



CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s) Benjamin N. Cheng	Project Number 35024
Project Title A More Efficient Screening Method for Biofuel Cellulases	
Objectives/Goals This project's objective is to develop an efficient method for identifying and screening cellulose-degrading enzymes used in biofuel production. Abstract Methods/Materials First, I made cellulose agar plates using carboxymethyl cellulose as the carbon source for bacteria growth and cellulase activity. Next, I determined the optimal conditions for the current Congo Red staining method, specifically staining time and dye concentration. Noticing limitations of this method, I attempted to improve it. I tried a new method by directly incorporating a dye into cellulose agar plates for three dyes, Congo Red, Trypan Blue, and AZO-CMC. Finding the most effective method, I proceeded to do further tests to confirm its sensitivity and reliability. Results I successfully established the Congo Red staining method currently used by scientists for biofuel cellulase screening. I found that the optimal Congo Red method was staining for 10 minutes with an 0.1% dye solution. However, this method consumes a lot of time, generates a lot of waste, and most importantly washes away the bacterial colonies. Instead of staining after culture, I directly incorporated dye into the cellulose agar plates. Out of the three dyes, using Trypan Blue at a concentration of 0.01% was most effective, while other two were either ineffective or uneconomical. Further tests showed that the Trypan Blue method was equally reliable as the Congo Red method, using both purified bacteria and soil samples. Conclusions/Discussion I determined the optimal Congo Red staining method to be 0.1% for 10 minutes. I proceeded to find a better screening method by adding Trypan Blue dye directly into cellulose agar plates at a concentration of 0.01%. This method was confirmed for its sensitivity and reliability and also eliminates the downsides of the Congo Red staining. Therefore, I have developed a more efficient screening method for biofuel cellulases.	
Summary Statement I developed a more efficient method for the screening of biofuel cellulases by directly adding Trypan Blue dye at a concentration of 0.01% into cellulose agar plates.	
Help Received My teacher helped me plan out the project, instructed me on registration and filling out forms, and gave me feedback on my project. My dad helped me on some of the slightly dangerous parts of the experimentation, and my mom gave me advice on how to prepare a presentation.	