The Recombination System in Escherichia Coli; A Deeper Understanding

Michelle Moody

Microbiology and molecular genetics

Department of Microbiology and Molecular Genetics. Oklahoma State University, Stillwater, OK 74078, USA

Many people who suffer from various genetic disorders have immensely benefitted from discoveries leading to medical breakthroughs that have been life changing and even life-saving. Although science has come a far way in understanding these genetic abnormalities, there is still countless research that needs to be done in order to develop an even more broad understanding of how genes work in order to keep making advances in medicine. Escherichia coli, has been one of the most widely studied organisms for such research involving genetic recombination. By studying the processes of genetic recombination in Escherichia coli cells, one study focusing on the function of the ssDNA-binding-protein, resulted in a deeper understanding of how Escherichia coli cells recombine.

**Introduction**

Escherichia Coli (E. coli) has been vastly studied for years because of it’s simple yet effective make up. E. coli is a singled celled organism that can survive many harsh environmental conditions, which has made it a model organism for various scientific research and medical advances. E. coli is very well understood and has been the basis of most genetic recombination studies due to it’s simple make up that can be easily manipulated or engineered. However, there are many different strains of E. coli. Fortunately, many genomes of these strains have been sequenced by research throughout the years. Of the more recent research topics in E. coli, one very interesting discovery involves the recombination kinetics and the DNA-binding proteins in E. coli. ssDNA-binding-protein (SSB) is the main enzyme in E. coli involved with recombination.

Four strains of E. coli were introduced to a DNA fragment known as RHA, by the homologous recombination (HR) system, to erase the Tc^r gene in order to study the HR frequency, the effects of recombination, and also the length of the homologous arm. By using a modified double layer plate, where the scientists spread a transformation solution on the tops of LB agar plates, they were able to observe the growth of HR. A specific reaction system was set up to observe the processes involved with plasmid transformation, recombination kinetic analysis, quantitative PCR, DNA sequencing, and statistical analysis. Results showed that treatment with RecA, ET SSB, and RecBCD (recombination enzymes) separately or combined, did not promote genetic recombination. However, RecA combined with RecBCD or, ET SSB combined with RecBCD, did promote genetic recombination to yield the HR production.

**Discussion**

With the discovery of the combinations in RecA/RecBCD/SSB that promote recombination in E. coli, we can now assume the combination of enzymes will produce a more desired outcome opposed to a single enzyme being utilized in production. There are still many questions and hypothesis that remain untested and unanswered, such as what the effects of introducing other proteins and enzymes would have on the HR system, and why the combination of specific enzymes have a greater effect.

References

# Chai, Ran. "*Recombination function and recombination kinetics of* Escherichia coli*single-stranded DNA-binding protein*“, Page Title - Oklahoma State University." *Site Name*. N.p., 2017. Web. 10 Feb. 2017.