



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Beatrice M. White</b>	<b>Project Number</b> <b>J1611</b>
<b>Project Title</b> <b>Bad Water Gone Good: Determination of Most Effective Emergency Water Sanitization Method</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective was to test my hypothesis that boiling is the most effective method of sanitization of water, compared to bleach, iodine, and filtration.</p> <p><b>Methods/Materials</b> Four water sanitization methods were evaluated for their effectiveness in reducing bioburden (bacteria, fungi, and yeast) in water obtained from San Benito River. The methods evaluated were boiling, adding bleach, adding iodine, and filtration. These are methods recommended for treating water in an emergency, such as an earthquake. A sample was taken from the San Benito River and divided into four equal parts. Each portion was subjected to one of the sanitization methods. The source water (San Benito River) was tested for bioburden load before and after treatment by the spread plate microbiological method. 0.1 mL of the sample is added to agar plate and evenly spread over the surface with a sterile spreader. The inoculated plates are incubated for one week at room temperature in the dark. On each day, the plates are visually inspected for microbial colonies or colony forming unit (CFU), which are counted. A final bioburden count is determined by the highest colony count. The colony count is then used to calculate the bioburden load (CFU/mL) in the source and treated water.</p> <p><b>Results</b> The bioburden load of the San Benito River water, pre-treatment, was 141,250 CFU/mL. After treatment, the bioburden load was reduced to 1080 CFU/mL (iodine), 740 CFU/mL (bleach), 5 CFU/mL (boiling), and 0 CFU/mL (filtration). The reduction was calculated as 99.2%, 99.5%, 99.99%, and 100%, for iodine, bleach, boiling, and filtration, respectively.</p> <p><b>Conclusions/Discussion</b> My hypothesis was incorrect. This experiment showed that filtration is most effective in making water safe to drink, but filters are expensive and not always available. Even though boiling did not remove all bioburden, it is a good, inexpensive alternative when filtration systems are not available. The high counts of bioburden in bleach and iodine treated water were surprising because these are recommended methods for making water safe to drink. Because of these unexpected results, a follow up experiment would be to investigate methods to improve the effectiveness of bleach and iodine treatment, as these methods also are inexpensive and require no specialized equipment. Based on the results of my experiment, I recommend families keep a filtration system in an emergency supply kit.</p>	
<b>Summary Statement</b> Comparison of emergency water sanitization methods to determine most effective method of reducing bioburden	
<b>Help Received</b> Microbiology supplies and advice was obtained from Ms. Suchi Kuo (MedImmune, LLC). My father helped me obtain water samples (drove me to the river) and with my questions about calculations and tables	