Molecular Basis of Infectious Diseases (MBID)

Funded by the National Institute of Allergy and Infectious Diseases (NIAID), T32AI055449

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
2024-2025

Holly Branthoover, Immunology and Microbiology, Baylor College of Medicine

Appointment: August 1, 2024 – July 31, 2025
Mentor: Katy Patras, PhD, Immunology and Microbiology, Baylor College of Medicine

Project Title: Investigating the influence of human milk oligosaccharides on bacterial-immune dynamics in the gravid vaginal tract

Transfer of beneficial microbes from mother to infant is a critical component of every pregnancy and important for limiting neonatal disease, but factors that influence the maternal vaginal microbial community are complex and largely unknown. Current methods of limiting transfer of pathogens, like group B Streptococcus, involve antibiotics, which come with off-target microbial alterations and potential adverse health outcomes for the infant. My project investigates if human milk oligosaccharides, one of the most abundant components naturally made in human breast milk, can impact the vaginal microenvironment during pregnancy and promote a health-associated vaginal microbiome, supporting the transfer of an optimal microbiome to the infant.

Shane Cristy, Microbiology and Infectious Diseases, University of Texas Health Science Center at Houston

Appointment: August 1, 2023 – July 31, 2025
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

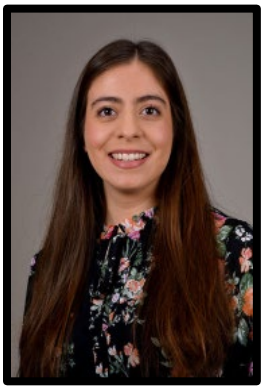
I am researching how *Candida albicans,* an opportunistic fungal pathogen, causes catheter-associated urinary tract infections (CAUTIs), a common yet understudied nosocomial infection. I am utilizing a combination of transcriptomics and functional assays to determine how *C. albicans* forms these infections 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, Microbiology and Infectious Diseases, University of Texas Health Science Center at Houston

Appointment: August 1, 2023 – July 31, 2025
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.



Larissa Tavizon, Microbiology and Molecular Genetics, University of Texas Health Science Center at Houston

Appointment: September 1, 2024 – August 31, 2025
Mentor: Danielle Garsin, PhD, Molecular Virology and Microbiology, University of Texas Health Science Center at Houston

Project Title: Elucidating the role(s) of ubiquitin-mediated proteolysis factors on SKN-1 during pathogen infection of C. elegans

Pathogens are becoming increasingly resistant to modern medicine resulting in untreatable infections. Rather than targeting the pathogen, an alternative option is to utilize the immune response to fight infection. A component of the protective immune response is the transcriptional regulator Nrf (humans)/SKN-1 (C. elegans). SKN-1 activity is protective against pathogen infection however, this activity is controlled by several regulatory mechanisms, one being the negative regulator WDR-23. Since this transcription factor plays a significant role in activating a protective response it is important to better understand how Nrf/SKN-1 regulates the immune response during infection. Doing so will address the critical need for new strategies for treating drug-resistant infections. A previous screen observing SKN-1 activity on pathogen identified a potential regulator, LIN-23. The objective of the research plan is to identify the mechanisms by which LIN-23 regulates SKN-1 activity during pathogen exposure and characterize the role of WDR-23 as a negative regulator of SKN-1. I hypothesize that LIN-23 targets WDR-23 for proteolysis and in doing so promotes SKN-1 activity. Upon completion of the proposed project, I expect to have shown a connection between LIN-23 and WDR-23 in a pathway to regulate SKN-1 activity. Understanding the mechanisms of these two regulators on a critical transcription factor will result in a positive impact on the field.