CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J1309

Project Title
The Art of Brewing Hydrogen: Improving Gas Yield of Hydrogen-Producing Bacteria

Abstract

Objectives/Goals
I am trying to produce hydrogen as a clean alternate energy source, by using hydrogen-producing anaerobic bacteria (of the Clostridium genus). From prior exterimentation, I know that gas yield of these bacteria must be increased. The goal of this series of experiments is to increase gas yield of these bacteria by improving growth conditions.

Methods/Materials
Hydrogen producing anaerobic bacteria (collected from dirt) were grown in 30 ml. test tubes, in a growth medium. The growth medium was prepared by boiling corn-stalk and collecting the liquid. The biogas collected at the top of inverted test-tubes. The corn-stalk solution was displaced into balloons attached to the bottom of the test-tubes. A series of experiments were conducted, testing various living conditions against controls. Conditions were judged by measuring biogas produced.

Results
Fertilizer because of nitrates and phosphates, iron filings, and heat in the form of sunlight all helped gas production. Lye (pH: approx. 9) and lemon juice (pH: approx. 5) prevented gas production.

Conclusions/Discussion
The results strongly supported my hypothesis. Sunlight (probably because of heat), iron filings, and fertilizer help gas production. My results do not show the improvement necessary to run a hydrogen economy on anaerobic bacteria. Although the results were not as good as I hoped, the project was successful because of the skills that I have acquired, and because of what I learned about the growth of the bacteria. Hopefully, dramatic improvement in hydrogen production from these bacteria can yet be obtained, and I want to continue with this goal.

Summary Statement
I have shown that gas yield of hydrogen-producing anaerobic bacteria can be increased by improving growth conditions.

Help Received
My father, Timothy Dreszer, discussed ideas and helped with set-up. Matthew Knope, my science teacher, discussed ideas. Prof. Bruce E. Logan, gave me useful advice.