CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
J1305

Project Title
Resistance of Lake Water Biofilms to Ultraviolet Radiation

Abstract

Objectives/Goals
The purpose of this experiment was to determine the amount of UV light that kills biofilm organisms and other bacteria. The hypothesis of the experiment was that higher levels of UV light would eliminate more bacteria and biofilm organisms than lower levels of UV light. It was also hypothesized that the biofilm organisms would be more resistant than normal bacteria, represented by milk bacteria and E.coli.

Methods/Materials
The two forms of biofilm organisms treated were either free floating in 15 ml of lake water, or already established as biofilms on microscope slides that had grown for 2-3 weeks. For the milk bacteria and the E. coli trials, 0.1 ml of either milk or diluted E. coli culture were plated on an LB agar plate. Petri dishes containing plated bacteria, 15 ml of lake water, or a biofilm slide were treated with up to 1,000,000 microjoules per square cm of UV light. The number of colonies or organisms remaining was compared to the control.

Results
Most milk bacteria and E. coli colonies were eliminated by about 10,000 microjoules per sq. cm, but the established and free floating biofilm organisms were still thriving at that point and even at the highest treatment, 1,000,000 microjoules per sq. cm. The numbers of the organisms in established biofilms were estimated for the control and the treated, and were about the same. After treatment, free floating organisms were allowed to form biofilms for 2-3 weeks, then the number of organisms in 10 microscope fields from two plates were counted and averaged. Statistical analysis showed no difference between the treated plates and the control.

Conclusions/Discussion
Although the point where biofilm organisms began to decrease was not found, they were resistant to at least 100 times more UV light than milk bacteria or E. coli. It was hypothesized that the biofilms would be more resistant to UV light than milk bacteria or E. coli, but the free floating organisms were not expected to be this resistant without a biofilm matrix. I think that biofilm organisms are so resistant to UV light because they live out in the sunlight, and have developed the ability to protect and repair their damaged DNA, because without that, they would not be able to survive or reproduce properly.

Summary Statement
My project is about determining the resistance of biofilm organisms to Ultra Violet light in comparison to normal bacteria.

Help Received
My dad helped me understand scientific concepts and statistical analyses, helped with the experimental part, and took pictures of biofilms through the microscope. My science teacher, Mrs. McKinney, helped direct me in the written part of my project. Gen-Probe donated equipment and supplies.