



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Hailey C. Loehde-Woolard</b>	<b>Project Number</b> <b>S0616</b>
<b>Project Title</b> <b>Investigating Cellulosic Ethanol: Oxidation of Lignocellulosic Materials to Achieve High Conversion Yields of Cellulose</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment was to compare my previously developed treatment process with recent developments by others utilizing hydrogen peroxide to delignify wood pulp, and to adjust my methods in order to achieve the highest yield possible.</p> <p><b>Methods/Materials</b> I used unprinted newsprint as a model of waste stream paper and hardwood, as it has the same concentrations of lignocellulosic materials. I used my (patent-pending) process with a high alkaline, high temperature, high pressure, and microwave digestion process. I also used hydrogen peroxide to act as an oxidizer to delignify the paper in hopes of an increased conversion.</p> <p><b>Results</b> For the control alkaline tests (without H<sub>2</sub>O<sub>2</sub>) I achieved similar results compared to previous years experiments. A conversion of about 47.99% cellulose to glucose was achieved. In the H<sub>2</sub>O<sub>2</sub> experiment, I saw drastic changes. I achieved an average conversion yield of 95.36%, with my highest results being 99.89%. These results are higher than the scientific papers I consulted on the subject.</p> <p><b>Conclusions/Discussion</b> I believe the changes in the conversion yields were due to the liquification of the other lignocellulosic materials in combination with my method. In the overall purpose of my endeavors, I believe that I have successfully found an adequate, feasible and high yielding procedure for the production of cellulosic ethanol on a large scale. I am in the process of filing for a patent.</p>	
<b>Summary Statement</b> I have developed a novel method utilizing hydrogen peroxide and microwave digestion to increase conversion yields of cellulose to glucose for the purpose of producing cellulosic ethanol on a commercial scale.	
<b>Help Received</b> Mother ceded use of the kitchen and garage for three weeks for the duration of experiments, and bought necessary supplies. Genencor Co. donated samples of one of their commercial enzymes for use in this experiment. Father helped obtain chemicals.	