CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J0410

Project Title
Exploring Transgenics: Phenotypic Detection of Gene Activity in Fruit Flies

Abstract

Objectives/Goals
My goal was to design a method for identifying transgenic lacZ positive fruit fly larvae by their appearance, using a reporter gene assay. I used the E. coli gene set Lac Operon, which produces the beta galactosidase enzyme. A compound called 'X-Gal' reacts with beta galactosidase to produce a blue color. The blue color is used to detect gene activity in the transgenic organisms. In fruit flies and other eukaryotes, the blue color can only be detected after the organism is killed, and stained with X-Gal. This then eliminates the possibility of 'in-vivo' studies. I had watched my father staining the dead flies, and wondered if there was a way to 'stain' the live ones. My hypothesis was that transgenic Lac Z positive fruit flies could display blue color (gene activity) if X-Gal was in their diet. The right concentration of X-Gal and beta galactosidase might produce live larva displaying the blue color. This would then permit in-vivo research!

Methods/Materials
My experiments involved growing strains of LacZ positive flies (D91, D105, & F273) with varying concentrations of X-Gal in their diet, totaling over 300 flies in my experiment. I also performed a control study using wild type flies cultured in the same media. The fly vials were observed under a dissecting microscope to look for larvae with any signs of blue color. 60 vials were prepared using X-Gal concentrations of 0.4 ppm, 2ppm, 4 ppm, 8 ppm, 10 ppm and control (no X-Gal). Each vial had a minimum of 2 pairs of flies.

Results
In the experiment, it seemed that a few of the experimental larvae/pupae expressed blue colored areas, indicating expression of beta gal enzyme.The results showed promise, but more specialized equipment will be needed to clearly view the blue color.

Conclusions/Discussion
Although the outcomes of the first experiment yielded inconclusive results, I was able to conclude that the Lac Operon is possibly only active during the pre-pupa to pupa stage. The pupae expressed the Lac Operon in the abdomen and tail areas, and survived in concentrations from 0.2ppm to 0.8ppm. This showed me that at these concentrations of X-Gal, transgenic screening through phenotypic detection was possible. Unfortunately, I was unable to develop a reliable screening method for LacZ positive fruit flies, but I have demonstrated that it is possible. I will continue my experiments, and hopefully, a new screening method will be available soon!

Summary Statement
My project examined whether live transgenic Drosophila melanogaster could be given X-Gal in their diet to produce blue color in their body, indicating in-vivo expression of Lac Z activity.

Help Received
Thanks to my father for letting me use his laboratory supplies. I also want to give special thanks to Dr. Larry Marsh, a Professor in the Dept. of Developmental and Cell Biology of the UC Irvine for providing me with transgenic fruit flies. I also thank Molecular Biologicals Inc., for allowing use of laboratories.