CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

J1914

Project Title

Comparing the Efficacy of Backcountry Water-Treatment Methods

Abstract

Objectives

Most water purifiers designed for hikers claim to eliminate over 99% of bacteria. I tested four different water-purifiers for my project: a hollow-membrane filter (Sawyer Squeeze), chlorine dioxide drops (Aquamira Treatment), chlorine tablets (MSR Aquatabs), and iodine tablets (Potable Aqua Tablets). I believed the Aquatabs and Aquamira treatment would destroy the least bacteria, since research has shown that chlorine does not destroy as much bacteria as iodine. I believed the iodine tablets and hollow-membrane filter will be effective and result in sterile plates.

Methods

I performed two trials and used 40 plates. I filtered water from Escondido Creek and Moonlight Beach effluent, and followed the necessary procedures on the product description to filter/clean the water. I then inoculated each plate with 2mL of the filtered water into the Coliscan Easygel. I sealed each plate and placed them in an incubator at 37°C. I documented the bacteria and analyzed the results.

Results

I tested each filter twice on creek and effluent water. In both trials, the Sawyer Squeeze Filter results were sterile. In the Aquamira Drops plates, I observed coliform and noncoliform colonies too numerous to count, and E. coli colonies. In plates containing water treated by the Aquatabs Tablets, I documented mold colonies, some E. coli colonies, and coliform and noncoliform colonies too numerous to count. Three plates containing iodine-treated water had at least 1 coliform colony, and one plate also contained 2 noncoliform colonies. The rest of the iodine-treated plates were sterile. The coliforms and noncoliforms in the positive control plates for both the creek water and the effluent were too numerous to count. An average of 21 E. coli colonies were also found.

Conclusions

I hypothesized that all of the water-purifying methods would work to some extent, however, this was not supported. The Aquatabs tablets and Aquamira Treatment did not live up to their claims to remove 99% of all bacteria. The iodine treated plates destroyed approximately 96% of the bacteria, but the plates were not sterile, which was surprising. The Sawyer Squeeze Filter plates supported my hypothesis, as every plate was sterile. I would most recommend the Sawyer Squeeze filter. Although it does cost the most, it is efficient and contains no chemicals. Given the right care, the filter can last longer than any chemical solution.

Summary Statement

I tested several different brands and types of water-treatment products (Sawyer Squeeze filter, Aquamira Treatment, Aquatabs Tablets, Potable Aqua Iodine Tablets) for their effectiveness in treating contaminated creek water.

Help Received

My science teacher provided me guidance while I performed the procedures myself.