CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S1304

Project Title
Wastewater Treatment's Effect on Ultraviolet Light Resistance

Abstract

Objectives/Goals
The objective is to determine if treating wastewater with ultraviolet light will increase bacterial resistance to ultraviolet light in the effluent by triggering constitutive production of DNA repair enzymes.

Methods/Materials
Samples were collected from the influent and effluent of two wastewater plants: one used ultraviolet treatment, the other traditional chemical treatment. Each of these four sources was broken into two groups: one exposed to an additional hour of ultraviolet light, the other not exposed. Three plates of each of the eight conditions were used in each of five trials, for a total of fifteen plates per condition. Plate coverage was calculated based on histograms of digital photographs.

Results
After ultraviolet treatment, an additional hour of ultraviolet treatment decreased plate coverage 4.23%. After chemical treatment, that same amount of ultraviolet treatment reduced plate coverage only 2.72%. I used t-tests to verify results.

Conclusions/Discussion
Contrary to my hypothesis, I found that chemical treatment induced more resistance to ultraviolet light than ultraviolet treatment. One theory that explains this is that the time lapse between wastewater treatment and experimentation. Another explanation is that the bacteria in the wastewater did not have inducible repair systems. My data encourages the use of ultraviolet systems to treat wastewater and suggests that the concerns about inducing bacterial resistance in the effluent are unjustified.

Summary Statement
Ultraviolet wastewater treatment does not induce constitutive repair enzymes and does not cause ultraviolet light resistance in the effluent.

Help Received
Lab techs at the Ukiah Wastewater Treatment Plant and Laguna Subregional Treatment Plant helped with sample collection. Clint Smith helped with statistical analysis.