Taylor, William C. University of Chicago, Chicago, Illinois. Somatic crossing over in $sc^{4L}sc^{8R}$ heterozygotes.

Experiments were undertaken to study mosaic spots produced by somatic crossing over in y $sc^{4L}sc^{8R}/sn^3$ females. Several stocks were maintained as separate lines, each arising from one pair of parents. Stock males were tested for the presence of extra Y-chromosomes by pair-mating a sample to attached-X, no free Y females. Samples of females scored for mosaics were also tested for the presence of extra Y-chromosomes by mating to attached XY, no free Y males; no evidence of extra Y-chromosomes was found in either case. Cytological tests failed to show any extra Y-chromosomes, but did show X-chromosomes which looked like the $sc^{4L}sc^{8R}$ chromosome.

Forty-five abdomens from females which had been irradiated with 1200 R at various stages in development (36-90 hours after egg laying) were scored for single y, single $sn^3$, and y-$sn^3$ twin spots. A second experiment used 104 females from a different line not irradiated during development. The results were:

$ysc^{4L}sc^{8R}/sn^3$--frequency of spots/abdomen

| | twin spots | single y | single $sn^3$ |
|---|---|---|---|
| 45 irradiated females | .49 | 2.8 | 1.2 |
| 104 non-irradiated females | .05 | 1.4 | .53 |

In both experiments there were more than twice as many single y spots as single $sn^3$ spots. One would certainly not expect such a result, as the y $sc^{4L}sc^{8R}$ chromosomes lacks all of the centric heterochromatin with the nucleolus-organizer, thus being unable to carry out ribosomal-RNA synthesis (see Ritossa and Spiegelman, Proc. Nat. Acad. Sci. 53:737-745, 1965, for the localization of the r-RNA loci in D. melanogaster). Simple proximal heterochromatic exchange cannot alone explain these results. Part of the excess of y over $sn^3$ can be due to the fact that $sn^3$ is not completely expressed; Brown (unpublished, in Brosseau, J. Exp. Zool. 136:585, 1957) found phenotypically normal bristles on homozygous $sn^3$ abdomens. When only single spots with more than one bristle in each were counted, there were 24 y and 25 $sn^3$ in the irradiated group, with 17 y and 9 $sn^3$ in the non-irradiated group. Thus, the entire excess of y in the irradiated group and some of the excess in the non-irradiated group was due to single spots of only one bristle. Another possibility which might account for the excess of single bristle y spots is the fact that a single exchange within the inversion loop to the right of sn would produce a dicentric chromosome deficient for the y locus. If this exchange occurred in the division just before bristle synthesis, there is a 50% chance that both centromeres of the dicentric would go to the same pole and produce a y bristle.

The next logical step would have been to switch the y and $sn^3$ markers. However, it is not possible to separate y from the $sc^{4L}$ break. The $sn^3$ marker was introduced into the inversion and 100 y $sc^{4L}sc^{8R}sn^3/$ + + + females (non-irradiated) were scored for single y $sn^3$, single y and single $sn^3$ spots.

y $sc^{4L}$ $sc^{8R}$ $sn^3$/+++-- frequency of spots/abdomen

| | single y$sn^3$ | single y | single $sn^3$ |
|---|---|---|---|
| 100 non-irradiated females | .35 | .26 | .23 |

A simple exchange in proximal heterochromatin would result in single y $sn^3$ spots, at a frequency roughly comparable to single y or single $sn^3$ spots in the previous experiments. A single $sn^3$ spot requires that a two-strand double euchromatic exchange take place. However, if the distal sections of heterochromatin pair, one of the exchanges could take place here, leaving only one exchange which must take place in euchromatin between y and $sn^3$. The most logical explanation for single y spots is that they are the reciprocal product of the double exchange which produced the single $sn^3$ spots. This hypothesis is further substantiated by the fact that the frequencies of single y and single $sn^3$ spots are almost identical, .26 and .23 respectively.

The y-$sn^3$ twin spots in the two earlier experiments were most likely the result of a single exchange in proximal heterochromatin. If such is the case, the y bristles were formed from cells lacking the ribosomal RNA loci on both X-chromosomes and thus unable to carry out r-RNA synthesis. These data thus allow one to speculate that hypodermal cells may survive for some generations without a capacity for r-RNA synthesis. Many of the y bristles, both in single and twin spots, were of an abnormally small size.