Dyer, K. F. M.R.C. Radiobiological Research Unit, Harwell, Berkshire U.K. Crossing over adjacent to the centromere on the second chromosome of Drosophila melanogaster.

Position effect phenomena in Drosophila have been fairly well documented but synthetic lethals and related effects are still largely unexplained. The possible occurrence of synthetic lethals and sterility effects in connection with crossing over in centromeric heterochromatin on the second chromosomes might therefore be of some interest.

The following information was gathered during the construction of a multiply marked second chromosome and involves the loci purple 54.5, light 55.0, straw 55.1 lightoid 56.0 and cinnabar 57.5. Centromeric heterochromatin is generally considered to include light, straw and possible lightoid.

1. The construction of homozygous pr lt. This stock was constructed twice and on each occasion the stock exhibited the light phenotype, the females were sterile and both males and females showed reduced viability. The hybrid between the two stocks exhibited the same characteristics.

2. The construction of homozygous lt stw. The stock of this construction synthesized at Harwell is lethal and carried as heterozygous with Cy. When lt stw from Pasadena was crossed with our own stock fully fertile and viable flies resulted.

3. pr lt/lt stw. These flies, which show the normal lt phenotype are of somewhat reduced viability and are female sterile. This is a strong suggestion that crossing-over has been responsible for the induction of sterility since normally, of course, lt/lt females are fully fertile.

4. pr lt ltd cn/pr lt ltd cn. When homozygous, ltd cn is a perfectly normal combination, but when attached to the pr lt stock it does not alter the female sterility although the viability is significantly improved; as shown by the following experiment.

Flies of genotypes pr lt/Cy and pr lt ltd cn/Cy were collected and aged for 5 days. One female and five males were put in 1/2 pint bottles. The parents were removed after 4 days and then all hatching flies were counted.

Day	pr lt	pr lt	Cy
1	-	-	68
2	1	-	37
3	-	-	67
4	4	1	56
5	2	1	74
Total	7	2	302

Day	pr lt ltd cn	pr lt ltd on	Cy
1	27	21	132
2	15	7	145
3	27	15	91
4	26	17	167
5	21	11	103
Total	116	81	638

Eight separate stocks of pr lt ltd cn and all possible crosses were set up but the offspring in all cases remained female sterile.

The importance of the centromere in crossing over as more than just a negative factor is becoming apparent and the functions of the heterochromatin adjacent to the centromere are also becoming more clearly defined. The inconsistency of the present results i.e., the viable and fertile lt stw stocks lethality, sterility and partial compensation of inviability by crossing over between lt and ltd might indicate the delicate system of nucleic acid synthesis. The slight increases or decreases of heterochromatin due to non-reciprocal crossing over might make important changes in the feed back system envisaged by Schultz (1956).

Reference: Schultz, J. Cold Spring Harb. Symp. Quant. Biol. XXI 307-328 1956.