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1. Location of knobs on the genetic maps of chromosomes 6 and 3.

The long arm of chromosome 6 contains four cytological markers, including a prominent chromomere and three knobs. Some stocks carrying the y allele possess a medium sized knob at the most proximal knob site and plants of this type were crossed with a homozygous $\underline{Y}\ \underline{pg_{11}}$ tester having no knob in the proximal position. The heterozygotes $\frac{y\ Pg_{11}\ K}{Y\ pg_{11}\ k}$ were backcrossed to a $\underline{y}\ \underline{pg_{11}}\ \underline{k}$ stock and 38 plants of various phenotypes were examined for knob constitution. All plants of the backcross progeny were homozygous for $\underline{pg_{12}}$ on chromosome 9, which is necessary for expression of $\underline{pg_{11}}$. The following data were obtained:

(0)	Y pg_{11} k	12
(0)	y Pg_{11} K	6
(1)	Y Pg_{11} K	10
(1)	y pg_{11} k	6
(2)	Y pg_{11} K	3
(2)	y Pg_{11} k	1

The relative frequencies of noncrossovers and crossovers are meaningless since plants with crossover phenotypes were purposely selected. The knob is more closely linked to $\underline{Pg_{11}}$ than to $\underline{Y}$. It cannot lie between the two loci because the postulated singles in (2) would then become doubles. The data are best interpreted as indicating the order: centromere - $\underline{Y}$ - $\underline{Pg_{11}}$ - $\underline{K}$.

The knob on the long arm of chromosome 3 has been placed at 3L.6 and falls between Na and A. In order to obtain a more precise location of the knob with respect to these markers, backcrosses were made as follows:

$$\frac{Lg\ Na\ K\ A}{lg\ na\ k\ a} \quad K1O\ K1O\ ♀ \quad X \quad lg\ na\ k\ a\ ♂$$

In a population of 566, there was 36.0% recombination between Na and A and 2.5% between Lg and Na. The Lg Na a crossovers were classified for presence or absence of the knob by observing preferential segregation of Lg in testcross progenies derived from the cross:

$$\frac{Lg\ Na\ (K)\ a}{lg\ na\ k\ a} \quad K1O\ N1O\ ♀ \quad X \quad lg\ na\ k\ a\ ♂$$

Backcross progenies were obtained from 54 Lg Na a plants. Six of the

progenies gave 1:1 ratios for Lg:lg while the remainder gave frequencies of Lg varying from 57-72%, but all significantly different from a 1:1. The six progenies with 1:1 ratios are presumably derived from plants of $\frac{\text{Lg Na k a}}{\text{lg na k a}}$ constitution resulting from a crossover between Na and K. Progenies with excess Lg came from $\frac{\text{Lg Na K a}}{\text{lg na k a}}$ plants resulting from a crossover between K and A. If all six of the 1:1 progenies trace to Na k crossovers, the frequency of Na-K recombination in the total population would be 36% X 11% or about 4% and the frequency of K-A recombination would be 32%. The presence of K10 K10 in the original backcross may have increased these frequencies above their normal levels. Two of the six 1:1 progenies were borderline cases, whose occurrence would be expected with probabilities of 20% and 30%; if these are eliminated, Na-K recombination becomes 2.5% and K-A would be 33.5%.

The variation in frequencies of preferential segregation of Lg (from 57% to 72%) in the second backcross was greater than expected, even though the 54 populations sampled generally did not exceed 200 individuals. K10 is heterozygous in all cases and the same knob is present; some unidentified factor apparently influenced the rate of preferential segregation. Since preferential segregation occurs only after a crossover between the knob and its centromere, variations in crossing over may be responsible.

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2. The effect of K10 on chromosome breakage and recombination.

In structurally normal bivalents, the enhancement of recombination produced by abnormal chromosome 10 (K10) is restricted to the proximal regions adjacent to the centromere. In general, these regions consist of heterochromatic, deeply staining chromomeres. Crossing over in k10 k10 plants within segments adjacent to centric regions is much lower per unit of pachytene length than in more distally situated euchromatic regions. It was suggested (Rhoades and Dempsey, 1966) that the proximal heterochromatic regions were not as tightly coiled in K10 plants and that this relaxation in coiling facilitated the intimate pairing