



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Taras B. Dreszer	Project Number S0904
Project Title Heat to Hydrogen: Testing Effects of Temperature on Bacterial Hydrogen Production	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project was to find out if maintaining the bacteria at 30 degrees Celsius (optimal bacterial growth temperature) to increase growth and gas production could achieve a net gain in energy over growth at room temperature.</p> <p>Methods/Materials Bacteria (<i>Clostridium acetobutylicum</i>) were isolated by heat shocking, and cultivated in a sucrose and distilled water solution. Bacteria were fed blended cornstalk in a glass 250 ml flask, with a pressure relieving valve open to the air. The apparatus was completely filled with water. Two conditions were tested, one at room temperature, and one incubated at 30 degrees Celsius. Controls without bacteria were used and did not produce biogas. Biogas was measured and estimates of hydrogen were made based on research.</p> <p>Results 16.2 ml of biogas was produced by the room temperature condition, and 20.6 ml of biogas was produced by the incubated condition, which correlates to roughly 12.96 ml hydrogen produced by the heated test, and 9.72 ml hydrogen produced by the control meaning that it would take far more energy to incubate the organic waste (2.5 kcal) than would be gained (0.00243 kcal).</p> <p>Conclusions/Discussion It would take far more energy to incubate the organic waste than would be gained. According to these results, not nearly enough hydrogen would be produced to power transportation through converting all of the cornstalk in the US. However, with certain improvements, this could become a practical energy source. Though the hypothesis was rejected and the project did not show that this energy source was a practical one, this method could still play a valuable role in replacing fossil fuels.</p>	
Summary Statement The purpose of this experiment is to improve the yield of hydrogen producing bacteria by changing growth temperature.	
Help Received Christine Hutton advised me in handling bacteria, advised me throughout the project, and provided some of the equipment I used.	