CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0411

Project Title
mRNA Splicing and Transcription Are Linked: BBP's Dual Role

Abstract

Objectives/Goals
My project studies genetic interactions between the branchpoint binding protein (BBP) and transcription factors BUR2, CTK2, and CTK3. BBP facilitates binding of the U2 snRNP during spliceosome assembly. Although it is essential in the cell, its absence does not adversely affect splicing; this suggests an additional function. BUR2, CTK2, and CTK3 have been found to play a role in the phosphorylation of the C-terminal domain (CTD) of the RNA polymerase 2 during transcription. These transcription factors were selected because the phosphorylation they perform facilitates the binding of splicing factors, including BBP. Finding an interaction between these proteins would suggest a larger link between transcription and splicing as well as clarify the roles of the specific proteins.

Methods/Materials
I generated mutant strains of Saccharomyces cerevisiae in which BBP and either BUR2, CTK2, or CTK3 are deleted from the genome. A plasmid containing a mutant version of BBP was then transformed into the cells. These double mutants were grown in culture and their rate of growth compared.

Results
I found that mutations in different regions of BBP had unique effects when combined with the deletion of BUR2, CTK2, or CTK3. Surprisingly, one mutant of BBP grew slower than the mutant alone when BUR2 was deleted from the genome but better when CTK2 or CTK3 was deleted. Specific regions of interaction were pinpointed along BBP through genetic tests.

Conclusions/Discussion
These data suggest different mechanisms of interaction for each of the three proteins with BBP. This research supports a new view of splicing and transcription as two processes working simultaneously and cooperatively in the healthy functioning of the cell.

Summary Statement
mRNA splicing and transcription are commonly thought of as distinct processes; this experiment refutes that understanding by showing a direct link between proteins involved in splicing and transcription.

Help Received
I used lab equipment at University of California, San Diego under the supervision of Dr. Tracy Johnson.