In-Depth Analysis of the Bacteriophage Esperanza
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This summer we have been delving deeper into the inner workings of the snail gut. Our research has been focused on a single bacteriophage, Esperanza, isolated last summer from the gut of a *Biomphalaria glabrata* snail. We are interested in bacteriophages, or phages, from the snail gut due to their potential for use in medical research. Esperanza is a lysogenic phage, meaning that it integrates itself into the bacterial DNA, and only leaves the genome when the bacterium is stressed. Lysogenic phages, like Esperanza, would potentially be useful in medical research because it could be used to insert a gene into the bacteria without causing an adverse reaction in the bacteria. *Biomphalaria* snails are important because they are intermediate hosts for *Schistosoma mansoni*, a parasite that causes the human disease schistosomiasis. The long-term goal of this research is to be able to insert a gene into the bacteria that causes it to interfere with the parasite before it is passed on to humans. Using phages to stop the transmission of this parasite is exciting because the direct use of the microbial community of the snail would bypass the need for harmful toxins or other drugs.

Our main goal for the summer was to determine the number of copies of Esperanza in most snail guts using a quantitative polymerase chain reaction. In this method, a fluorescent dye intercalates with double stranded DNA, and that fluorescence is measured to determine the amount of copies of the target DNA sequence in each sample. We were able to obtain relative quantification using this method, but not the absolute quantification we wanted. Later in the summer, we ordered a new kind of probe called TaqMan® which has a probe that fluoresces when a specific sequence is amplified rather than fluorescing with any sample of double stranded DNA.

We also tested the range of bacteria that Esperanza can infect, or Esperanza's host range. We compared it to Lajila and Sagirah, phages from termite gut bacteria, and Lucky Break, a phage from soil bacteria around a termite nest. We spotted each of these phages onto 12 different bacteria to see if they would infect the bacteria and kill it causing clearing, or plaques. Since most of the bacteria used were from termite guts, Esperanza, a phage from snail bacteria, had inconclusive results from this test, as it caused plaques in the first round of testing but not in the second round.

In the end of the summer, we began to prepare for work with metagenomic sequencing. This procedure will involve preparing a sample from a snail gut, and sequencing everything in that sample using ultracentrifugation and a cesium chloride gradient. This will give us a robust view into the snail gut, including viruses that would be difficult or impossible to cultivate in a lab setting. This procedure will be continued into the fall of 2013.

The opportunity to be involved in research at Calvin has benefitted me in many ways. In addition to obtaining much biological knowledge and learning new techniques, I have gained confidence in the knowledge and techniques I already knew. I feel comfortable engaging in conversations about my research both with other scientists and people who are not very interested in science. This experience will be very beneficial to me in my future as I plan to attend graduate school in the sciences.