Bean Lab – Developing Biomarkers for Lung Infections

Undergraduate Research: Genotyping and Phenotyping Microbes

The goal of our research is to identify new biomarkers for chronic lung infections, including biomarkers for breath-based diagnostics.

Why do we need new biomarkers and diagnostics?
The standard clinical diagnostics for lung infections are surprisingly poor, failing to identify the pathogen 80% of the time. In addition, clinically-relevant phenotypes, such as antibiotic resistance profiles and mucoidy (i.e., sliminess…see photo), are very difficult to determine accurately for bacteria that have evolved and adapted during chronic lung infections, such as the chronic infections associated with cystic fibrosis or COPD. We are interested in discovering metabolic biomarkers of chronic lung infections that will allow us to detect infections earlier, and identify important microbial phenotypes directly from the patients’ breath.

How do undergraduate researchers contribute to these goals?
We collect data on the array of phenotypes that each microbial isolate possesses in order to find correlations between the phenotypes and the isolates’ metabolomes. Undergraduate researchers will be responsible for one (or more, with experience) phenotype characterization method that will be applied to every isolate that we study. In addition to performing phenotype assays, such as antibiotic resistance profiles, the student will be responsible for sequencing the genes associated with the phenotypes.

Is this lab right for you?
- You will gain experience in:
  - handling, culturing, and isolating bacteria,
  - a variety of phenotype assays, and
  - chromosome isolations, gene amplification (PCR), and gene sequencing.
- We work with hazardous materials and infectious human agents, which are not dangerous for most people but do come with potential health risks.
- You will need to be able to put in at least 10 hours of lab work per week.
- Because we work with human pathogens, students must be trained in general laboratory techniques for 6-12 months before working independently.
- Because students will be responsible for multiple bacterial phenotyping assays, a long-term commitment is preferred, and provides the most beneficial learning experience for you.
- Completion or current enrollment in MIC 206 (Microbiology Lab) is preferred, but not required.

To apply:
Email Dr. Bean at Heather.D.Bean@asu.edu with an unofficial transcript, and a one-page summary of relevant experience and your research and education goals.