# Molecular Basis of Infectious Diseases (MBID)

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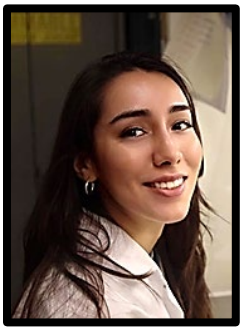
Program Director: **Michael Lorenz**, PhD, Professor, Microbiology and Molecular Genetics, The University of Texas Health Science Center at Houston

https://www.gulfcoastconsortia.org/home/training/molecular-basis-of-infectious-diseases-mbid/

## Meet the Trainees 2023-2024



**Lois Armendariz,** Biosciences, Rice University
Appointment: September 1, 2022 – August 31, 2024
**Mentor:** Natasha Kirienko, PhD, Biosciences, Rice University
***Project Title: Elucidating the Role of Host Lipid Metabolism in Pathogenic Infection of Caenorhabditis elegans***
Antimicrobial resistance (AMR) is a phenomenon in which microbes evolutionarily acquire resistance to widely used antimicrobials, thus making them a severe threat to public health. Current efforts to combat AMR have been highly inefficient. New approaches to overcome this crisis focus on enhancing the immune response to infections. Host-pathogen interactions studies during infection have become increasingly popular. One suitable model organism for studying these interactions is a small, free-living roundworm called *Caenorhabditis elegans*. *C. elegans* shares conserved immune pathways with mammals, which allows for findings to be translated to humans.
Published research in *C. elegans* suggests that lipid metabolism plays a role in innate immune activation during *Pseudomonas aeruginosa* infection. However, the processes leading to this activation are unknown. The goal of my research is to uncover the mechanism by which lipid-related processes influence and/or regulate the immune response to infection. I have identified lipid-related genes and processes involved in host defense against *P. aeruginosa* liquid-based infection as well as in activation of the ESRE mitochondrial surveillance pathway. I will now focus on finding the virulence mechanisms used by *P. aeruginosa* to trigger these host lipid metabolic changes as well as death. This work will allow us to understand lipid-mediated immune response and identify factors that could be enhanced for host benefit.

**Shane Cristy**, Microbiology and Infectious Diseases, University of Texas Health Science Center at Houston
Appointment: August 1, 2023 – July 31, 2024
**Mentors:** Michael Lorenz, PhD, and Jennifer Walker, PhD, Microbiology & Molecular Genetics, University of Texas Health Science Center at Houston
***Project Title: Candida albicans biofilm formation in catheter-associated urinary tract infections***
I am researching how *Candida albicans,* an opportunistic fungal pathogen, causes catheter-associated urinary tract infections (CAUTIs), a common yet understudied nosocomial infection. I am utilizing a combination of transcriptomics and functional assays to determine how *C. albicans* forms these infections and adapts to the urinary tract environment. Lastly, I am also interested in interspecies interactions between *C. albicans* and bacterial pathogens that are commonly co-isolated from CAUTIs.

**Samantha Hitt**, University of Texas Health Science Center at Houston
Appointment: August 1, 2023 – July 31, 2024
**Mentor:** Anna Konovalova, PhD, Microbiology & Molecular Genetics, University of Texas Health Science Center at Houston
***Project Title: Elucidation of The Molecular Signal for the Regulator of Capsule Synthesis Stress Response***
The Regulator of Capsule Synthesis (Rcs) is a stress response pathway that detects and counteracts cell envelope damage caused by host immune factors and antibiotics. Rcs is highly conserved in Enterobacterales and is essential for virulence and intrinsic antibiotic resistance in many enteric pathogens. My project focuses on identifying the molecular signal that triggers Rcs and how the signal is transduced from the cell surface to the cytoplasm, leading to the adaptive gene expression response. With this project, I aim to gain a mechanistic understanding of bacterial survival strategies in the host environment and their ability to withstand antibiotic challenges.

**Jason Pizzini,** Immunology and Microbiology, Baylor College of Medicine
Appointment: September 1, 2022 – August 31, 2024
**Mentor:** Robert Britton PhD, Molecular Virology and Microbiology, Baylor College of Medicine
***Project Title: Microbial therapeutics to prevent ExPEC colonization and disease***
The emergence of multi-drug resistant extraintestinal pathogenic E. coli (ExPEC) strains has led to an urgent demand for alternative treatments, beyond antibiotics, to combat this highly dangerous pathogen. Our laboratory aims to harness the inherent defense mechanism of the gut microbiota, known as colonization resistance, to tackle this issue. By identifying and assembling specific bacterial communities, we aim to fortify the gut against ExPEC colonization, effectively preventing its dissemination and the subsequent onset of disease.