CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Michele L. Eggleston

Project Number

36327

Project Title

Is It Clear? Is It Clean? Methods for Testing and Treating Water with Cheap Materials for Use in Developing Countries

Abstract

Objectives/Goals

In some countries, clean water is a luxury and polluted water causes numerous diseases. We became interested in this problem and studied correlation between turbidity and bacterial contamination. We tried to find an easy way to estimate the quality of water and purify it to make it safer to drink.

Methods/Materials

We built a nephelometer with scraps of wood and cheap components. We tested it on milk dilutions and on growing bacterial cultures. We collected sea water from 3 beaches and 3 water ways around San Diego and measured their turbidity using our instrument.

We centrifuged, sedimented and filtrated our samples, measured their turbidity and cultured them on agar plates to estimate their level of bacterial contamination before and after these treatments. Tap water was used as control.

We built filters with plastic bottles, fabrics, coffee filters, pillow stuffing, and packing foam to find out the best material to decrease turbidity and bacterial contamination. Fabric was also washed with dirty water and exposed to the sun for several hours to see if sunlight could kill enough bacteria to reuse these fabrics.

Results

Our nephelometer could measure the turbidity of all samples which was proportional to the amount of particles in suspension in milk dilutions and in bacterial cultures.

Sedimentation, centrifugation and filtration all greatly reduced the turbidity and bacterial contamination of the samples, filtration was the fastest. We also found that there is correlation between turbidity and bacterial contamination

All tested filters decreased turbidity and bacterial contamination, the more layers, the more efficient. At least 4 hours of sun exposure on fabrics washed with dirty water killed enough bacteria to reuse them.

Conclusions/Discussion

Taking into account limited resources in some countries, we managed to estimate the quality of water and treat it by filtration with cheap materials such as pillow stuffing and multi layers of cotton fabric widely available from recycled clothing to improve its quality. We are also working on a bigger filter to handle more than a cup or 2 of water.

Studying life style and customs of less developed areas can help us find even more inexpensive ways of purifying water using local resources. Learning about what microorganisms contribute to water-borne diseases will also help us understand what level of purification is acceptable to obtain relatively safe water.

Summary Statement

I could estimate water quality with a home made instrument and made efficient and inexpensive filters to improve its quality

Help Received

I found a basic design for my nephelometer from the ScienceBuddies site but improved it myself to make it portable and more robust. I designed and performed the experiments myself, some of them in a lab setting for centrifugation and used of incubator)