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

Degrees & Requirements

More information about Department of Molecular Microbiology degrees and requirements (http://bulletin.wustl.edu/grad/gsas/dbbs) can be found in the Graduate School Bulletin.

Research

M30 MolMB 900

Cross-listed with L41 Biol 590

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.

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.

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.

Daniel Goldberg, MD, PhD
McDonnell Pediatric Research Building, 9th Floor
Phone: 314-362-1514

Biochemistry of malaria.

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.

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 pilus 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 pilus 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.

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.

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.

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

A

Shabaana Abdul Khader, PHD
Interim Head of the Department of Molecular Microbiology
Professor of Molecular Microbiology
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
BS Madurai Kamaraj University 1993
PHD Madurai Kamaraj University 2004
MS Madurai Kamaraj University 1995

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

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)
BS California Institute Technolo 1973
PHD University of California 1979

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Alumni Endowed Professor of Molecular Microbiology
MD Johns Hopkins University Medich 1991
PHD Johns Hopkins University Medic 1991
BA Johns Hopkins University 1983

C

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

D

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PHD Yale University 2014

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

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

F

Mario Federico Feldman, PHD
Associate Professor of Molecular Microbiology (primary appointment)
PHD Universidad del Buenos Aires 2004

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Henry V Huang, PHD
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BA Occidental College 1972
PHD California Institute Technolo 1977

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PHD Michigan State University 2009

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PHD University of San Diego 2006
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Vice Chancellor for Research
PHD Washington Univ in St. Louis 1988
BS Oberlin College 1979

O

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BA George Washington University 1972
PHD University of Florida 1982

R
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PHD California Institute Technolo 1981

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

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

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

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

Sean P. J. Whelan, PHD
Marvin A Brennecke Distinguished Professor of Molecular Microbiology (primary appointment)
PHD University of Reading 1993

Courses

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.

M30 MoIMB 900 Research Elective — Molecular Microbiology
Research opportunities may be available. If interested, please contact the Department of Molecular Microbiology.