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Dominance and overdominance are the two major theories of the cause of hybrid vigor. According to the dominance theory, the vigor of an F_1 hybrid results from the masking of deleterious recessive genes from one parent by their dominant alleels from the other, each parent contributing different recessives and dominants to the hybrid. According to the overdominance theory, the vigor is a direct result of the heterozygosity *per se*. Although both theories are in accord with observed breeding behavior, the heterozygous state is obligatory if overdominance is the genetic mechanism of vigor and the degree of vigor should be proportional to the degree of heterozygosity in the hybrid. Overdominance would thus preclude the establishment of pure-breeding lines as vigorous as the hybrids. If dominant interaction is the mechanism, however, the possibility of obtaining such lines would be raised, although linkage between favorable dominants and unfavorable recessives may make the formation of homozygous lines as vigorous as the hybrids difficult to obtain and hence impractical for agricultural use.

These theories can be tested by a breeding method called convergent improvement, by means of which various inbred lines can be produced that differ from each other only in the proportion of germplasm which they possess in common. Thus, when these inbreds are crossed, their hybrids will have varying degrees of heterozygosity. Using the fruit fly *Drosophila melanogaster* as the experimental animal, and egg productivity as the quantitative characteristic measured, such lines were produced in the laboratory. When these lines were crossed, their hybrids had 12.5%, 75.0%, and 87.5% of their germplasm in common (considering the original F_1, hybrids as 0%). All crosses showed heterotic increases in egg productivity when compared to the parental lines, and all were equal or superior to the original hybrid. Since no correlation between productivity and expected degree of heterozygosity was found to exist, overdominance was rejected as an explanation of the observed hybrid vigor.