

Thesis Defense Announcement  
To: The George Mason University Community

**Candidate:** Kayleen M. Higgins  
**Program:** MS in Biology

**Date:** April 28, 2022

**Time:** 12:00 PM Eastern Time

**Zoom Link:** <https://gmu.zoom.us/j/92296685458?pwd=TFNzbGpZS3djdkZsL2c0RlRDZW90dz09>

**Title:**  $\beta$ -lactamases in *Francisella novicida*

**Committee Chair:** Dr. Ancha Baranova

**Committee Members:** Dr. Brett Froelich, Dr. Ramin Hakami

All are invited to attend the defense.

**ABSTRACT:**

The bacterium *Francisella tularensis* is a versatile bacterium. It is able to infect multiple hosts through multiple transmission routes, including the bite of an arthropod, ingestion, inhalation, and contact through the eyes, causing tularemia. In the 1950s, it was developed as a biowarfare agent as it can cause infection with a low dosage of bacterial cells within the host. *F. tularensis* is resistant to penicillins and there is a possibility that it will acquire resistance to the current antibiotics used to treat tularemia. While studying the bacterium's resistance to penicillin, researchers have discovered that *F. tularensis* produces  $\beta$ -lactamases to hydrolyze the drug before it can destroy the bacterial cell wall. *F. tularensis* has two  $\beta$ -lactamase genes in its genome: FTT\_0681c (bla1) and FTT\_0611c (bla2). However, *F. tularensis* is a biosafety level 3 (BSL-3) organism, so it requires special resources and training of the researchers to study this bacterium. *Francisella novicida* U112 has homologous genes to *F. tularensis* Schu S4 (FTN\_1002 and FTT\_0681c (bla1), FTN\_1072 and FTT\_0611c (bla2), and FTN\_1227 and FTT\_0783), so it could be used as a model for the BSL-3 organism. Understanding more about the  $\beta$ -lactamase enzyme produced by *F. novicida* will allow for a greater understanding of the molecular mechanisms of *F. tularensis*' antibiotic resistance and whether it can express carbapenemase activity. Increasing knowledge of this bacterium allows researchers to prepare for alternative treatment options if *F. tularensis* becomes resistant to the current antibiotic treatments.