



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Brianna L. Lawrence	Project Number 27009
Project Title Death to Biofilm: Determining the Best Biocide Solution for Biofilm Elimination	
Objectives/Goals Bacteria are very diverse organisms and can live in any environment. They attach to all surfaces and form layers known as biofilm. These biofilm exist in every hydrated system and are known to carry pathogenic bacteria. As biofilm grows pieces of it float freely in the water. These free floating bacteria have the ability to harm many people. The objective of this experiment is to determine which water treatment best destroys biofilm. Abstract Methods/Materials Untreated well water was collected from a public source. Next, PVC pipe was purchased and cut into 24 four-inch sections. PVC piping was chosen because it is a common plumbing material. Each section of piping was filled with the untreated water and placed in a well ventilated area at room temperature for 12 days. Every three days, four samples of bacteria were viewed under a microscope at medium power to observe progression of growth. The bacteria count was recorded. At the end of the growing period, a final bacteria count was recorded for each sample. Meanwhile, five biocides were chosen as disinfectants: Hydrogen Peroxide, Alcohol, Ammonia, Chlorine, and Iodine. These biocides were chosen for their natural cleaning abilities. Each compound was measured and mixed with purified water to create five solutions. The well water was poured out of four pipes and one biocide solution added. After a specific amount of time, a sample from each pipe was viewed under the microscope for a bacteria count and recorded. This process was repeated for each solution. The data was analyzed to determine the best biofilm disinfectant. Results The Alcohol solution was the best disinfectant with a 66% elimination of bacteria. Alcohol's average decrease of bacteria per field of view under the microscope was 39 bacteria. Close behind was Ammonia with 64% bacteria elimination, its bacteria count also decreased by 36 bacteria. Hydrogen peroxide was able to kill 57% with a decrease of 37 bacteria per field of view. Chlorine and Iodine had very close results. Iodine had a disinfectant percentage of 64%, and Chlorine had a disinfectant percentage of 55%. Iodine's bacteria count decreased by 33 bacteria, and Chlorine's count decreased by 29 bacteria. Conclusions/Discussion The results from the experiment show the best biofilm disinfectant is the alcohol. My hypothesis stated chlorine would work the best; therefore my hypothesis was refuted.	
Summary Statement Using different biocide solutions to determine which one kills biofilm the most effectively.	
Help Received Mother helped put board together; Jacob from Home Depot cut the PVC pipe into 24 pieces	