INDIANA UNIVERSITY
Bloomington, Indiana

1. A mutant dehydrogenase.

Mammalian tissue shows high lactate dehydrogenase activity and little if any malate dehydrogenase. The opposite is the case in corn. There is little if any lactate but much malate dehydrogenase activity in endosperm and seedling material. In starch gel electrophoresis this activity is found distributed in two major and one minor bands. This note deals with studies on an alcohol dehydrogenase which is found in endosperm and seedling material. The enzyme migrates to the anode at pH 8.5. A mutant form of this dehydrogenase has been found in an su_2 strain of corn but the mutant enzyme and mutant phenotype are independently controlled. The mutant enzyme also migrates to the anode but at a slower rate than the common form. A hybrid dehydrogenase with an intermediate migration rate is formed in heterozygotes. Homozygotes for the common or mutant alleles show only a single band while three dehydrogenase bands are found in the heterozygotes.

The mutant dehydrogenase shows reduced activity in comparison with the common form. In heterozygous endosperm having two doses of the common allele and a single dose of the mutant, the fastest migrating band is the most intense, the intermediate hybrid band is much lighter, and the slow migrating band can hardly be detected. In endosperm from the reciprocal cross, with two doses of the mutant allele, the isozyme pattern is quite different. The fast and slow migrating bands are about equal in intensity and the hybrid band is heavier, giving about a 1:2:1 ratio for the three bands. If the common and mutant alleles were equally active and the enzymes specified by these alleles were also equally active, the three bands formed from random dimerization of the monomers in heterozygous endosperm with two doses of the mutant allele should occur in a ratio of 1:4:4 for the fast, hybrid, and slow migrating bands, respectively. Since the slow band has about the same intensity as the fast band we conclude that either the mutant allele is one-fourth as active as the common allele, or the slow migrating dehydrogenase is only one-fourth as active enzymatically as the fastest migrating dehydrogenase. The former is the favored hypothesis. This dehydrogenase is also found in the very young seedling. In heterozygous seedlings the three bands occur in a 1:2:1 ratio as would be expected from equal activity of both alleles and both enzyme

forms in diploid tissue. It is unlikely that the enzymes formed by the same allele in different tissues have different specific activities, but not impossible. We propose that in the seedling both alleles are equally active but in the endosperm the mutant allele is partially repressed. A similar situation was found for the pH 7.5 esterase when the relative activity of two alleles in different tissues was compared.

Drew Schwartz
Toru Endo

2. Further studies on preferential segregation.

In the 1958 Maize News Letter data were presented showing that the preferential segregation produced in non-homologous chromosomes by abnormal 10 occurred only when there was crossing over between the knob and the centromere to produce heteromorphic dyads consisting of one knobbed and one knobless chromatid. The test referred to above came from plants with a normal chromosome 9 and one in which a piece of 3L had been inserted into 9S between the Sh and Wx loci. The latter chromosome was designated Dp9. Crossing over in the entire length of 9S was found to be greatly reduced when the Dp9 chromosome was heterozygous. When plants heterozygous for Dp9 and abnormal 10 and also heterozygous for the terminal knob in 9S were testcrossed as the female parent, there was a striking reduction in the degree of preferential segregation for the distal Yg_2 marker in 9S compared to that found in sib plants homozygous for normal chromosomes 9. The conclusion was drawn that the formation of heteromorphic dyads via crossing over is an essential antecedent to preferential segregation. That this conclusion is indeed valid is shown by the following experiments involving chromosomes 3 and 9.

The rearranged chromosome 9, (R)9, studied by McClintock (1944) is known to drastically reduce the amount of crossing over in the short arm of 9. The (R)9 chromosome possesses a terminal knob of medium size on its short arm. Plants heterozygous for the (R)9 chromosome and for the wd and wx markers were test-crossed as the female parent. Sib plants with and without abnormal 10 were available. As expected there was an extremely low amount of crossing over between wd-wx in the homozygous kl0 plants and the contrasting alleles for the two segregating loci were each recovered in 50% of the progeny. Although plants heterozygous for a knobbed 9 and a knobless 9 (wd) undergo preferential