CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22250

Project Title
Original Mutagenesis Strategy Reveals Novel Activities in a Drosophila Gene and Potentially Any Gene of Interest

Abstract

Objectives/Goals
Just like Dr. Frankenstein and his accomplice, Igor, I created mutants. Now, my mutants are a bit different from Frankenstein, but nonetheless they are paving a new path for science.
NOVA, Novel OVexpression Activity is a mutagenesis scheme that I developed to use a mutagen, try to mutate rhomboid and Star transgene, and overexpress them. The NOVA mutagenesis approach is used t analyze two genes, rhomboid and Star, which play an essential role in regulation of a signaling pathway during the development of multi-cellular organisms, including everything from flies to humans. The idea of NOVA analysis is to expose a transgene to mutagenesis, express the mutated transgene at high levels, and then screen for novel phenotypes in the wings. After the mutants are found, their DNA is analyzed to figure out the exact spot at which the molecular lesion occurs.

Methods/Materials
Using Drosophila fruit flies, I crossed the flies and used a strong driver, GAL4, to overexpress the gene rhomboid. After a few generations, I screened the offspring for mutants. Once the mutants were found, the DNA was extracted, put through a Polymerase Chain Reaction (PCR), run through a gel, and finallyt sequenced. The data is then analyzed. A construct is created, and then it is injected into the fly and generations are crossed to be certain that the original phenotype is present in the fly.

Results
I was able to isolate novel phenotypes, called Dominant Negative and Neomorphic. Additionally, I was able to analyze the molecular lesion that was responsible for the novel phenotypes.

Conclusions/Discussion
My conclusion is that the NOVA strategy can be applied to two genes in Drosophila. In principle, it can be used as an effective tool for generating dominant mutations in genes of unknown functions.
Diseases, such as genetics ones and cancer, are caused by a deregulation of endogenous proteins. Since most of cancer is caused by the overproduction, the use of Dominant Negative mutations can help. The use of Dominant Negative forms of these mutations may be used to control these components that may be a great utility of curing such diseases. This may be done through gene therapy by introduction ot Dominant Negative. Drosophila is merely a tools to find information on forms of Dominant Negativt mutations. Then, the information can be applied to human genes in something such as gene therapy.

Summary Statement
Using NOVA, I was able to generate novel phenotypes in Drosophila mutants and analyze the exact molecular lesion where this occured.

Help Received
Used the lab equipment at University of California, San Diego under the supervision of Annabel Guichard; My supervisor, Annabel Guichard, also helped me learn how to use computer programs such as Adobe Illustrator, Excel, Photoshop, etc.; My sister, Monica, helped me chose the colors for my board;