

Research Projects in the SMART AMR IRG

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1. Project Title: Epitranscriptional Regulation of *E. faecalis* Biofilm Formation

MIT Faculty Advisor: Peter C. DEDON
Mentor: Michelle M. MITCHENER
Email Address: michelle.mitchener@smart.mit.edu

Project Description

Enterococcus faecalis is a leading cause of opportunistic and hospital-acquired infections. This pathogen is especially difficult to treat due to its ability to form biofilms, inherently antimicrobial-tolerant bacterial communities that adhere to a surface. Therefore, understanding how bacterial biofilms form and are maintained has important implications for treatment of *E. faecalis*-associated diseases. Although biofilms help bacteria survive in harsh environments, within the biofilm nutrients and oxygen are often limited. The bacteria must respond to these stressors in order to survive. Our laboratory and others have discovered that one way in which organisms respond to such stressors is by regulating protein translation through select chemical modification of transfer RNAs (tRNAs). Such posttranscriptional modifications enable cells to respond quickly to environmental challenges, like those in biofilms, by selectively upregulating only those proteins necessary to respond to and survive a given stress. The overarching goal of this project is to understand how tRNA modifications contribute to bacterial biofilm formation and maintenance in hopes of better understanding *E. faecalis* biology and identifying potential targets for therapeutic intervention.

Goals

The student will investigate tRNA modification changes in *E. faecalis* samples using liquid chromatography-tandem mass spectrometry (LC-MS/MS). The student will also be exposed to a variety of other chemical biology techniques, potentially including bacterial culture, gel electrophoresis, high-throughput sampling, etc.

Prerequisites/Skills

- Humility and integrity
- Dedication; Willingness and eagerness to learn
- Completion of introductory courses in chemistry and biology

Types of Software Applications

Various (may include Prism, Agilent Quantitation (mass spectrometry) software, Python (no need to know how to code), etc.)—all software will be provided (or is open source)

Relevant Papers and or URLs

tRNA modifications in cellular responses to stress (review):

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6468425/>