Regulation of Gene Expression in Saccharomyces Cerevisiae: Isolating Mutants That Allow the Transcription Factor Ace2 to Activate the HO Gene

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Saccharomyces cerevisiae, commonly known as baker's yeast, has become a model organism for studying eukaryotic cell function. Yeast is ideal for laboratory studies using molecular genetics because desired genotypes and phenotypes can be easily expressed and yeast has a short generation time. General mechanisms of transcriptional gene regulation are widely studied in yeast because insights learned apply to all eukaryotic cells. The transcription factors Ace2 and Swi5 have nearly identical DNA-binding domains and recognize the same sequence in vitro, but activate different target genes in vivo. Swi5 activates the HO gene while Ace2 activates the CTS1 gene. We want to investigate what is preventing Ace2 from binding to and transcribing the HO gene by isolating and studying mutants that allow Ace2 to activate HO expression in the absence of the normal Swi5 activating factor. We created a strain containing recombinase sites upstream and downstream of ACE2 that allow Ace2 to be popped out upon exposure to the recombinase enzyme. 124 mutants were obtained from the Ace2 popout strain, 47 of which showed partial ACE2 dependence. These 47 candidates will be subject to dominance/recessive tests and complementation tests to further characterize each mutant. The results will help us to understand the differences in the way Swi5 and Ace2 activate transcription of the HO gene in yeast.