Washington University in St. Louis

Department of Molecular Microbiology

The Department of Molecular Microbiology teaches introductory courses in microbiology and pathogenic microorganisms for first-year medical students and graduate students. In conjunction with the Division of Biology & Biomedical Sciences (DBBS) (http://www.dbbs.wustl.edu/Pages/) program in Molecular Microbiology and Microbial Pathogenesis (http://www.dbbs.wustl.edu/divprograms/micro/Pages/default.aspx), the department also offers a number of advanced courses that are primarily designed for graduate students but also open to medical students. Advanced elective research activities are offered by faculty in the department.

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

Faculty

Sean P. J. Whelan, PhD (https://www.whelan-lab.org/)
Department Chair

Visit our website for more information about our faculty (https://microbiology.wustl.edu/faculty/) and their appointments.

B

Wandy L. Beatty, Ph.D.
Associate Professor of Molecular Microbiology (primary appointment)
Bachelor of Science, Montana State University Bozeman, 1989
Doctor of Philosophy, University of Wisconsin Madison, 1994

Douglas E Berg, Ph.D.
Alumni Professor Emeritus of Molecular Microbiology
Bachelor of Science, Cornell University, 1964
Doctor of Philosophy, University of Washington, 1969

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Ernest St. John Simms Distinguished Professor of Molecular Microbiology
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Doctor of Medicine, Johns Hopkins University, 1991

C

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Doctor of Philosophy, Rosario National University, 2014

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Doctor of Philosophy, Yale University, 2014

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Doctor of Philosophy, Mount Sinai School of Medicine, 2002

O

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Doctor of Philosophy, California Institute Technology (Duplicate of California Institute of Technology), 1981

S

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Doctor of Philosophy, University of Michigan (Duplicate of University of Michigan Ann Arbor), 1960

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Associate of Arts, Tyler Junior College, 2004
Bachelor of Science, Tulane University, 2008
Master of Science, University of Texas Tyler, 2011
Doctor of Philosophy, Washington University in St Louis, 2017

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Doctor of Philosophy, Louisiana State University, 1985

Asya Smirnov, D.V.M., Ph.D.
Instructor in Molecular Microbiology (primary appointment)
Doctor of Veterinary Medicine, Moscow Veterinary Academy, 1993
Doctor of Philosophy, Hebrew University of Jerusalem, 2005

Christina Leigh Stallings, M.A., M.S., Ph.D.
Professor of Molecular Microbiology (primary appointment)
Bachelor of Science, University of Mary Washington, 1999
Master of Arts, Columbia University, 2001
Master of Science, Columbia University, 2002
Doctor of Philosophy, Columbia University, 2005

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Associate Professor of Molecular Microbiology
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Master of Science, California State University, 1980
Doctor of Philosophy, Northwestern University, 1985

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Niraj Harish Tolia, Ph.D.
Adjunct Assoicate Professor of Molecular Microbiology
Bachelor of Science, Imperial College, 1999
Doctor of Philosophy, Watson School of Biological Sciences, 2004

V

Joseph Paul Vogel, Ph.D.
Associate Professor of Molecular Microbiology (primary appointment)
Mankato, 1986
Doctor of Philosophy, Princeton University, 1993

W

David Wang, Ph.D.
Professor of Molecular Microbiology (primary appointment)
Robert C. Packman Professorship
Professor of Pathology and Immunology
Bachelor of Science, Stanford University, 1992
Doctor of Philosophy, Massachusetts Institute of Technology, 1998

Sean P. J. Whelan, Ph.D.
Professor of Molecular Microbiology (primary appointment)
Head of the Department of Molecular Microbiology
Marvin A Brennecke Distinguished Professor of Molecular Microbiology
Doctor of Philosophy, University of Reading, 1993

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/usher 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 picronaviruses — 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.

Courses

Visit online course listings to view offerings for M30 MolMB (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M30).