Cross B progeny. The results of this and similar experiments reveal a remarkable similarity in the response of SF and GD sterility to changes of developmental temperature. Such a degree of similarity would be unlikely to occur if the two traits were under independent genetical control. It may well be that SF and GD sterility and therefore I-R and P-M hybrid dysgenesis are, in fact, causally dependent and that the same nuclear-cytoplasmic interaction is responsible for all of the dysgenic traits which can be induced in a cross of this kind.

References: Eggleston, P. & M.J.Kearsey 1980, Heredity 44:237; Grell, R.F. 1972, Genetics 73:87; Kidwell, M.G. 1979, Genet.Res. (Camb.) 33:205.

Ehrman, L. and D.Baumann-Meringolo. State University of New York, Purchase, New York USNA. Courtship followed by rare D.pseudoobscura male matings.

To determine if the rare male advantage (observed in eight species of Drosophila [see Ehrman & Probber 1978; Meringolo et al. 1982]) is the result of the females' preference for males of a type different from tnat by which they are first courted (Spiess & Schwer 1978; Spiess 1982) D.pseudoobscura of the CH and AR strains were tested. (These are highly inbred and were originally reported by Ehrman et al. 1965.)

A profoundly modified direct observation mating chamber was used; the chamber is divided into two equal compartments by a removable, rotatable barrier made of fine wire mesh. Groups tested were of the following composition: 13 females plus 39 males--13 minority and 26 majority types. Males were marked (in half of the groups the rare type was marked, and in the other half, the majority type male was marked) by placing a small drop of white liquid paper on the dorsal thorax. First, with the barrier in place, the 13 females plus 13 males (either rare or majority) were placed in one half of the chamber, with the remaining 26 males in the other half of the chamber. The males were allowed to court but not to mate. After 15-20 min, the barrier was removed, all the files were allowed to mingle, and matings were scored (Table 1).

Table 1. Type of D.pseudoobscura male preferred when females were courted by rare type first, and when females were courted by majority type first. (NM = no mount) (Within each group of females tested, half the time the rare males were CH and half the time they were AR males.)

AR Females		
AR female w/rare males first, then majority introduced:		
AR x rare	33	31.7%
AR x majority	49	47.1
NM	22	21.2
AR female w/majority males first, then rare introduced:		
AR x rare	35	33.7%
AR x majority	41	39.4
NM	28	26.9

CH Females		
CH female with rare males first, then majority introduced:		
CH x rare	29	27.9%
CH x majority	55	52.9
NM	20	19.2
CH female with majority males first, then rare introduced:		
CH x rare	31	29.8%
CH x majority	51	49.0
NM	22	21.2