

In summary, the presence of translocations reduced overall single exchange, but multiple exchange was not similarly reduced. In fact, high coincidence values were associated with the presence of a translocation. In addition, in normal samples, coincidental exchange seemed to be more closely associated with directly adjacent regions, in contrast to what has previously been observed. Before definitive statements can be made as to what the above means in terms of mechanism, critical comparisons of double exchange in normal and structurally aberrant populations are needed.

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4. A B-type translocation involving the short arm of chromosome 3.

A new B-type translocation involving the short arm of chromosome 3 was reported last year (News Letter 41:139). The translocation has now been further characterized and can be designated TB-3b.

The segment of chromosome 3 distal to the break carries not only cr_1 and d_1 but also ra_2 . Maize linkage maps usually place ra_2 in the long arm of chromosome 3. Since TB-3b uncovers ra_2 in addition to the 3S markers cr_1 and d_1 , ra_2 appears to reside in 3S instead of 3L.

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5. A translocation complex involving chromosomes 5, 6, and a supernumerary.

Last year it was reported (News Letter 41:139) that the gene pr on the long arm of chromosome 5 appeared to be uncovered by a new A-B translocation. It is now evident that the genes ae , pr , gl_8 , lw_2 , ys_1 , v_2 , and v_{12} are distal to the break and that bt_1 is proximal. Since the gene order is normally given as bt_1 v_3 bv_1 pr , progenies involving v_2 and bv_1 will be tested next summer to locate the breakpoint more precisely.

Preliminary cytological observations indicate the presence of a translocation complex involving chromosomes 5, 6, and a B.

From a cross by pollen from a normal plant, 15 plants were tested for the ability to produce hypoploid sperm (pr test). Eight plants with 60-70% aborted pollen gave about 20% hypoploid endosperms, two plants with 60-70% aborted pollen gave no hypoploid endosperms, and five plants with 10-25% aborted pollen gave no hypoploid endosperms. Therefore, it is still not clear whether the B-type translocation is separable from the remainder of the translocation complex.

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6. Duplications from translocations between homologous chromosomes.

A method for the detection of duplications arising from translocations between homologous chromosomes was presented in a previous issue (MNL 38: 101-105). Further work has been done on this problem.

Twelve possible cases of duplications have been isolated on the basis of genetic evidence. Cytological examinations at pachynema for each of these cases have not revealed any observable buckles which would indicate the presence of a duplication. Either the duplications are too small to be seen or they are not there and the genetic data must be interpreted differently. The genetic data are too involved and incomplete (due to a hailstorm last summer) to be presented here. In general, however, the data conform to theoretical expectations. Gene markers which are on presumptive duplication chromosomes show reduced transmission rates through the pollen.

Theoretically, the frequency of translocations between homologous chromosomes should not be uncommon. Roughly, it should be $(1/n-1)$ times the frequency of translocations between non-homologous chromosomes, where n is the haploid number. This neglects complications arising from different chromosome lengths and different arm ratios. The translocation between homologous chromosomes must involve the same arms if a duplication is to be induced. (If the two arms are different, then two duplication-deficient chromosomes and a pericentric inversion). Since the number of chromosome arms equals $2n$ the frequency with which the desired type of translocation occurs is $(1/2n-1)$ or $1/19$ in the case of maize. Even allowing for the probabilities that one break must be proximal and the other distal to the marker gene if the duplication is to be detected, the observation of duplications does not seem theoretically impossible.

The above discussion rests upon an assumption which is probably not true-- that the chromosomes are randomly arranged in the interphase nucleus. It is known from the work of Longley that there is a correlation between the distances from the centromeres to the breakpoints for the two chromosomes involved in a non-homologous translocation. This is believed to be the result of polarized orientation of the chromosomes brought about by the previous telophase. Presumably, there would be a similar correlation in homologous translocations, in which case the duplications produced would tend to be short ones, and there would be a low probability of a given gene being bracketed by a proximal and distal break.

Furthermore, recent work by Feldman and Mello-Sampayo, and by Maguire suggest that homologous chromosomes tend to be associated with each other during the cell life cycle. It is quite possible that homologous chromosomes tend to lie close together during interphase and consequently are more apt to exchange segments with each other than with non-homologous chromosomes following radiation-induced chromosome breakage. The ratio of homologous translocations to non-homologous translocations would be illuminating. However, the technique for detecting homologous translocations needs more work.

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7. Pollen: a crude enzyme system.

As part of an extensive research program concerned with the biosynthesis of anthocyanin in maize, efforts were made to extract and identify