CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J1303

Project Title
What Are the Effects of Ultraviolet Light on Bacteria Mortality?

Abstract

Objectives/Goals
The purpose of this experiment was to observe the effects of short term ultraviolet light exposure on bacteria.

Methods/Materials
Escherichia coli (E. coli) and Serratia marcescens cultures were prepared by a technician at the University of California San Diego biology laboratory. I plated and labeled the samples and exposed the bacteria to ultraviolet light (at 254 nm) for two, five, and 30 minutes. Trypticase soy agar was used as the culture medium. The samples were plated. Half of each disk was exposed to ultraviolet light and half of each plate was shielded, so that each plate would serve as its own control.

The experiment was repeated using only the Serratia marcescens strain and shorter lengths of exposure times (15 seconds, 30 seconds, and one minute) to the 254 nm ultraviolet light in an attempt to establish at what exposure time mortality begins.

Results
After incubation, bacteria on the side not exposed to ultraviolet light (the shielded side) were observed to have grown into distinct, visible colonies. None of the bacteria exposed to ultraviolet light for two, five, or 30 minutes at 254 nm survived.

When the experiment was repeated, bacteria mortality was approximately 40-75% for Serratia marcescens exposed to ultraviolet light (at 254 nm) for 15 seconds and about 75-90% bacteria mortality for the 30 second exposure. One minute of exposure time to ultraviolet light resulted in 95-99% bacteria mortality. Therefore, complete mortality for Serratia marcescens is probably a little longer than one minute, but less than two minutes.

Conclusions/Discussion
Ultraviolet light exposure for short time periods, such as two or five minutes, was not expected to completely destroy the bacteria. Similarly, it was not expected that bacteria exposed to ultraviolet light (254 nm) for one minute would result in almost complete mortality. Surprisingly, very low exposure times, such as 15 and 30 seconds resulted in at least 40% bacteria mortality and bacteria exposed to 254 nm for one minute resulted in at least 95% mortality.

Summary Statement
In this experiment, I observed the effects of short term ultraviolet light exposure at 254 nm on Serratia marcescens and E. coli bacteria.

Help Received
Dr. Mandy Butler, Professor of Biology at the University of California San Diego, provided me with the laboratory and bacteria cultures for this experiment. Mrs. Hunker, my science teacher at The Rhoades School provided comments and guidance for my project. My parents provided transportation to and from