CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0919

Project Title
Water Purification in Emergency Situations

Abstract

Objectives/Goals
This project examines various methods to purify water to make it drinkable, and analyzes which method is the most efficient.

Methods/Materials
In this experiment, water is collected from San Francisco's Lake Merced. The lake water is then filtered through paper towels to remove the large debris. The filtered water is then diluted and plated on a sheet of Petrifilm to determine the amount of bacteria in the original sample (the control). Then, the remaining water is processed through various methods to determine which method(s) will make the water "drinkable." The various treatments include chemical treatment (bleach and chlorine dioxide), filtration (active carbon/charcoal and micro membrane), boiling, steam distillation, and ultraviolet light irradiation. The method(s) that lead to drinkable water will then be analyzed to determine which method is the most "efficient."

Results
In conclusion, the methods that are effective in killing the microorganisms are bleach, chlorine-dioxide, boiling, steam distillation, and UV light irradiation. The active charcoal and micro-membrane are not effective in killing bacteria. The Webster's Dictionary defined "efficient" as "performing or functioning effectively with the least waste of time, effort or resources." Relative to time, ultra-violet light irradiation is the fastest in purifying the water. Relative to the amount of effort, the bleach and chlorine dioxide are the easiest to use. Relative to resources, the bleach and chlorine-dioxide required very little resources. Relative to cost, ultraviolet light irradiation is the cheapest.

Conclusions/Discussion
In summary, bleach, chlorine dioxide, boiling, steam distillation and UV light irradiation are all effective methods to purify water. Bleach and chlorine-dioxide are the best methods in purifying water relative to effort and resources. The UV light method is best in purifying water relative to time and cost. 2,400,000 gallons of contaminated water can be purified with one $80.00 UV light unit! This is amazing! Of course, there is no "one" method that can be classified as the most efficient. The "best" method can only be evaluated relative to the situation at the time. However, with our better understanding of water science and newer technology, we may be better able to provide everyone with a constant source of inexpensive, safe, drinkable water.

Summary Statement
This project examines various methods to purify water to make it drinkable in emergency situations, and analyzes which method is the most efficient relative to time, effort, resources, and cost.

Help Received
My father helped me purchase materials over the internet, helped me get the UV light, and drove me to Lake Merced. My aunt helped me get the Pipetman, and gave me suggestions for the dilutions.