Taylor Blossom: Chemical & Biological Engineering
Mentor: Ross Carlson -- Chemical & Biological Engineering
Bio-fuel Production by Community Biofilm

The purpose of this project was to explore the structure of community biofilms and create a biofilm that could convert cellulose into biofuel. The three microorganisms that were studied were Clostridia phytofermentans, Escherichia coli, and Methanosarcina barkeri. C. phytofermentans is an anaerobic cellulose degrader which liberates glucose, E. coli, is a biofuel producing oxygen scavenger, and M. barkeri is an acetate utilizing methanogen that detoxifies byproducts. These microorganisms were first grown as monocultures before being grown as biofilms on plates. The plates were standardized so that only C. phytofermentans would be able to grow on them, and the other microorganisms were reliant upon the byproducts from C. phytofermentans. The primary challenge for this community growth was ensuring that the anaerobic C. phytofermentans and M. barkeri had sufficient growth to complete their respective purposes in the community, but were not exposed to oxygen. Once community growth was achieved, HPLC was used to quantify the concentrations of various media components and microorganism byproducts that were present. In addition, plate counts were performed on selective media for each organism to determine the concentration of colony forming units present. The information gained from HPLC and colony forming unit counts were used to adjust inoculum concentrations of each organism in the biofilm, as well as plate content, to maximize the biofuel producing capacity of the biofilm, and gain insight into the structure of the microbial community.