CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S1706

Project Title
Bioluminescence and Ultraviolet Resistance

Abstract

Objectives/Goals
The objective of this experiment was to determine if LuxR genes that allow for bioluminescent properties would confer ultraviolet resistance in E. coli. This may suggest another function light emission has in luminescent organisms.

Methods/Materials
Utilizing plasmids containing bioluminescent LuxR genes, which are all of the genes required for light product ion in the bacteria Vibrio fisheri. E. coli was transformed into a bioluminescent bacteria. These bacteria were exposed to increasing minutes of ultraviolet light. Unexposed E. coli and untransformed E. coli were used as controls. The growth was quantified by calculating percent coverage of growth on culture media-containing Petri dishes. Growth rates were compared to determine if LuxR-containing E. coli were more resistant to ultraviolet radiation.

Results
The average percent decrease in growth compared to controls in all 3 trials were consistently higher in the non-transformed E. coli than the transformed LuxR bacteria. In all trials combined, the LuxR transformed E. coli had an average of 31.2% more growth than non-transformed E. coli after being exposed to UV light.

Conclusions/Discussion
In this experiment, evidence was generated that pVib bioluminescent plasmids confer resistance to ultraviolet light#s harmful effects on E. coli. The purpose of bioluminescence in terms of survival has been the subject of much discussion, as light emission requires 10% or more of the E. coli cell#s energy. In light of the experimental evidence, it seems plausible that bioluminescence provides energy to photolyase, allowing for nocturnal light dependant repair of DNA.

Summary Statement
Plasmids containing bioluminescent genes were inserted into E. coli and exposed to UV light resulting in evidence that this luminescence protects bacteria from UV light by providing energy for light-dependant repair of DNA.

Help Received
Erin Vaccaro, my science teacher, helped with experimental design; Carla Longchamp, M.D. assisted with ordering supplies and bacterial disposal.