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EXPAND Mentor

UC San Diego
PHYSICAL SCIENCES
Student Success Center

Characterizing protein-protein interactions in *Mycobacterium tuberculosis*

Burkart Lab, Winter 2022

What you will do:

Mycobacterium tuberculosis (Mtb), the causative agent of tuberculosis (TB), is a top 10 cause of death worldwide and the leading cause of death from a single infectious agent, killing more people annually than HIV/AIDS or any other microbial pathogen. Although TB is curable and preventable, the rapidly increasing occurrence of drug resistant infections, combined with limited treatment options, has made it difficult to resolve these issues. This places a high burden on quickly identifying new drug candidates to effectively treat mycobacterial infections. The products of the type II fatty acid biosynthesis (FAS-II) pathway contribute to the increased occurrence of drug resistance by creating unique cell wall components. In this pathway a carrier protein and partner protein form specialized interconnected complexes to produce these cell wall components. Structural elucidation of these complexes offers valuable insight into possible drug targets, but our understanding of the protein-protein interactions (PPI) that regulate this pathway remains elusive. The complexity of FAS-II also poses significant barriers to physically resolving these complexes through traditional biochemical methods. Computational approaches offer a unique advantage to study the PPI of this vital pathway. By combining computational chemistry with traditional biochemistry and structural biology, we will have a better ability to elucidate the PPI that are involved in FAS-II, and resolve the protein-protein complexes, so we can better understand this pathway and identify new drug targets.

Skills you will acquire:

This project combines wet chemistry and computational chemistry. The split between in person/virtual will be determined by the mentor and mentee based on current restrictions and the comfort of the mentee

- Understanding of Mtb global impact and FAS-II applications
- Ability to use and implement modern tools to study PPI, then apply elucidated interactions to drug discovery
- Familiarity with command line
- Capability to create publication-quality figures and images
- Capability to perform rigorous data analysis
- Docking simulations
- Introduction to biochemistry benchwork skills
- Protein biochemistry and protein purification skills
- Cell culture skills
- Understanding of drug resistance and mechanisms for combating resistance