

# 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

### Interim Department Chair

**Shabaana Abdul Khader, PhD** ([http://microbiology.wustl.edu/Bio\\_Sketches/khaderCV\\_2014.html](http://microbiology.wustl.edu/Bio_Sketches/khaderCV_2014.html))

### Program Director

**Christina L. Stallings, PhD** ([http://microbiology.wustl.edu/Bio\\_Sketches/stallingsCV\\_2014.html](http://microbiology.wustl.edu/Bio_Sketches/stallingsCV_2014.html))

Visit our website for more information about our faculty ([http://www.microbiology.wustl.edu/faculty\\_research\\_2014.htm](http://www.microbiology.wustl.edu/faculty_research_2014.htm)) and their appointments.

## A

### Shabaana Abdul Khader, PHD

Professor of Molecular Microbiology (primary appointment)  
Professor of Pathology and Immunology  
PHD Madurai Kamaraj University 2002

### Mushtaq Ahmed, MS, PHD, MS

Assistant Professor of Molecular Microbiology (primary appointment)  
MS Anna University Chennai 1997  
PHD Madurai Kamaraj University 2004  
BS Madurai Kamaraj University 1993  
MS Madurai Kamaraj University 1995

### Natalia S Akopyants, MS, MS1, PHD

Instructor in Molecular Microbiology (primary appointment)  
MS Moscow State University 1980  
MS1 Moscow State University 1981  
PHD Inst of BioOrg Chem-Rus A of S 1988

## B

### Wandy L. Beatty, PHD

Associate Professor of Molecular Microbiology (primary appointment)  
BS Montana State University 1989  
PHD Univ of Wisconsin Madison 1994

### Stephen M Beverley, PHD

Ernest St. John Simms Distinguished Professor of Molecular Microbiology (primary appointment)  
PHD University of California 1979  
BS California Institute Technolo 1973

### Tamara L. Brent, MD, PHD

Professor of Molecular Microbiology (primary appointment)  
Alumni Endowed Professor of Molecular Microbiology  
MD Johns Hopkins University Medic 1991  
PHD Johns Hopkins University Medic 1991  
BA Johns Hopkins University 1983

### Anne Elizabeth Mayer Bridwell, DVM, PHD

Instructor in Molecular Microbiology (Pending Dean's Approval) (primary appointment)  
DVM Virginia Tech 2009  
PHD Wake Forest University 2015  
BS Kenyon College 2015

## C

### Michael G Caparon Jr, PHD

Professor of Molecular Microbiology (primary appointment)  
BS Michigan State University 1981  
PHD University of Iowa 1985

## D

### Siyuan Ding, PHD

Assistant Professor of Molecular Microbiology (primary appointment)  
PHD Yale University 2014

### Deborah E Dobson, PHD

Associate Professor of Molecular Microbiology (primary appointment)  
BS University of Illinois 1976  
PHD University of CA Berkeley 1981

### Karen W Dodson, PHD

Instructor in Molecular Microbiology (primary appointment)  
PHD Washington Univ in St. Louis 1990  
BA University of Missouri 1983

## F

### Mario Federico Feldman, PHD

Professor of Molecular Microbiology (primary appointment)  
PHD Universidad del Buenos Aires 2004

## H

### Henry V Huang, PHD

Associate Professor of Molecular Microbiology (primary appointment)  
BA Occidental College 1972  
PHD California Institute Technolo 1977

### Scott James Hultgren, PHD

Helen L Stoever Professor of Molecular Microbiology (primary appointment)  
PHD Northwestern University 1987  
BS Indiana University Bloomington 1981

## K

### Sebla Bulent Kutluay, PHD

Assistant Professor of Molecular Microbiology (primary appointment)  
PHD Michigan State University 2009

## L

### Jennifer K Lodge, PHD

Professor of Molecular Microbiology (primary appointment)  
Associate Dean for Research  
Vice Chancellor for Research  
PHD Washington Univ in St. Louis 1988  
BS Oberlin College 1979

### Carolina Beatriz Lopez, PHD

Professor of Molecular Microbiology (primary appointment)  
PHD Mount Sinai School of Medicine 2002

## O

### Paul D Olivo, PHD, MD

Adjunct Assistant Professor of Molecular Microbiology (primary appointment)  
PHD University of Florida 1982  
BA George Washington University 1972  
MD University of Florida 1981

## R

### Charles M Rice III, PHD

Adjunct Professor of Molecular Microbiology (primary appointment)  
BS University of California 1974  
PHD California Institute Technolo 1981

## S

### Laurence David Sibley, PHD

Professor of Molecular Microbiology (primary appointment)  
Alan A and Edith L Wolff Distinguished Professor  
PHD Louisiana St University 1985  
BA Oberlin College 1978

### Asya Smirnov

Instructor in Molecular Microbiology (primary appointment)

### Christina Leigh Stallings, PHD, MA, MS

Associate Professor of Molecular Microbiology (primary appointment)  
BS Mary Washington College 1999  
PHD Columbia University 2005  
MA Columbia University 2001  
MS Columbia University 2002

## T

### Niraj Harish Tolia, PHD

Adjunct Associate Professor of Molecular Microbiology (primary appointment)  
BS Imperial College 1999  
PHD Watson Sch of Biological Scien 2004

## V

### Joseph Paul Vogel, BS2, BS1, PHD

Associate Professor of Molecular Microbiology (primary appointment)  
BS2 Minnesota State University 1986  
BS Minnesota State University 1986  
BS1 Minnesota State University 1986  
PHD Princeton University 1993

## W

### David Wang, PHD

Professor of Molecular Microbiology (primary appointment)  
Professor of Pathology and Immunology  
BS Stanford University 1992  
PHD Mass Inst of Technology (MIT) 1998

### Sean P. J. Whelan, PHD

Marvin A Brennecke Distinguished Professor of Molecular Microbiology (primary appointment)  
Head of the Department of Molecular Microbiology  
PHD University of Reading 1993

## Research Electives

### Molecular Biology Research Electives

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

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#### Stephen M. Beverley, PhD

McDonnell Pediatric Research Building, 9th Floor  
Phone: 314-747-2630

Molecular genetics of protozoan parasites and tropical diseases; biosynthesis of the parasite surface, genomics, virulence and drug action or resistance.

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#### 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.

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**Tamara L. Doering, MD, PhD**

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

The Doering lab studies the opportunistic fungal pathogen *Cryptococcus neoformans*, with the dual motivations of elucidating basic biology and identifying potential drug targets. Projects include studies of the synthesis and regulation of the main cryptococcal virulence factor, its polysaccharide capsule, and host-fungal interactions. Current approaches include those of biochemistry, cell and molecular biology, and genetics; studies also include high-throughput analysis of host-pathogen interactions and computational approaches to reconstructing the capsule regulatory network.

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**Daniel Goldberg, MD, PhD**

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

Biochemistry of malaria.

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**Henry Huang, PhD**

McDonnell Pediatric Research Building, 8th Floor  
Phone: 314-362-2755

RNA virus evolution; molecular biology of alphaviruses; alphavirus gene expression vectors; antiviral drug design.

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**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.

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**Amanda Lewis, PhD**

BJC Institute of Health, 10th Floor  
Phone: 314-286-0016

The focus of this lab is polymicrobial infection and women's health. Our lab is using biochemical, cellular and animal models to study infectious processes of the female urogenital tract that involve multiple bacterial species. For example, bacterial vaginosis (BV) is a polymicrobial imbalance of the vaginal flora characterized by reductions in beneficial lactobacilli and an overgrowth of mostly gram-negative bacteria. BV is the most common of all vaginal infections, and it is associated with increased risks of adverse pregnancy outcomes and greater susceptibility to sexually transmitted infections. We are collaborating with clinical investigators to define molecular and biochemical processes of BV and to identify patient groups most at risk for adverse events. Another active area of study in the lab involves polymicrobial UTI. We have developed a mouse model of polymicrobial UTI and are currently defining novel processes, bacterial factors and host factors that contribute to susceptibility.

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**Jennifer Lodge, PhD**

McDonnell Pediatric Research Building, 10210A  
Phone: 314-286-2125

Our focus is antifungal therapy and vaccine development against a fungal pathogen: *Cryptococcus neoformans*. This is a significant fungal pathogen, particularly in immunocompromised patients, that causes pulmonary infections and meningoencephalitis. It has been estimated that more than 1,000,000 new cases of *Cryptococcus* infection occur annually, resulting in more than 650,000 deaths per year, primarily in Africa. Our lab focuses on understanding the structure and synthesis of the fungal cell wall. We are working on it as a target for antifungal therapies and for vaccine development.

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**David Sibley, PhD**

McDonnell Pediatric Research Building, 9th Floor  
Phone: 314-362-8873

We study the intracellular survival mechanisms of protozoan parasites, focusing on the model parasite *Toxoplasma gondii*. Current approaches include high-resolution microscopy, genetic mapping of virulence traits, comparative genomic analyses, and the development of animal models for studying pathogenesis and resistance.

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**Christina L. Stallings, PhD**

McDonnell Pediatric Research Building, 8th 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.

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**Niraj H. Tolia, PhD**

McDonnell Pediatric Research Building, 8th Floor  
Phone: 314-286-0134

This lab's focus is on the structural and mechanistic studies of malaria pathogenesis. Our lab is interested in the molecular events that occur during erythrocyte invasion by *Plasmodium* parasites. We use the tools of structural biology, biochemistry and biophysics to examine proteins and protein complexes associated with these events.

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**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.

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**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.

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## Courses

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

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**M30 MoIMB 526 Microbes and Pathogenesis**

The course will familiarize the student with the diversity of pathogenic microbes and the different ways they can survive and cause disease. It is a concepts-based course, emphasizing the general principles of microbial pathogenesis. Selected pathogenic microbes are used as models to describe pathogen-host interactions in molecular detail. The laboratory will introduce the student to the principles and the basic techniques of diagnostic bacteriology.  
Credit 30 units.

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**M30 MoIMB 900 Research Elective - Molecular Microbiology**

Research opportunities may be available. If interested, please contact the Department of Molecular Microbiology.

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