Molecular Basis of Infectious Diseases (MBID)

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

Program Co-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

Jacob Rutherford, Institute of Biosciences and Technology, Texas A&M University
Appointment: October 1, 2021 – July 31, 2022
Mentor: Julian Hurdle, PhD, Center for Infectious and Inflammatory Diseases, Institute of Biosciences and Technology, Texas A&M University
Project Title: Study of Fusobacterium nucleatum FAS-II Using Molecular and Chemical Genetics
F. nucleatum has been classified as a carcinogen that promotes the formation of colorectal cancer, and I am investigating the *fabK* gene as a possible drug target. We have compounds that specifically inhibit FabK and are planning to use these to determine if FabK inhibition *in vitro* and *in vivo* leads to a decrease in *F. nucleatum* associated cancer pathologies. Additionally, these compounds will be used alongside molecular genetic tools to increase our understanding of *F. nucleatum* lipid biology, an area which has not previously been studied.

Shelby Simar, The University of Texas Health Science Center at Houston
Appointment: October 1, 2021 – July 31, 2022
Mentor: Blake Hanson, PhD, Department of Epidemiology, Human Genetics and Environmental Sciences, The University of Texas Health Sciences Center at Houston
Project Title: Characterizing the Accessory Genome of Vancomycin-Resistant Enterococci and Its Role in Antimicrobial Resistance
Vancomycin-resistant enterococci are important causes of bloodstream infections in severely ill and immunocompromised patients. The plasticity of the enterococcal accessory genome— the genetic material that varies between strains— promotes the development of resistance to multiple antibiotics by acquisition of antimicrobial resistance (AMR) determinants through horizontal gene transfer of mobile genetic elements (MGEs). Evaluating the transmission of AMR determinants among enterococci has previously been challenging due to limitations of existing surveillance and sequencing methodologies, as these approaches generally focus only on a subset of the bacterial genome. Our research aims to leverage both short- and long-read sequencing methods to provide insight into MGEs facilitating AMR transmission in enterococci causing bloodstream infections that will prove critical for optimizing surveillance and therapeutic strategies.

John Taylor, Institute of Biosciences and Technology, Texas A&M University
Appointment: October 1, 2021 – July 31, 2022
Mentor: Yi Xu, Ph.D., Center for Infectious and Inflammatory Diseases, Institute of Biosciences and Technology - Texas A&M University
Project Title: Streptococcus gallolyticus subspecies gallolyticus, a Virulence Mechanism
Streptococcus gallolyticus subspecies gallolyticus (Sgg) is a pathobiont of the gut that actively promotes host cell proliferation and accelerates colon tumor growth. It possesses a type VII secretion system (T7SS) that is functionally important for secreting proteins that are responsible for stimulating host cell proliferation. However, the particular secreted factor/factors that accomplish this, as well as the mechanism by which they accomplish this, have yet to be elucidated. Thus, the goal of my research is to determine which Sgg T7SS effector(s) is/are responsible for stimulating host cell proliferation and accelerating tumor growth, as well as the host factors that it targets and its precise mechanism of action.

Hannah Wilson, University of Texas Health Science Center at Houston
Appointment: October 1, 2021 – July 31, 2022
Mentor: Michael Lorenz, PhD**,** Department of Microbiology and Molecular Genetics**,** The University of Texas Health Science Center at Houston
Project Title: Determining the contributions of C. albicans metabolism and morphogenesis to phagosomal alkalinization
My project focuses on the dynamic interaction between host macrophages and the opportunistic fungus, *Candida albicans*. Specifically, I am studying the molecular mechanisms by which *C. albicans* neutralizes the acidifying phagosome and escapes from the phagocyte via filamentous growth. By characterizing this process, I will identify the elements that are central to the ability of *C. albicans* to disseminate and cause systemic infections.