

Investigating the Roles of NDJ1 and TID1 in Distributive
Segregation Using Non-Exchange Chromosomes

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TITLE: Investigating the Roles of NDJ1 and TID1 in
Distributive Segregation using Non-Exchange
Chromosomes

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ABSTRACT

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Meiosis is a specialized cell division that leads to a reduction of ploidy in sexually reproducing organisms through segregation of homologous chromosomes at the first meiotic division. Improper segregation of chromosomes during meiosis results in aneuploidy, which is usually fatal during embryonic development. The meiotic process is therefore tightly regulated. Typically, proper segregation of homologs at meiosis I requires pairing of homologous chromosomes, followed by crossover recombination between homologs. Crossovers enable proper chromosomal segregation during the first meiotic division in part by establishing tension in the meiotic spindle. However, in the absence of crossovers, some cells maintain the ability to direct homologous chromosomes to opposite spindle poles, through a poorly understood mechanism known as distributive segregation.

We are using the common brewers yeast *Saccharomyces cerevisiae* to determine possible roles of two genes in distributive segregation. The genes of interest, Ndj1 and Tid1, have been previously demonstrated to play a role in crossover interference, but their roles in distributive segregation are not well understood. Ndj1 has been shown to function in the tethering of telomeres to the nuclear envelope and may aid in the homology search chromosomes undergo. Tid1 has been characterized as a recombination accessory factor and may stimulate crossovers by directing recombinases to double strand break sites early in meiosis. To assay distributive segregation, we use yeast in which crossing over between one chromosome pair is prevented (due to sequence divergence). Using this system, we can assay the ability of yeast to carry out distributive segregation. Our results indicate that mutations in Ndj1 impair the ability of yeast to carry out distributive segregation, while mutations in Tid1 do not affect distributive segregation. These results, in turn, suggest that Ndj1 may play a role in distributive segregation. This experiment is part of a larger question to determine whether crossover assurance and crossover interference are independent mechanisms.

Keywords: meiosis, distributive segregation, nondisjunction, Ndj1, Tid1, yeast.

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