I first heard of bacterial vaginosis, or BV, through this project and was surprised to find that it is very common among women of childbearing age. Actually, it is the most common vaginal infection presented in medical practice. It is associated with a variety of negative effects regarding reproduction and pregnancy including premature rupture of fetal membranes (PROM) and a higher risk of contracting STDs.

Most healthy vaginal environments are dominated by one or two species from the gram-positive genus Lactobacillus. Lactobacilli are thought to play a protective role against infection by producing lactic acid, hydrogen peroxide, and bacteriocins (proteinaceous toxins). Due to the lactic acid production, a healthy vaginal environment has an acidity of about pH 4.

In BV conditions, there is a loss of Lactobacilli and along with a decrease in acidity (pH >4.5). The Lactobacilli are replaced with rod-type, gram-variable anaerobes, with the most prevalent of these being Gardnerella vaginalis. Our research is focused on the shift between healthy and BV conditions.

We focused our study on Gardnerella vaginalis and some of the most common Lactobacillus species found in the vaginal tract: L. gasseri, L. jensonii, L. crispatus, and L. iners. While there is a large loss of most of these Lactobacillus species in the transition between healthy microbial environments to BV environments, Lactobacillus iners tends to remain in large numbers. The question of the difference between L. iners and the other common Lactobacillus species is one that has driven some of our research.

L. iners has been shown to produce less lactic acid and less hydrogen peroxide than the other Lactobacilli – factors that could explain its inability to fully protect against infection on its own. It was hypothesized that L. iners reacts differently to the antibiotics than the other Lactobacillus species. In this hypothetical scenario, a woman would take antibiotics which could kill most Lactobacillus species, excluding L. iners, leaving her susceptible to BV infection. We used the Kirby-Bauer method to assess the susceptibility of the various Lactobacillus species to a panel of antibiotics. However, we found that L. iners is similarly affected, or even more susceptible, to many of the common antibiotics.

The role of the pH change in the transition between healthy and BV also took our interest. When analyzing the growth curves of the bacteria at different pH’s (4, 5, 6, and 7), we found that most of the Lactobacilli grow similarly at all of the different pH’s. Yet both L. iners and G. vaginalis grew much more slowly at pH 4, which is the acidity of a healthy vaginal environment. This could mean that L. iners has a growth advantage at BV levels. Perhaps whatever gets rid of the other Lactobacilli affects L. iners, but the advantage of a higher pH balances out the negative effects.
Preliminary trials of head-to-head competition growth support these findings, but more testing is needed. In the head-to-head study, we will grow up a *Lactobacillus* species and *G. vaginalis* in the same broth culture tube at healthy (pH4) and BV (pH5.5) conditions. This will help us to measure the capability of each species compete for nutrients in these specific pH environments.

There have been studies on the inhibition properties of *Lactobacilli* on *G. vaginalis*, however the reverse has not yet been done. Preliminary trials looking at the effects of *G. vaginalis* supernatant on the growth of the *Lactobacilli* have been performed. The initial results seem to indicate that all species are negatively affected by compounds secreted by *G. vaginalis* as it grows.

This has been my first summer doing research at Calvin and I am extremely thankful for the experience. At the beginning of the summer, I was eager to learn new lab techniques to aid me in future classes and maybe my career. It wasn’t until later in the summer, when I started to fully understand what was going on, that I really got excited about the research and started puzzling about the pieces of information we have about BV. To continue contributing to this puzzle, I hope to work on this project during this coming school year.