AMANDA L. SMYTHERS, AARON HOLLAND, P. ETHAN ADKINS, and DERRICK KOLLING, Department of Chemistry, Marshall University, Huntington, WV, 25755. **Using directed evolution to increase lipid formation in Chlorella vulgaris for use in biofuels**.

Microalgae, with their ability to grow in adverse environments using a variety of water sources, is an advantageous source of energy that will not compete with food supply. Chlorella vulgaris is a high lipid producing microalgae which research shows has an average of 42 percent dry weight lipid content under nitrogen deprivation. This experiment aims to increase the accumulation of lipids in C. vulgaris through applied natural selection, or directed evolution, to create a modified C. vulgaris culture with increased acetyl-CoA carboxylase (ACCase) activity. A less expensive method of genetic engineering, applied natural selection can theoretically be repeated without the constraint of restrictive technology, potentially enabling microalgae users to undergo the process to increase the productivity of industrial microalgae cultures. ACCase is the starting point of the lipid synthesis pathway and cannot be bypassed in the production of triglycerides.

In an experiment published by the American History Museum, it was shown that one may use sethoxydim, a member of the cyclohexanedion family of herbicides, to induce the overexpression of ACCase in Nannochloropsis salina, resulting in a sevenfold increase in lipid content. This experiment aims to expand upon this research by measuring the effect of sethoxydim on C. vulgaris and comparing it to the effect of an aryloxyphenoxypropionate herbicide, a fellow ACCase inhibitor.

This experiment is currently ongoing, but current results have shown moderate success in increasing lipid production.