



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Nagy C. Hakim	Project Number J1113
Project Title Effect of Increased Light Intensity and Bottle Size on Solar Water Purification	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals There is an urgent need for clean water in areas which lack basic sanitary conditions. Solar disinfection (SODIS) is a cheap and effective way to purify water in only six hours. More than 2.5 million people worldwide use SODIS as their primary source of water purification. However, SODIS does not work when the water is turbid. The purpose of this project is to investigate the effectiveness of reflectors and various bottle sizes on solar disinfection with turbid water. Based on preliminary research, I predict that the purity of water would increase with the intensity of light and the use of smaller bottles.</p> <p>Methods/Materials My experiment consists of adding an aluminum reflector to various size bottles to increase the intensity of light and temperature, and study the effectiveness of SODIS in this setup. Water was collected from Stevens Creek Reservoir and the bacteria let to multiply by keeping it in a warm container with nutrients. Two sets of 2 liter, 1 liter, and 1/2 liter bottles were filled with the infected water. The bottles were placed on wooden stands, half of them fitted with reflectors, under direct sunlight for 6 hours. Samples were taken every two hours, and placed on the nutrient agar. After culturing for 2 days, I counted the bacteria colonies in the Petri dishes. Water is considered drinkable if there are 5 colonies or less in the dish. The experiment was done following BioSafety Level 1 precautions.</p> <p>Results The results indicate that the reflectors were very effective, and smaller bottles performed slightly better. None of the bottles without reflectors were drinkable after 6 hours due to the turbidity of the water. However, all the bottles with reflectors were drinkable after 4 hours. Smaller bottles were even drinkable after 2 hours.</p> <p>Conclusions/Discussion My experiment did agree with my hypothesis: Reflectors and smaller bottles improved the purification of the water. Increased light and hotter temperatures, combined to kill the bacteria, even in turbid water. My contaminating variable was that one small bottle with a reflector fell twice during a 4 hour period, and a shadow of a truck came over all the bottles for about a half hour during the 4-6 hour time period. If I were to repeat the experiment, I would use less turbid water, to test if the reflectors would be as effective in clear water. I would also study which of the temperature or UV light affects more the purification of water.</p>	
Summary Statement This project shows the effectiveness of increased light intensity and small bottle size on solar water purification.	
Help Received Father helped purchase test kits.	