

Department of Molecular Microbiology

Website: <http://www.microbiology.wustl.edu>

Research Electives

Molecular Microbiology Research Electives

During the fourth year, opportunities exist for many varieties of advanced clinical or research experiences.

Stephen M. Beverley, PhD

McDonnell Pediatric Research Building, 10th Floor
Phone: 314-747-2630

Molecular genetics of protozoan parasites and their viruses, including neglected tropical diseases; biosynthesis of the parasite surface, molecular genetics and genomics, glycobiology, virulence and drug action or resistance.

Michael Caparon, PhD

McDonnell Pediatric Research Building, 10th Floor
Phone: 314-362-1485

Molecular genetics and pathogenicity of the streptococci and other pathogenic gram-positive bacteria.

Siyuan Ding, PhD

McDonnell Pediatric Research Building, 9th Floor
Phone: 314-273-3963

Our lab studies the molecular mechanisms of rotavirus replication, immunity, and pathogenesis; enteric virus-host interactions; and antiviral signaling in the gastrointestinal tract using viral reverse genetics, high-throughput screens, mouse models, and human intestinal organoids.

Tamara L. Doering, MD, PhD

McDonnell Pediatric Research Building, 10th Floor
Phone: 314-747-5597

We study the opportunistic fungal pathogen *Cryptococcus neoformans*, with the dual motivations of elucidating basic biology and identifying potential drug targets. Topic areas include the synthesis of the polysaccharide capsule that is the main cryptococcal virulence factor, host-fungal interactions, transcriptional regulation, fungal

cell biology, and genomic determinants of cryptococcal virulence. Current approaches include those of biochemistry, cell and molecular biology, and genetics; studies also include image-based analysis of host-pathogen interactions and computational analyses.

Daniel Goldberg, MD, PhD

McDonnell Pediatric Research Building, 9th Floor
Phone: 314-362-1514

Biochemistry of malaria.

Scott J. Hultgren, PhD

McDonnell Pediatric Research Building, 10th Floor
Phone: 314-362-6772

Our focus is on the pathogenic mechanisms and disease outcomes in the urinary tract. Work in the Hultgren lab blends multiple scientific disciplines to elucidate bacterial and host mechanisms that determine the onset, course and outcome of interactions between a host mucosal surface and bacterial pathogens. Using genetics, genomics, biochemistry, structural biology, high-resolution imaging, animal models, clinical studies and combinatorial chemistry, we have illuminated new ways in which intracellular lifestyles and community behavior play critical roles in the pathogenesis of urinary tract infection. We have uncovered new principles of adhesive pili biogenesis in gram-negative bacteria by the chaperone/ushe pathway, delineating the fine molecular details of a donor strand complementation and exchange mechanism by which the energy of final subunit folding is used to complete the assembly and extrusion of pili across the outer membrane. We revealed how uropathogenic *Escherichia coli* use type 1 pili to invade and establish biofilm-like intracellular bacterial communities within bladder cells as part of a mechanism that subverts host defenses and how quiescent intracellular reservoirs can seed recurrent infections. We have uncovered complex networks that govern mucosal epithelial response to infection, which we have shown determines disease outcome. Further, we have made seminal contributions to our understanding of the pathogenesis and response to other uropathogens, polymicrobial infections and catheter-associated UTIs and to the mechanisms by which bacteria form a directed amyloid fiber, curli, which is important in biofilm formation. Together, this work is changing the way UTIs are evaluated, reshaping models of bacterial infections in general and spawning new technologies to design novel vaccines and antimicrobial therapeutics to diagnose, treat and/or prevent UTIs and their sequelae.

Christina L. Stallings, PhD

BJC Institute of Health, 10th Floor
Phone: 314-286-0276

Our main focus is the molecular pathogenesis of mycobacteria. Our laboratory integrates in vivo disease modeling, molecular biology and biochemistry to provide answers to the fundamental biological questions regarding molecular pathogenesis and to yield therapeutic strategies for the treatment of mycobacterial infections.

Joseph P. Vogel, PhD

McDonnell Pediatric Research Building, 10th Floor
Phone: 314-747-1029

Legionella pneumophila, the causative agent of Legionnaires' pneumonia, replicates inside alveolar macrophages by preventing phagosome-lysosome fusion.

David Wang, PhD

McDonnell Pediatric Research Building, 8th Floor
Phone: 314-286-1123

Our work focuses on the discovery and characterization of novel viruses. We use functional genomic technologies to identify novel viruses from a variety of clinical samples from diseases of unexplained etiology. We then use epidemiologic, molecular and cellular strategies to define the relevance of newly identified viruses to human disease. A range of new viruses — including polyomaviruses, astroviruses and picornaviruses — are currently under investigation.

Sean P. J. Whelan, PhD

McDonnell Pediatric Research Building, 9th Floor
Phone: 314-286-1585

The Whelan Lab research focus is on the molecular mechanisms that underpin gene expression in nonsegmented negative-strand (NNS) RNA viruses — a group of viruses that includes some of the most significant human pathogens in existence (e.g., rabies, ebola, respiratory syncytial virus, measles, mumps, Nipah viruses). Vesicular stomatitis virus (VSV) has served as an important prototype of the NNS RNA viruses for more than 50 years, and Dr. Whelan has played a leading role in this field that can be traced back to the recovery of infectious virus from cDNA. As independent investigators, Dr. Whelan and his colleagues have led the way to understanding the structure and function of the viral replication machinery. The goals of such studies have been to ultimately inform the development of inhibitors against this group of important pathogens and to advance the use of VSV as a vaccine vector, an oncolytic agent, and a neuronal tracer.
