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Analysis of Crossover Interference in Yeast

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Abstract

Meiosis is one type of cell division that produces germ cells. In Meiosis I, the DNA in a diploid cell is doubled and homologous chromosomes separate. In Meiosis II, each pair of sister chromatids are separated, resulting in four haploid daughter cells. The proper segregation of chromosomes is reliant on the homologs pairing up and forming a structure called the synaptonemal complex. This structure holds the two pairs of chromosomes in close proximity through Meiosis I, thus aiding in successful segregation going into Meiosis II. The synaptonemal complex also plays a large role in recombination, holding the chromosomes in place while crossovers are formed along the length of the homologs. The crossovers, or overlapping of chromosomal arms, can result in the recombination of DNA and genetically variable offspring.

Under normal conditions, crossovers form during a stage of Meiosis I called pachytene. It is thought that the synaptonemal complex limits where and how many crossovers occur by causing interference along the chromosomes. The goal of this project was to determine whether specific incubation conditions affect the timing and distribution of crossovers.Three chromosomes containing four unique markers were studied to observe the recombination frequencies of the intervals between any two adjacent markers. The nine intervals were analyzed under several conditions and the number, timing, and distribution of crossovers was determined. Results and their compatibility with current models of synaptonemal complex functions will be discussed.