



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> <b>Arman A. Hamamah</b>	<b>Project Number</b> <b>J1312</b>
<b>Project Title</b> <b>Do Different Dilutions of Disinfectants Affect the Development of Bacterial Resistance?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of my experiment is to determine if bacterial resistance (after repeated exposure to a disinfectant) depends on the concentration of the disinfectant. The independent variable is the different concentrations of the disinfectant (percentage). The dependent variable is bacterial inhibition (percentage). The hypothesis is that if the bacteria are exposed to less concentrations of the disinfectant, then more resistance develops.</p> <p><b>Methods/Materials</b> Bacteria used were Staphylococcus Aureus E. Coli, and Gram positive Bacillus. Disinfectants used were Ammonium Chloride, Sodium Hypochlorite, Hydrogen Chloride, and Pine Oil. For each, 10,20,30, and 50% concentrations were prepared. Each bacterium was exposed to each disinfectant concentration. Resistant bacteria were re-exposed to the same solution 5 times. Zones of inhibition were measured each day. At the end, resistant bacteria were isolated, cultured and diluted. The degree of inhibition for each bacterium and each disinfectant concentration was calculated using viable cell count method. Resistance is measured by sequential change in the zones of inhibition and percent inhibition of the bacteria exposed to the specific disinfectant.</p> <p><b>Results</b> Zones of inhibition showed resistance development for E.Coli and Staph. Aureus exposed to all concentrations of Sodium Hypochlorite, Hydrogen Chloride, and Pine Oil. Viable cell count method showed resistance developed for E. Coli exposed to Hydrogen Chloride and Pine Oil. My hypothesis was not supported, as resistance, when developed, did not depend on disinfectant concentration.</p> <p><b>Conclusions/Discussion</b> Bacterial resistance can develop to disinfectants; however, it does not depend on disinfectant concentration.</p>	
<b>Summary Statement</b> Different bacteria were repeatedly exposed to four different concentrations of several disinfectants, and bacterial resistance was measured by sequential changes in zones of inhibition and viable cell count method.	
<b>Help Received</b> Laboratory staff provided space, materials, and guided me with streaking techniques. My parents guided me and provided transportation throughout the experiment.	