Subject: Thesis Defense - Annika Geiger, MS Biology
Date: Monday, March 31, 2025 at 3:40:07 PM Eastern Daylight Time
From: SSB Faculty List on behalf of Diane St. Germain
To: SSB-FACULTY-LIST-L@LISTSERV.GMU.EDU

Thesis Defense Announcement
To: The George Mason University Community

Candidate: Annika Geiger

Program: M.S. in Biology

Date: Monday April 14, 2025

Time: 11:00 AM Eastern Time (US and Canada)

Join Zoom Meeting
https://gmu.zoom.us/j/92139969785

Committee chair: Dr. Monique van Hoek

Committee members: Dr. Alessandra Luchini, Dr. Brett Froelich

Title: Determining the Influence of Genes on Biofilm Formation in *Francisella novicida*

Abstract:
Biofilms are matrix-associated bacterial communities that enhance persistence in environmental niches. The Gram-negative bacterium *Francisella tularensis* can survive in water and mud, and replicate in amoebae, arthropod cells, and mammalian macrophages, where it causes the disease
tularemia. The ability of *Francisella* species to form biofilms has been demonstrated in subspecies *tularensis*, *holarctica*, and *novicida*, contributing to their environmental resilience. Biofilm formation is likely a key mechanism for *Francisella* spp. persistence outside of the host; however, the specific genetic factors and regulatory systems influencing this process remain poorly understood. In this study, we performed a comprehensive screening of the 3,050 genes in
the entire *Francisella novicida* transposon mutant library to identify genes that modulate biofilm formation. By comparing biofilm production across mutant strains and to the parental *F. novicida* U112 strain, we identified both biofilm-enhancing and biofilm-suppressing loci. Mutations in genes encoding secretion systems, adhesins, transporters and nucleotide biosynthesis pathways were associated with altered biofilm production, suggesting their potential
involvement in biofilm regulation in *F. novicida.* Additionally, several of the mutants displaying significant changes in biofilm formation are in genes of unknown functions, indicating the potential involvement of previously uncharacterized genes or pathways in biofilm regulation and formation. A more detailed examination of a selected set of these mutants was done to further

characterize their biofilm formation. Our study reveals novel insights into the genetic determinants of biofilm formation in *F. novicida*, offering new possibilities for understanding its persistence and survival mechanisms. This work provides a foundation for future studies on *Francisella* biofilm regulation and may inform strategies to mitigate its environmental persistence of this organism.

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