



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

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Project Title
Using Ferric Hydroxide to Filter Out Bacteria from Water

Abstract

Objectives/Goals
To filter out microorganisms from water using a new method which includes the use of hydroxides.

Methods/Materials
The source of sand was "All Purpose Sand". For coating the sand 1M of FeCl₃ was used for 3M of ammonium hydroxide. After the sand was added to (1000cc) 1M of FeCl₃ it was left to dry then Ammonium Hydroxide was added layer by layer until all of the 3M solution was finished (3600 cc). The diatomaceous earth was fully coated then was left to dry.
A solution of the three bacteria and water was made that contained 100mL of liquid bacteria for 300mL of water. Samples of the three solutions were taken in three petri dishes and were placed into an incubator at about 24°C were left for about 12-24 hours. The rest of the three bacteria solution was passed through the columns of 35.5 x 5 cm that contained 600mL of the coated sand for the 100mL of the bacteria solution. At the end of each column coffee filter paper was used to prevent the grains of sand from passing through. The solution was passed through and the result water was placed in a petri dish and was left in the incubator at 24°C for 12-24 hours.

Results
A full 1M of FeCl₃ and 3M of NH₄OH were used, meaning 1 liter of FeCl₃ solution and 3.6 liters of NH₄OH.
The effect of 1M concentration of FeCl₃ and 3M of NH₄OH used for modifying the sand on the adsorption of yeast to sand columns, 35 x 5 cm to 600mL sand, successfully removed 99.9% of the all three bacteria.

Conclusions/Discussion
The hypothesis of this experiment is that the modified sand with ferric chloride and ammonium hydroxide inside the columns will significantly remove 99.9% of the three bacteria from the water.
The hypothesis of this experiment proved to be correct.
A simple way the project can be improved or differentiated on our designed experiment and filtration mechanisms is instead of modifying the diatomaceous earth with ferric hydroxide only, but use a concentration of ferric hydroxide and aluminum hydroxide.

Summary Statement
Found, and tested a new method of bacterial filtering from water which would be financially, economically, and environmentally efficient.

Help Received