CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J1322

Project Title
Does the Surface Clarity of Plastic Bottles Affect Solar Water Disinfection as Measured by the Presence of E. coli?

Abstract

Objectives/Goals
Solar water disinfection (SODIS) is a method for improving the safety of drinking water in third world countries. 2-liter clear plastic bottles are filled with available water and then placed horizontally in the sun for six hours. Bacteria such as e coli are destroyed due to a combination of heat and UV rays. In actual application, bottles are reused multiple times. My objective is to determine whether SODIS is still successful if the recommended 'clear' bottles are scratched and more opaque in appearance.

Methods/Materials
Nine 2-liter soda bottles were scratched to three levels of opaqueness. Six bottles were left unscratched (3 were controls). An equal amount and concentration of e coli was added to each bottle. The bottles were sealed and placed horizontally in the sun (the control were left in darkness). Samples from each bottle were inoculated onto agar plates, incubated at 37 degrees for 24 hours, and then compared to the controls.

Results
All levels of scratching (light, medium, and heavy) allowed for the presence of e coli after sun exposure, with the Level 3 (scratchiest bottles) having the highest average number of escherichia coli colonies. Only the clear bottles showed no evidence of e coli growth. The e coli growth was highest for the controls.

Conclusions/Discussion
There is a direct relationship between the scratchiness of the sun-exposed clear plastic bottles and the presence of e coli. Based on my results, only unscratched clear bottles should be used for SODIS. Further research could possibly reveal whether longer UV exposure might minimize the affects of the bottle opaqueness, especially for the lightly scratched bottles.

Summary Statement
My project tests one of the variables present when using the SODIS method to disinfect drinking water.

Help Received
I received both the needed supplies and helpful advice from Mr.K. at the Biology Laboratory at Fresno State University. My father helped with digital pictures and my mother helped in coordinating appointments.