Honors Senior Spotlight

Cassandra Murphy '22
Hometown: Indianapolis, Indiana

Major: Forensic Science
Minor: Biology

Thesis Title: Inflammatory Responses in Borrelia burgdorferi Infected Human Cardiac Tissues

Thesis Advisor: Dr. Eva Sapi

What is your thesis about?
Lyme Disease, a common vector-borne disease in the northeastern and midwestern regions of the United States, is caused by the transmission of the bacterial spirochete, Borrelia burgdorferi, through a tick bite. Lyme carditis is a very serious symptom most often causing cardiac conduction abnormalities. When B. burgdorferi spirochetes enter the heart tissue, the body's inflammatory response is activated, attracting neutrophils and macrophages to the tissue. Exposed to this response over prolonged periods of time, the cardiac tissue is at risk for cell damage and death. In this study, diseased cardiac tissues with unknown cause are being tested for the presence B. burgdorferi and inflammatory factors. Standard PCR is being conducted on the tissue cells to amplify the 16S rRNA gene and the pyrg B. burgdorferi housekeeping gene. RT-PCR tests for the expression of Il6, Il-17f, TNFα, and TGFβ genes in the infected tissue cells, which all act as inflammatory markers. Examination of these markers will extend our knowledge about the acute and chronic effects of B. burgdorferi on the cardiovascular system which could lead into more accurate diagnoses as well as more targeted treatments to prevent cardiac tissue damage in individuals with Lyme disease.

What motivated and/or inspired you to select this as your research topic?
I have always been interested in the study of pathology and disease. During that time, my dad began to exhibit a multitude of cardiac and neurological symptoms that affected our family, leading to a Lyme Disease diagnosis. As I learned more about bacteria in my molecular and microbiology classes, the ability of Borrelia burdorferi to quickly adapt, attack, and evade detection in the human body intrigued me to further study. With Dr. Sapi, I have learned so much about the morphology and behavior of B. burgdorferi in human tissue!

Do you have any advice for future Honors students thinking about writing an Honors Thesis?
My advice is to start early! You don't have to have everything figured out from day one, but identify what you are passionate about! As you start to take classes in your field, make connections with your professors. Go to their office hours and talk about their prior research topics; not only will you discover each faculty member's preferred focus, but will also help you discover what you are most interested in!

After graduating, what are your plans?
After graduation, I will be working in a forensic or genetic lab, until Fall 2023 when I get my Master's degree in Genetic Counseling!