

These data confirm the conclusions reached above on the negative correlation between crossover percentages in the two regions and on the dosage effect of additional B chromosomes.

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10. A molecular basis for heterosis.

Recent studies on the kinetic properties of alcohol dehydrogenase isozymes in corn scutella have revealed that the enzyme forms specified by the $Adh^{C(m)}$ and Adh^S alleles are strikingly different. For example, the C^m type isozyme found in $Adh^{C(m)}$ homozygotes shows optimal activity at pH 10.5 and a 10 fold reduction in activity at pH 8.0. On the other hand the S type isozyme formed in Adh^S homozygotes is most active around pH 8.0 and is completely inactive at pH 10.5. $Adh^S/Adh^{C(m)}$ heterozygotes which form both the S and C^m type isozymes show high activity at both pH levels as expected (Table 1). The striking difference between the isozymes is quite surprising in view of the fact that they are specified by allelic genes and do not show preferential dimerization.

Table 1
Units activity/gram kernel

	: pH 8.0	: pH 10.5
Adh^S/Adh^S	: 5898	: 0
$Adh^S/Adh^{C(m)}$: 3399	: 3779
$Adh^{C(m)}/Adh^{C(m)}$: 519	: 5702

The alcohol dehydrogenase system can serve as a model for explaining the phenomenon of hybrid vigor although we have no reason to believe that this particular enzyme is implicated in heterosis. We propose that the intracellular milieu such as pH, ionic strength, chemical composition, etc. is not constant and may vary significantly during growth. Furthermore, we propose that enzymes specified by various alleles of the same gene may have different optima for activity. The enzyme specified by one allele may be active in one environment but relatively inactive in a second, while another allelic enzyme may show the reverse relationship. Heterozygotes which contain both alleles would produce enzymes which are active in either environment. This would be expected to result in hybrid vigor since in such heterozygotes the range of intracellular conditions in which high enzyme activity persists is considerably broadened.

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