CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22681

Project Title
Shedding Light on the E. coli Dilemma

Abstract

Objectives/Goals
To determine non-toxic methods of neutralizing harmful bacteria, such as Escherichia coli, by using titanium dioxide (TiO2) as a photocatalyst.

Methods/Materials
After creating dilutions of Titanium dioxide of 0.000M (control solution)0.0025M, 0.0050M, 0.0075M solutions, put equal amounts in test tubes. Put one loopful (0.1 mL)of E. coli into each and expose to 2| hours of continuous light. After completing the exposure, extract 0.1 mL from test tubes and spread acro| evenly on agar-filled petri dishes. Incubate for 48 hours and count number of colony forming units (CFU)| Record data and use Analysis of Variance (ANOVA) F-Test to prove differences between control and experimental groups.

500ml water bottles, two liter container, 500 grams of TiO2, electronic scale, 250 mL graduated cylinders, 10 mL graduated cylinders, test tube stand, test tubes, incubator, slant tubes with E. coli K-12 strain, inoculating loop/tube, Bunsen burner, Sylvania "Grow-Lux" fluorescent light, trypticase soy agar| filled petri plates, distilled water, eye goggles, pairs of non-latex gloves, masks, periodic table of elements, TI-89 calculator, bottle of Clorox bleach, plastic wrap, and microscope.

Results
Null hypothesis = there is no difference between the two groups
Alternative hypothesis = there is a difference between the two groups
Control/Group A (0.0025M TiO2)- accept alt. hyp.
Control/Group B (0.0050M TiO2)- accept alt. hyp.
Control/Group C (0.0075M TiO2)- accept alt. hyp.
Group A/Group B- accept Null hyp.
Group A/Group C- accept alt. hyp.
Group B/Group C- accept alt. hyp.

Average number of colony forming units:
Control- 155.3 CFUs
Group A- 52.4 CFUs
Group B- 38.6 CFUs
Group C- 8.3 CFUs

Summary Statement
Titanium dioxide can be used to neutralize E. coli in the presence of light and water.

Help Received
None