



# DIVISION OF INFECTIOUS DISEASES

## Mission

The mission of the Division of Infectious Diseases is:

- To excel in clinical care, education, and research
- To conduct and publish basic and clinical research on infectious diseases in children
- To serve as a national resource for pediatric transplant infectious diseases
- To recruit and train outstanding pediatric infectious disease fellows

## FACULTY

**John V. Williams, MD**

Professor of Pediatrics  
Henry L. Hillman Endowed Chair  
in Pediatric Immunology  
Chief, Pediatric Infectious Diseases  
Affiliate, Center for Vaccine Research  
Faculty Member, Graduate Programs  
in Molecular Virology and  
Microbiology and Immunology

**Brian T. Campfield, MD**

Assistant Professor of Pediatric  
Infectious Diseases

**Carolyn B. Coyne, PhD**

Associate Professor of Pediatrics  
Associate Professor of Immunology  
Associate Professor of Microbiology  
and Molecular Genetics  
Director, Center for Microbial  
Pathogenesis

**Terence S. Dermody, MD**

Vira I. Heinz Professor and Chair,  
Department of Pediatrics  
Professor of Microbiology and  
Molecular Genetics  
Physician-in-Chief and  
Scientific Director

**Michael Green, MD, MPH**

Professor of Pediatrics, Surgery and  
Clinical and Translational Science  
Codirector, Transplant Infectious  
Diseases  
Medical Director, Infection Prevention  
Director, Antimicrobial Stewardship  
Program

**Philana Ling Lin, MD, MSc**

Associate Professor of Pediatrics  
Program Director, Infectious Diseases  
Fellowship Training Program  
Affiliate, Center for Vaccine Research  
Faculty Member, Graduate Program  
in Molecular Virology and  
Microbiology and Immunology

**Marian G. Michaels, MD, MPH**

Professor of Pediatrics and Surgery  
Director, Pediatric Human  
Immunodeficiency Virus  
(HIV) Center  
Codirector, Transplant Infectious  
Diseases

**Andrew Nowalk, MD, PhD**

Assistant Professor of Pediatric  
Infectious Diseases  
Codirector, Pediatric Residency  
Program, Department of Pediatrics  
Advisory Dean, University of  
Pittsburgh School of Medicine  
Professional Staff President, Children's  
Hospital of Pittsburgh of UPMC

**Laurie A. Silva, PhD**

Research Assistant Professor

**Gwen Taylor, PhD**

Research Instructor of Pediatrics

## OVERVIEW OF DIVISION

**T**he Division of Infectious Diseases provides consultation in the diagnosis and management of infectious diseases in hospitalized and outpatient children. The division consists of academically and clinically renowned faculty who contribute in many areas, including basic and clinical research, antimicrobial and vaccine development, microbial pathogenesis, outcomes research in clinical infectious diseases, hospital infection control and epidemiology, and transplant infectious disease. The division oversees an Antibiotic Stewardship Program, working with pharmacists to streamline and optimize antimicrobial use at Children's Hospital of Pittsburgh of UPMC. The goals of the program are to ensure that patients receive cost-efficient antimicrobials with the lowest risk of side effects and decreased risk for antimicrobial resistance. The division also supervises the Children's Hospital Infection Prevention Program, which works to develop guidelines to prevent hospital-acquired infections and manage potential outbreaks. The division conducts both practice-based and hospital-based clinical studies of infectious diseases, including surveillance of acute respiratory and gastrointestinal infections; new vaccines and antimicrobials; *Streptococcus pneumoniae*, cytomegalovirus (CMV), influenza, and other respiratory viral infections; epidemiology and clinical features of Lyme disease; and prophylaxis and treatment of infections in transplant patients. The division has several active basic researchers focused on microbial attachment and cell entry, immunity, and pathogenesis; lung immunobiology and inflammation; and vaccine development. Pathogens studied by investigators in the division include adenovirus, chikungunya virus (CHIKV), human metapneumovirus (MPV), influenza virus, *Mycobacterium tuberculosis*, reovirus, and rhinovirus.

## CLINICAL ACTIVITIES

**T**he Division of Infectious Diseases serves the pediatric population of Pittsburgh and the surrounding regions by providing consultation and treatment for children with rare, complicated, and difficult-to-treat infections. The service completed 3,582 consultative visits for inpatients and 875 for outpatients during fiscal year 2016. The Pediatric HIV Clinic provides ongoing care to HIV-infected children in Western Pennsylvania and the tristate region, as well as expert pre- and postnatal consultative services for HIV-infected pregnant women and their newborns.

In addition to treating children with complex infections, the Division of Infectious Diseases is a vital resource for health care providers and the public, both locally and nationally. Locally, the Division of Infectious Diseases is a collaborative partner with Pittsburgh Public Schools regarding influenza vaccination and with the Allegheny County Health Department on matters of communicable infectious diseases in the pediatric population of the Pittsburgh area, especially HIV and tuberculosis (TB). Faculty members routinely provide educational outreach to community health care providers in the tristate region, such as the Children's Institute of Pittsburgh, and educate the public about community-acquired and emerging pediatric infectious diseases through frequent interviews with local news channels, such as KDKA-TV and radio (for example, Middle East respiratory syndrome virus, otherwise known as MERS). Nationally, the faculty serves on committees that establish guidelines for institutions, such as the Centers for Disease Control and Prevention (CDC), the U.S. Food and Drug Administration (FDA), the Organ Procurement Transplant Network (OPTN)/United Network for Organ Sharing (UNOS), the American Society for Transplantation, the National Institutes of Health (NIH), the Pediatric Infectious Diseases Society, and the Society for Pediatric Research. Members of the faculty give invited talks at numerous meetings of medical and scientific societies, such as the American Association of Pediatrics, the Infectious Diseases Society of America, the American Society for Microbiology, the American Transplant Congress, and the Society for Pediatric Research.

## RESEARCH AND OTHER SCHOLARLY ACTIVITIES

### John V. Williams, MD

John V. Williams joined the division as chief in April 2015 after 12 years on the faculty at Vanderbilt University Medical Center. Williams is an international authority on the epidemiology, immunity, and pathogenesis of respiratory viral infections.

Williams is a graduate of the University of Virginia and completed medical school at the Medical College of Virginia/Virginia Commonwealth University. He trained in pediatrics at Children's Hospital of Pittsburgh/University of Pittsburgh and then in infectious diseases at Vanderbilt. During his fellowship, he began working on human MPV just after the virus was discovered. Since then, Williams' team has described the clinical features and epidemiology of MPV. Articles have been published in top journals, including the *Journal of Clinical Investigation*, the *Journal of Infectious Diseases*, *Nature Structural and Molecular Biology*, the *New England Journal of Medicine*, *Proceedings of the National Academy of Sciences*, and *PLOS Pathology*, among others. For this superb body of work on MPV, Williams won the 2014 E. Mead Johnson Award for Pediatric Research, the most prestigious research award in academic pediatrics. Williams has been very successful in extramural research funding, currently including R01, R21, and U01 grants.

Williams has extensive experience in other academic activities, including NIH study sections; leadership in national and international academic societies; and membership on the editorial boards of the *Journal of*

*Infectious Diseases*, the *Journal of the Pediatric Infectious Diseases Society*, and the *Journal of Virology*. He has been an active mentor of students, residents, and fellows. He received the inaugural Caroline B. Hall Award for Translational Research from the Pediatric Infectious Diseases Society in 2015 and was instilled as the Henry L. Hillman Professor of Pediatric Immunology in 2017.



**John V. Williams, MD**  
Chief, Pediatric Infectious Diseases

### RESEARCH

The focus of Williams' research is the basic and clinical investigation of respiratory viruses. A major area of investigation is the immunity and pathogenesis of human MPV. MPV is a recently discovered paramyxovirus that is a leading cause of acute lower respiratory tract illness in infants and children worldwide. Williams published molecular epidemiologic studies establishing the importance of MPV, in the process isolating dozens of field strains collected over 20 years. His team developed rodent models, used those systems to study MPV immunity and pathogenesis, and showed that the fusion (F) protein is the sole determinant of antibody-mediated protection. Williams' group identified RGD-binding integrins as receptors for MPV and showed that MPV uses integrins to enter cells by endocytosis, a novel mechanism of entry for

this type of virus. His laboratory discovered that MPV and other acute respiratory viral infections cause impairment of lung CD8<sup>+</sup> T cells via PD-1 signaling, a pathway previously associated with chronic infections and cancer. Williams' laboratory has generated candidate vaccines and monoclonal antibodies against MPV and identified mechanisms by which MPV subverts the host innate immune response.

Williams also leads a large CDC-funded surveillance study of acute respiratory and gastrointestinal infections in children based at Children's Hospital of Pittsburgh, one of only seven sites nationally. He conducts collaborative research with clinical investigators at the University of Pittsburgh and international sites. He has participated in studies of respiratory virus epidemiology in North America, South America, the Middle East, and Africa. His group has published studies on coronaviruses, influenza virus, MPV, parainfluenza viruses, respiratory syncytial virus, and rhinoviruses in diverse populations.

Williams has active research projects in several areas.

- Epidemiology and burden of acute respiratory and gastrointestinal infections
- Effectiveness of influenza and rotavirus vaccines in children
- Mechanisms by which MPV and other respiratory viruses impair lung CD8<sup>+</sup> T cells
- Candidate vaccines and therapeutic monoclonal antibodies against MPV
- High-throughput screening for small-molecule inhibitors of MPV
- Human T-cell responses to MPV

The overarching goals of Williams' research on MPV are to elucidate mechanisms of viral pathogenesis, understand the contribution of host immune responses to pathogenesis, and guide the development of interventions against this important human pathogen.

#### ADVISORY COMMITTEE MEMBERSHIPS

- Scientific Review Group 08 ZHD1 DSR-K1 NIH Loan Repayment Program
- NIH MID-B B Study Section
- Scientific Advisory Board, Quidel
- Independent Data Monitoring Committee, GlaxoSmithKline
- Education Committee, American Society for Virology
- Chair, Fellowship Awards Committee, Pediatric Infectious Diseases Society

- Research Committee, Pediatric Infectious Diseases Society
- Chair, Young Investigator Coaching Program, Society for Pediatric Research

#### EDITORSHIPS

- Editorial Board, *Journal of Infectious Diseases*
- Editorial Board, *Journal of the Pediatric Infectious Diseases Society*
- Editorial Board, *Journal of Virology*

#### MAJOR LECTURESHIPS AND SEMINARS

- "Human MPV: The End of the Beginning," pediatric grand rounds, Emory University School of Medicine, Atlanta, Ga., 2016
- "Human MPV: From Holland to the Bronx," pediatric grand rounds, Children's Hospital at Montefiore, Albert Einstein College of Medicine, New York, N.Y., 2017
- "Violets Are Blue: Human MPV Pneumonia," pediatric grand rounds, Hassenfeld Children's Hospital of New York, NYU Langone Medical Center, New York, N.Y., 2017
- "Human MPV: Haciendo tos de Buenos Aires," invited talk, Fundación INFANT, Buenos Aires, Argentina, 2017

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- Alpha Omega Alpha, selective honorary society, by election
- Society for Pediatric Research, selective honorary society, by election
- American Association of Immunologists
- American Society for Virology
- Pediatric Infectious Diseases Society
- Infectious Diseases Society of America
- American Society for Microbiology
- American Association for the Advancement of Science

#### HONORS

- E. Mead Johnson Award in Pediatric Research, Society for Pediatric Research
- Vanderbilt Mary Ann and John H. Hash Award for Outstanding Teaching of Graduate Students in Microbiology and Immunology
- Inaugural Caroline B. Hall Lecture, Infectious Diseases Society of America
- Henry L. Hillman Endowed Chair in Pediatric Immunology

**Brian T. Campfield, MD****RESEARCH**

Brian T. Campfield joined the division as assistant professor of pediatrics in 2014, providing patient care and conducting research investigating the role of follistatin-like protein 1 (FSTL-1) in host defense and immunity, centered on the role of FSTL-1 in the lung.

Campfield is a graduate of the University of Virginia and completed medical school at the University of Pittsburgh. He completed his pediatrics residency and pediatric infectious diseases fellowship at the Children's Hospital of Pittsburgh of UPMC/University of Pittsburgh. During fellowship, he reported the first study of FSTL-1 in response to infection in the murine model of Lyme disease. Subsequently, under the mentorship of Jay Kolls, he identified a novel and critical role for FSTL-1 in lung homeostasis. That work is the basis of his NIH K08 Career Development Award, which was funded in 2015.

The Campfield Laboratory focuses on host-pathogen interaction in the lung, viewed through the lens of FSTL-1 function, with a focus on innate and adaptive immune responses. His laboratory has identified a role for FSTL-1 in regulation of IL-17 signaling pathways.

*A Critical Role for FSTL-1 in Lung Homeostasis.* This work aims to investigate the temporospatial expression of FSTL-1 in the lung and the effect of FSTL-1 loss in a murine model of lung inflammation and emphysema development. This study additionally aims to examine the role of interleukin 17RA and CCR2 signaling in FSTL-1-dependent lung disease. A further aim of this research is to determine whether the role of FSTL-1 in lung homeostasis is intrinsic to lung tissue or due to circulating FSTL-1 protein. Through this Career Development Award, Campfield receives mentorship from John V. Williams, Steven D. Shapiro, Prabir Ray, and Jay Kolls. Additional studies under way are investigating the role of FSTL-1 in acute lung injury, utilizing novel tools developed in his laboratory to identify FSTL-1 function at the cellular level. This research is funded through the spring of 2020.

*Mechanisms of FSTL-1-Mediated Inflammatory Signaling.* Cellular signaling pathways of FSTL-1-mediated inflammation are largely unknown. Campfield has developed several *in vitro* systems to assess the role of FSTL-1 in cellular signaling, employing genetic and molecular suppression, overexpression, and tagged expression. These studies have identified a novel function for FSTL-1 as a modulator of transcriptional regulation.

**ADVISORY COMMITTEE MEMBERSHIPS**

- Member, Pediatric Scientist Training Program Steering Committee, Children's Hospital of Pittsburgh of UPMC
- Founding member, Pittsburgh Pediatric Physician Scientist Peer Mentoring Group, Children's Hospital of Pittsburgh of UPMC, University of Pittsburgh School of Medicine
- Member, Infection Control Committee, Children's Hospital of Pittsburgh of UPMC
- Member, Physician Wellness Task Force, Children's Hospital of Pittsburgh of UPMC
- Member, Career Mentoring Program, University of Pittsburgh School of Medicine
- Interviewer, Residency Program, Children's Hospital of Pittsburgh of UPMC
- Interviewer, Infectious Diseases Fellowship Program, Children's Hospital of Pittsburgh of UPMC

**MAJOR LECTURESHIPS AND SEMINARS**

- "A Follistatin-Like Protein 1 Puzzle: IL-17, Inflammation, and the Lung," Child Health Research Center (K12) 10th Annual Retreat, Children's Hospital of Pittsburgh, Pittsburgh, Pa., April 2017
- "Follistatin-Like Protein 1 Modulates IL-17 Signaling Via IL-17RC Regulation in Stromal Cells," Immunology 2017, Washington, D.C., May 2017

**PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS**

- Fellow, American Academy of Pediatrics
- Infectious Diseases Society of America
- Pediatric Infectious Diseases Society
- American Association of Immunology
- American Thoracic Society
- American Association for the Advancement of Science

**HONORS**

- Pediatric Loan Repayment Program Award, NIH
- Mentored Career Development Award, NIH
- Early Career Faculty Travel Award, American Association of Immunologists

**Carolyn B. Coyne, PhD****RESEARCH**

The Coyne Laboratory studies the pathways by which viruses cross cellular barriers and the mechanisms by which these barriers restrict viral infections. Research primarily focuses on the polarized epithelium that lines the gastrointestinal tract and placental trophoblasts, which comprise the primary cellular barrier of the human placenta. The laboratory focuses on delineating the pathways targeted

by RNA viruses (e.g., enteroviruses and flaviviruses) to promote their replication and spread. The work is highly multidisciplinary and encompasses aspects of cell biology, tissue engineering, immunology, and microbiology.

*The Placental Barrier.* The placenta is unlike any other human organ. Given its essential role in protecting the fetus, the placenta must function as a barrier and conduit between the maternal and fetal environments and serve as an active immunological tissue that responds to microbes present in maternal circulation. The research program asks two central questions: (1) What are the mechanisms by which the placenta restricts the vertical transmission of micro-organisms and (2) How do micro-organisms associated with congenital disease breach the placental barrier? The laboratory established a new and important paradigm that, in addition to its role as a physical barrier, the placenta is a dynamic and highly reactive chemical barrier that uses multiple classes of molecules, including type III interferons and microRNAs, to protect the fetus and maternal host from viral infections. However, several key questions remain, including: (1) Are there differences in the mechanisms employed by the placenta to restrict microbial access at different stages of gestation, (2) What mechanisms are used by the placenta to defend against non-viral pathogens, and (3) What is the influence of the systemic maternal immune response on placental antimicrobial defenses?

*The Gastrointestinal Barrier.* The human gastrointestinal (GI) tract is a complex organ, with an epithelial surface that provides a protective and immunological barrier in a complex and diverse microbial environment. Enteroviruses are leading causes of human infections worldwide, particularly in infants and children, and they infect primarily via the fecal-oral route. These viruses, which include poliovirus, coxsackievirus, echovirus, enterovirus D68 (EV-D68), and enterovirus 71 (EV71), are small, single-stranded RNA viruses belonging to the *Picornaviridae* family. The events that surround enterovirus infections of the human GI epithelium remain poorly understood. The research team recently developed two human models of the GI epithelium to better define enterovirus-GI interactions. These include a cell line-based three-dimensional model and a human primary stem cell-derived enteroid model. Ongoing research in the laboratory is focused on defining the mechanisms by which enteroviruses bypass the GI barrier to initiate infection using these organotypic three-dimensional cell models, with a specific focus on the cell biological and immunological events associated with enterovirus infections of the GI tract.

*Cellular Pathways Targeted by RNA Viruses to Promote Their Replication.* RNA viruses usurp a variety of host cell pathways to facilitate their replication. Studies focus on identifying the pathways targeted by RNA viruses (including enteroviruses and flaviviruses) to promote their replication and spread. An obligate step in the life cycle of positive-sense RNA viruses is the formation of membrane-enriched organelles, termed replication organelles, which provide the structural support for viral replication. Multiple mechanisms have been proposed for the generation of these membranes, including manipulation of the host autophagic pathway, a process that removes damaged organelles via the formation of double membrane-bound vesicles. Current studies in the laboratory are focused on the identification and characterization of novel regulators of host cell autophagy and on the identification of mechanisms employed by RNA viruses to specifically modulate the host autophagic pathway.

Coyne has active research grants in the following areas. Enterovirus infection of polarized epithelial cells (National Institute of Allergy and Infectious Diseases [NIAID], NIH R01AI081759)

- The response of placental cells to teratogenic viruses during human pregnancies (25 Club of Magee-Womens Hospital)
- Primary human trophoblasts and the transfer of viral resistance (National Institute of Child Health and Development [NICHD], NIH R01 HD075665)
- The actin cytoskeleton and innate immune signaling (Burroughs Wellcome Fund)

#### ADVISORY BOARD AND COMMITTEE MEMBERSHIPS

##### Intramural:

- Faculty Executive Committee, University of Pittsburgh School of Medicine
- Executive Committee, Program in Microbiology and Immunology
- Promotions Committee, Department of Pediatrics

##### Extramural:

- Standing member, NIAID Virology A, NIH Study Section
- Member, Special Emphasis Review Panel, Rapid Assessment of Zika Virus Complications (R21), NIAID
- Member, Scientific Organizing Committee, Viruses 2018: Breakthroughs in Virus Biology, Barcelona, Spain
- Member, Microbe Program Committee, American Society for Microbiology

**EDITORIAL BOARDS**

- Editorial Board, *Journal of Virology*
- Editorial Board, *Virology*
- Editor, mini-reviews, *Journal of Virology*
- Opinions editor, *PLoS Pathogens*
- Editorial Board, *mBio*

**MAJOR LECTURESHIPS AND SEMINARS**

- Invited speaker, Maternal-Fetal Crosstalks Keystone Symposia, Washington, D.C., 2017
- Invited speaker, NIH Conference on Innate Immunity: Sensing, Signaling, and Selection, Washington, D.C., 2017
- Invited speaker, Vector-Borne Viruses Symposium, Rocky Mountain Laboratories, Hamilton, Mont., 2017
- Invited speaker, “How To”: A Career Planning Satellite Symposium for Junior Virologists, American Society for Virology, Madison, Wis., 2017
- “Crossing the Placenta,” invited speaker and convener, special symposium, Microbe 2017, American Society for Microbiology, New Orleans, La., 2017
- Keynote speaker, Mount Sinai–New York University School of Medicine Joint Training Program in Virus-Host Interactions, New York Academy of Medicine, New York, N.Y., 2017
- Invited speaker, Gordon Research Conference on Viruses and Cells, Il Ciocco, Italy, 2017
- Invited speaker, “Cell Biology of Pathogen Entry Into Host Cells,” Microbiology Society annual meeting, Edinburgh, United Kingdom, 2017
- Invited speaker, mini-symposium on pathogenic human viruses, Duke University, Durham, N.C., 2017
- Invited speaker, Placenta Satellite Symposium, annual meeting of the Society for Reproductive Investigation, Orlando, Fla., 2017
- Invited speaker, 32nd Congress of the International Society for Advancement of Cytometry, Boston, Mass., 2017
- Virology Seminar Series, Harvard University, Boston, Mass., 2017
- Indiana University Department of Microbiology, Indianapolis, Ind., 2017
- St. Jude Children’s Research Hospital, Children’s Infection Defense Center, Memphis, Tenn., 2017
- University of Illinois–Urbana Champaign Department of Microbiology, 2017
- University of Maine Department of Molecular and Biomedical Sciences, Orono, Maine, 2017
- University of North Carolina at Chapel Hill Department of Microbiology and Immunology, Chapel Hill, N.C., 2017
- University of New Mexico Department of Microbiology, Albuquerque, N.M., 2017

- University of Wisconsin Department of Microbiology, Madison, Wis., 2017
- Western University, London, Ontario, Canada, 2017

**PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS**

- American Society for Microbiology
- American Society for Virology
- Program Planning Committee: Abstract Selection, American Society of Virology
- Communications Committee, American Society of Virology
- Standing member, NIAID Virology A, NIH
- Study Section Member, Scientific Organizing Committee: Viruses 2018: Breakthroughs in Virus Biology, Barcelona, Spain
- Member, Microbe Program Committee, American Society for Microbiology

**Terence S. Dermody, MD****RESEARCH**

Terence Dermody is a virologist with interests in viral pathogenesis and vaccine development. He has focused mainly on reovirus, an important experimental model for studies of viral encephalitis in infants and young children, and CHIKV, a mosquito-borne virus that causes massive epidemics of febrile arthritis.

The work in the Dermody laboratory has encompassed several interrelated themes, including the structural basis of viral attachment and cell entry, mechanisms of genome replication and packaging, patterns of cell signaling and gene expression occurring in response to viral infection, mechanisms of virus-induced apoptosis and its significance in the viral life cycle, and the role of viral receptor distribution and utilization in disease pathology. The laboratory also is developing viral vectors for oncolytic and vaccine applications.

Dermody has active research grants in several areas.

- The molecular basis of reovirus pathogenesis (NIAID, NIH R01 AI038296-22 to -25)
- Cell biology of reovirus infection (NIAID, NIH R01 AI032539-21 to -25)
- Viral infections and celiac disease pathogenesis (National Institute of Diabetes and Digestive and Kidney Diseases, NIH R01 DK098435-01 to -04)
- Reovirus attachment mechanisms (NIAID, NIH R01 AI118887-01 to -05)
- CHIKV replication and pathogenesis (NIAID, NIH R01 AI123348-01 to -05)



- Molecular basis of pediatric disease (NICHD, NIH K12 HD052892-10)
- Basic and translational research training for Children's Hospital of Pittsburgh pediatric fellows (NICHD, NIH T32 HD071834-04 to -05)
- International Congress of Virology travel grant (NIAID, NIH R13 AI131504-01)

#### ADVISORY BOARD AND COMMITTEE MEMBERSHIPS

##### Intramural:

- Chair Management Committee, UPMC
- University of Pittsburgh Physicians Council of Clinical Chairs, UPMC
- Board of Trustees, Children's Hospital of Pittsburgh of UPMC
- Executive staff, Children's Hospital of Pittsburgh of UPMC
- Chair, Research Strategic Planning Committee, Children's Hospital of Pittsburgh of UPMC
- Faculty Executive Committee, University of Pittsburgh School of Medicine
- Search Committee, Center for Vaccine Research
- Chair, Appointments and Promotions Committee, University of Pittsburgh Department of Pediatrics
- Chair, Research Advisory Committee, University of Pittsburgh Department of Pediatrics

##### Extramural:

- Chair, Virology Division, International Union of Microbiological Societies
- Reoviridae Study Group, International Committee on Taxonomy of Viruses
- Board of Governors, American Academy of Microbiology
- Board of Directors, Burroughs Wellcome Fund
- External Advisory Board, Medical Scientist Training Program, University of Cincinnati College of Medicine
- External Advisory Committee, MD-PhD Training Program, University of Florida College of Medicine
- Scientific Advisory Committee, Autophagy Modulators as Novel Broad-Spectrum Anti-Infective Agents, Center of Excellence for Translational Research, Washington University, St. Louis, Mo.
- External Advisory Board, Medical Scientist Training Program, Duke University School of Medicine
- External Advisory Board, Department of Microbiology, Icahn School of Medicine at Mount Sinai
- External Advisory Committee, Molecular Dissection of Norovirus Replication and Pathogenesis to Develop Therapeutics, Baylor College of Medicine
- Scientific Program Vice chair, 17th International Congress of Virology, Singapore, 2017

#### EDITORIAL BOARDS

- Editor, *Journal of Virology*
- Spotlight Editor, *Journal of Virology*
- Member, Biology, Microbiology Faculty, Virology Section, Faculty of 1000 Editor, *mBio*
- Associate Editor, *Annual Review of Virology*

#### MAJOR LECTURESHIPS AND SEMINARS

- "Formation and Function of Reovirus Replication Organelles," Forefront of Virus-Host Interactions Conference, Basel, Switzerland, 2016
- "A Fascination With Viral Homing," Medical Scientist Training Program, University of North Carolina at Chapel Hill, Chapel Hill, N.C., 2016
- "Homing of Reovirus From Intestine to Brain: It Takes Two Receptors," Department of Immunology and Microbial Sciences, Scripps Research Institute, La Jolla, Calif., 2016
- Facilitator, Infectious Diseases Workshop, Cornell Leadership Program for Veterinary Students, New York State Veterinary College, Cornell University, Ithaca, N.Y., 2016
- "How a Virus Travels From Intestine to Brain," Department of Molecular and Biomedical Sciences, University of Maine, Orono, Maine, 2016
- "A Neural Targeting Receptor for Reovirus," Department of Infectious Diseases, Heidelberg University, Heidelberg, Germany, 2016
- "Homing of Reovirus From Intestine to Brain: It Takes Two Receptors," keynote speaker, Immunobiology and Immunopathogenesis Symposium, Department of Immunobiology, University of Arizona, Tucson, Ariz., 2016
- "Following the Journey of Reovirus From Intestine to Brain," plenary speaker, American Society for Microbiology annual meeting, Boston, Mass., 2016
- "A Way Forward for Physician-Scientists," keynote speaker, Medical Scientist Training Program annual retreat, University of Pittsburgh School of Medicine, Pittsburgh, Pa., 2016
- "A Way Forward for Physician-Scientists," keynote speaker, Medical Scientist Training Program annual retreat, Pennsylvania State University College of Medicine, State College, Pa., 2017
- "AOA and the Healthcare Transformations of the 21st Century," David Seegal Alpha Omega Alpha Lecture, Columbia University College of Physicians and Surgeons, New York, N.Y., 2017
- "CHIKV: A Global Emerging Viral Threat," Harold C. Neu Lecture, Department of Medicine, Columbia University College of Physicians and Surgeons, New York, N.Y., 2017

- “Cell Biology of Reovirus Infection,” keynote speaker, Virus-Host Interactions Symposium, Mount Sinai–New York University School of Medicine Joint Training Program in Virus-Host Interactions, New York, N.Y., 2017
- “Function of Reovirus Replication Organelles,” Department of Microbiology and Immunology, Stanford University School of Medicine, Stanford, Calif., 2017
- “A Neural Targeting Receptor for Reovirus,” Division of Infectious Diseases, Department of Medicine, Columbia University College of Physicians and Surgeons, New York, N.Y., 2017
- “CHIKV: A Global Emerging Viral Threat,” Department of Microbiology and Immunology, University of Arkansas for Medical Sciences, Little Rock, Ark., 2017
- Facilitator, Infectious Diseases Workshop, Cornell Leadership Program for Veterinary Students, New York State Veterinary College, Cornell University, Ithaca, N.Y., 2017

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- Fellow, Infectious Diseases Society of America
- Fellow, American College of Physicians
- American Society for Clinical Investigation
- Society for Pediatric Research
- Association of American Physicians
- Fellow, American Academy of Microbiology
- American Pediatric Society
- Fellow, American Association for the Advancement of Science
- Fellow, Pediatric Infectious Diseases Society

#### HONORS

- D.C. White Research and Mentoring Award, American Society for Microbiology, 2016

### Michael Green, MD, MPH

#### RESEARCH

The major focus of Michael Green’s laboratory has been on the epidemiology of antimicrobial resistance in children in hospital and community settings. His laboratory is currently funded through multiple NIH grants and contracts to carry out the work. Green’s interest in antibiotic resistance is further reflected in the efforts of the Children’s Hospital of Pittsburgh of UPMC Antimicrobial Stewardship Program (ASP), which he directs. More recently, he has expanded his efforts regarding his longstanding interest in infections in immunocompromised hosts, including transplant patients and children receiving immune suppression for autoimmune disease.

*Short-Course Therapy for Urinary Tract Infection (UTI) in Children (SCOUT).* This NIH-funded study is a multicenter, randomized, controlled trial to determine whether short-course antimicrobial therapy (five days) is non-inferior to standard-course antimicrobial therapy (10 days) in children with UTI. Green’s role in the study is to evaluate serial surveillance cultures from participants to track potential differences in the development of antibiotic resistance in isolates of *Escherichia coli* and *Klebsiella pneumoniae*. Resistant isolates will undergo evaluation for mechanism of resistance. Green is also performing surveillance screening for colonization with carbapenem-resistant *Enterobacteriaceae* to provide a sense of the prevalence of colonization in children with these increasingly important gram-negative bacteria.

*Difference in Infecting and Colonizing Enterobacteriaceae from Short-Course Versus Standard Therapy.* This R21 study (principal investigator [PI]: Scott Weissman, University of Washington) is an NIH-funded ancillary study whose goal is to carry out a detailed molecular analysis of bacterial isolates recovered as part of the SCOUT study to evaluate the impact of antibiotic drug and length of therapy on the indigenous flora and the likelihood of antimicrobial resistance and to assess the presence of virulence factors associated with UTI. Although accrual of specimens and funding for this study were completed in spring 2015, analysis of results from this ancillary study cannot begin until accrual for the primary study is completed.

*Type 1 Diabetes TrialNet/University of South Florida (Data Coordinating Center).* Green continues to serve as one of two infectious disease consultants for the NIH Type I Diabetes TrialNet. This clinical trial network evaluates potential interventions aimed at modifying the natural history of insulin-dependent diabetes mellitus in children. Many of these interventions include immunosuppressive regimens and are therefore potentially associated with the development of opportunistic infections. Green’s role as infectious disease consultant remains formally integrated into the protocol-development and approval process for TrialNet. Additionally, the work has resulted in several infectious diseases–related publications, and the infectious diseases group within TrialNet continues to develop ancillary studies to evaluate the impact of immunosuppression in subsequent TrialNet protocols.

*Improving Diagnosis and Treatment of Pediatric Candidiasis.* The goal of this NIH-funded, multicenter study is to develop new evidence-based treatment guidelines for invasive candidiasis in children. It retrospectively collects data to compare the effectiveness of echinocandin versus

amphotericin B or triazole antifungal therapy for pediatric invasive candidiasis, as well as to characterize the incidence of all invasive candidiasis infections in pediatric patients. Green has served as the site PI since Children's Hospital of Pittsburgh's involvement in this study began in 2015.

*Fungal Biomarkers for Diagnosis and Response to Therapy for Pediatric Candidemia.* The goals of this NIH-funded, prospective, multicenter study include defining the operating characteristics of fungal biomarker assays in pediatric patients at high risk for developing invasive candidiasis, determining how fungal biomarkers change in response to antifungal treatment, and creating a biobank of blood samples from pediatric patients who are at high risk for or have invasive candidiasis for future testing of fungal biomarker assays and development of new fungal biomarker assays. Green has served as the site PI since Children's Hospital of Pittsburgh's participation in this study began in 2015.

*A Multicenter Prospective Study of Human Adenovirus Infection and Disease in Pediatric Human Stem Cell Transplant (HSCT) Recipients.* The goal of this NIH-funded, multicenter Broad Agency Announcement (BAA) is to prospectively study the epidemiology of adenovirus after pediatric HSCT during the first six months after HSCT for development of adenovirus infection and disease. Green is the site co-PI for this study.

*A Phase II, Multicenter, Prospective, Randomized, Double-Blind Study to Assess the Clinical and Antiviral Efficacy and Safety of Nitazoxanide for the Treatment of Norovirus in Hematopoietic Stem Cell and Solid Organ Transplant Recipients > 6 Years of Age.* The purpose of this NIH-funded, phase II, multicenter, prospective, randomized, double-blind study is to assess the clinical and antiviral efficacy and safety of nitazoxanide for the treatment of acute and chronic norovirus in hematopoietic stem cell and solid organ transplant recipients. Green is site co-PI for this study.

*NIH/University of Pittsburgh Clinical and Translational Science Institute.* The goal of the Clinical and Translational Science Institute is to provide the clinical research infrastructure for medical scientists who conduct patient-oriented, research-related care for disorders of infancy, childhood, and adolescence. Green's current role continues to be to provide individual support and workshops on informed consent to new clinical investigators and their research staff.

#### ADVISORY COMMITTEE MEMBERSHIPS

- Chair, Infection Control Committee, Children's Hospital of Pittsburgh of UPMC
- Director, ASP, Children's Hospital of Pittsburgh of UPMC
- Executive Committee, Antimicrobial Stewardship Committee, Pediatric Infectious Diseases Society
- Transplant Infections Organizing Working Group, Pediatric Infectious Diseases Society
- Chair, Infectious Disease Committee, International Pediatric Transplant Association
- Ex-officio member, Patients Safety Advisory Group (sub-committee), Operations and Safety Committee, Organ Procurement and Transplantation Network, UNOS
- Non-Tenure-Stream Promotion Committee, University of Pittsburgh School of Medicine
- Antimicrobial Drug Advisory Committee, FDA
- Member, Transplantation Society's International Consensus Conference on Cytomegalovirus in Solid Organ Transplantation (third edition)
- Member, Sub-Board on Pediatric Infectious Diseases, American Board of Pediatrics

#### EDITORSHIPS

- Associate editor, *Pediatric Transplantation*
- Editorial Board, *Liver Transplantation*
- Associate editor, *Journal of the Pediatric Infectious Diseases Society*

#### MAJOR LECTURESHIPS AND SEMINARS

- "Epstein-Barr Virus (EBV) and Post-Transplant Lymphoproliferative Disorder (PTLD): Prevention, Diagnosis, and Management," transplant grand rounds, University of Pittsburgh School of Medicine, Pittsburgh, Pa., October 2016
- "EBV and PTLT: Essential Concepts and Breaking News," pediatric grand rounds, Cleveland Clinic, Cleveland, Ohio, November 2016
- "Infectious Complications of Organ Transplantation in Children," Cleveland Clinic, Cleveland, Ohio, November 2016
- "EBV and PTLT: Essential Concepts and Breaking News," infectious diseases grand rounds, University of Pittsburgh School of Medicine, Pittsburgh, Pa., February 2017
- "Infections in Children on Extrinsic Immune Suppression: Advice to the Primary Care Physician and Non-Transplant Subspecialist," Amos Christie Annual Lectureship, Vanderbilt pediatric grand rounds, Nashville, Tenn., May 2017

**PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS**

- American Pediatric Society
- American Society for Microbiology
- International Pediatric Transplantation Association
- Fellow, Infectious Diseases Society of America
- Fellow, American Society of Transplantation
- Society for Pediatric Research
- Pediatric Infectious Diseases Society

**HONORS**

- *Best Doctors in America*, Woodward/White, Inc.
- Best Doctors, *Pittsburgh Magazine*, 2017
- Clinical Science Established Investigator Award, American Society of Transplantation
- Visiting professor, Department of Pediatrics, Vanderbilt University
- Visiting professor, pediatric infectious diseases, Cincinnati Children's Hospital
- Visiting professor, pediatric infectious diseases, Cleveland Clinic
- Visiting professor, pediatric infectious diseases, Department of Pediatrics, University of Virginia School of Medicine
- 2017 Amos Christie Annual Lectureship, Department of Pediatrics, Vanderbilt University

**Philana Ling Lin, MD, MSc****RESEARCH**

Philana Ling Lin's research program is focused on the immunologic mechanisms of *M. tuberculosis* infection, the bacterium that causes TB. Her work has examined the role of various immunological factors (e.g., CD4 T cells, CD8 T cells, and tumor necrosis factor) involved in the host response to control both primary and latent *M. tuberculosis* infection. She has shown that positron emission tomography-computed tomography (PET-CT) characteristics of TB can be used to predict outcome soon after infection, as a modality of early treatment response and risk of reactivation. Her work has shown that latent infection is a spectrum of disease and is associated with risk to reactivation, which has important implications in human TB. Her recent studies are focused on co-infection with TB and simian immunodeficiency virus (SIV), a surrogate for HIV. The overall goals of her research program are to improve the current understanding of disease progression, identify predictors of infection outcome, distinguish risk factors for reactivation after latency, develop better strategies for vaccine development, and devise more targeted methods of curing disease from reservoirs and

improving treatment outcomes. Her research has been funded by the Bill and Melinda Gates Foundation; American Lung Association; Center for AIDS Research; Otis Foundation; University of Pittsburgh MIDAS National Center of Excellence; and the NIH, including current R01, R21, and R03 funding formats. She has published in high-impact journals, including *Nature Medicine*, the *Journal of Clinical Investigation*, *Proceedings of the National Academy of Sciences*, and *PLOS Pathogens*. She is the program director for the Pediatric Infectious Diseases Fellowship Training Program at Children's Hospital of Pittsburgh of UPMC and has mentored a number of medical students, residents, and fellows on scholarly projects.

Her ongoing research activities include the following.

- Developing blood transcriptional signatures of reactivation risk
- Recognizing innate and early adaptive host responses in the airway associated with infection outcome
- Characterizing reservoirs of reactivation during pre-existing latent infection and subsequent SIV infection
- Identifying immune mechanisms of reactivation TB during SIV-TB co-infection
- Distinguishing immunologic and PET-CT imaging risk factors of treatment relapse
- Determining immunologic mechanisms of increased susceptibility to severe TB during SIV infection with and without antiretroviral treatment
- Examining the impact of TB on SIV viral diversity
- Identifying TB vaccine candidates to advance into human clinical trials
- Surveilling the epidemiology of pediatric invasive pneumococcal infection after universal conjugate pneumococcal vaccination

**ADVISORY COMMITTEE MEMBERSHIPS**

- Program director, Pediatric Infectious Diseases Fellowship Training Program, Children's Hospital of Pittsburgh of UPMC
- Scholarship Oversight Committee, Children's Hospital of Pittsburgh of UPMC
- Antimicrobial Stewardship Committee, Children's Hospital of Pittsburgh of UPMC
- Infection Prevention Committee, Children's Hospital of Pittsburgh of UPMC
- Ad hoc, AIDS-Associated Opportunistic Infections and Cancer Study Section, NIH ad hoc, Collaborative Research at NIH Clinical Center (U01), NIH ad hoc, Wellcome Trust

**EDITORSHIPS**

- Editorial Board, *Infection and Immunity*

**MAJOR LECTURESHIPS AND SEMINARS**

- “Animal Models” speaker, “Smoldering TB: Exploring the Full Spectrum of Infection with TB,” scientific symposium, American Thoracic Society, Washington, D.C., May 2017
- “Immunopathogenic Mechanisms of *Mycobacterium Tuberculosis*,” Symposium on Synthetic Immunity, Sante Fe, N.M., July 2017
- “TB: Lessons From a Jigsaw Puzzle,” NIH Symposium on Molecular Mechanisms and Immune Consequences of Pathogen Reservoirs: Battling Unseen Enemies, Bethesda, Md., September 2017
- “TB Infection: Building a Framework for Eradication,” sponsored by NIH and Harvard Medical School Center for Global Health Delivery, Dubai, United Arab Emirates, September 2017

**PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS**

- Fellow, American Academy of Pediatrics
- Pediatric Infectious Diseases Society
- Infectious Diseases Society of America
- Society for Pediatric Research
- American Association of Immunology
- American Society for Microbiology

**Marian Michaels, MD, MPH****RESEARCH**

Marian Michaels’ work has focused on the following major areas: congenital/newborn infections; infections in immunocompromised hosts, including patients receiving solid-organ and bone marrow transplants, children on immunosuppressive medications, and children with HIV; immunizations; more general pediatric infectious diseases, including acute viral infections; and antibiotic treatment and antimicrobial stewardship.

Michaels is funded by the CDC through a subcontract to the Department of Family Medicine (PI: Richard Zimmerman) to evaluate influenza vaccine efficacy in hospitalized patients. The CDC funded five sites across the country for ambulatory vaccine efficacy, but only two sites (Pittsburgh under Michaels and the University of Michigan) were funded for the inpatient study. The division was the only pediatric program, and the work led to the funding listed below as part of the pediatric consortium. As an outgrowth of this study, Michaels is analyzing data that should lead to three papers this coming

year: influenza vaccine efficacy for inpatients compared to ambulatory patient groups, attitudes toward influenza vaccination and plans for future vaccines, and a survey on decision making for obtaining respiratory viral panels.

Michaels will be co-PI on a CDC-sponsored grant submission along with John Williams to be a center for the New Vaccine Surveillance Network. The study conducts prospective, population-based surveillance for acute gastroenteritis and acute respiratory illness among hospitalized children to elucidate the epidemiology of acute infections in the pediatric population and to evaluate vaccine efficacy, including inpatient influenza vaccine efficacy.

The “Natural History of CMV-Related Hearing Loss and Feasibility of CMV Screening as Adjunct to Hearing Screening in the Newborn (CHIMES)” study was funded through the National Institute on Deafness and Other Communication Disorders. The study is the largest congenital CMV screening study to date. Although the funding period has ended, the study continues to be a source of publications and presentations at international meetings (e.g., the Pediatric Academic Societies meeting).

Michaels continued her NIAID-supported congenital CMV work as the site PI for “A Phase III, Randomized, Placebo-Controlled, Blinded Investigation of Six Weeks Versus Six Months of Oral Valganciclovir Therapy in Infants With Symptomatic Congenital Cytomegalovirus Infection” (Collaborative Antiviral Study Group 112). The study showed longer therapy to be superior for symptomatic infants with congenital CMV infection. The study has led to two further investigations. The first is sponsored by NIAID as a BAA, with Michaels as a subcontractor to the University of Alabama, and will address treatment of asymptomatic infants with congenital CMV to prevent hearing loss. The second BAA funded by NIDCD will be a treatment trial for infants with hearing loss as the sole manifestation of congenital CMV infection. Michaels is co-investigator overseeing treatment and clinical management of all enrolled infants (site PI: David Chi, Otolaryngology).

The collaboration with the University of Alabama has been quite fruitful, and Michaels is the site PI for two other studies as a subcontractor regarding infants and infection. One is a BAA to look at the pharmacokinetics of ganciclovir for very premature infants. The other is a BAA to do long-term follow-up on newborns with herpes encephalitis. Michaels is acting as a no-cost consultant for a third University of Alabama study at Magee-Womens

Hospital that is performing rapid screening of women in labor for herpes simplex virus shedding. It is anticipated that after this first screening study, a larger study will follow the infants born to those women. Michaels will serve as the co-PI with Harold Wiesenfeld.

Michaels has been the site PI for a study out of Duke University looking at hospital-acquired, ventilator-associated pneumonia in children at risk in the pediatric intensive care unit. Study enrollment has just completed, with more than 100 subjects. The study seeks to inform practice for preventing pneumonia, as well as future treatment strategies.

*Outpatient Early-Intervention Services With Respect to HIV Disease for Children, Women, Youth, and Families (2H76HA00079).* The major goals of this project are planning, capacity building, and providing care and preventive strategies for HIV infection in children and adolescents in Western Pennsylvania. The work continues to support the HIV pediatric center, providing a 50% full-time-equivalent social worker dedicated to caring for these families and 10% of a faculty salary to oversee the care of these children. Starting in July 2013, the funding source moved from Pitt to UPMC.

*HIV Early-Intervention Project for Children, Youth, Women, and Families (2H12HA23029-07).* The major goal of this project is to improve access to care and supportive services for HIV-infected women, infants, children, and youth. The grant supports the HIV pediatric center, supporting a 25% full-time-equivalent social worker dedicated to caring for these families and 10% of a faculty salary to oversee the care of these children. Starting in July 2013, the funding source moved from Pitt to UPMC.

*Optimizing Outcomes After Pediatric Heart Transplant (National Heart, Lung, and Blood Institute, NIH 1P50HL74732-01).* The major goal of this project is to better understand the occurrence of allosensitization in pediatric heart transplant recipients and develop strategies for treatment. Michaels' role has been to develop uniform monitoring protocols to be used across centers regarding infections, prevention, and treatment and to review and analyze results.

Michaels and Green serve as site co-PIs for a BAA out of Children's Hospital of Philadelphia to better understand adenovirus infections in pediatric stem cell recipients. The study has just started enrollment.

Green and Michaels are co-PIs for a BAA out of Northwestern University that will be a double-blinded, placebo-controlled treatment study for immunocompromised hosts infected with norovirus. Enrollment was anticipated to start early in 2018.

*Antimicrobial Stewardship.* Michaels serves on the steering committee for Children's Hospital of Pittsburgh's ASP. One of the division's recently graduated pediatric residents completed a scholarly project analyzing Children's Hospital's use of piperacillin/tazobactam; the group examined the appropriateness of initially starting and subsequently continuing its use beyond day three. Results of the study were published in the *Journal of the Pediatric Infectious Diseases Society* in 2015. In addition, a manuscript describing Michaels' novel ASP Therapeutic Drug Monitoring Program was recently published in the *Journal of the Pediatric Infectious Diseases Society*.

Michaels collaborates with the Pennsylvania Department of Health's "Get Smart" program, designed to reduce antimicrobial use, particularly in children. As part of the program, Michaels mentored Tabitha Reefer, a graduate student in the University of Pittsburgh's Graduate School of Public Health. Reefer and Michaels collaborated with Michael Morowitz, MD, Department of Surgery, to assess a new strategy to manage children with both complicated and uncomplicated appendicitis to ensure safe management with shorter courses of intravenous and oral antibiotics. Reefer recently moved, and a surgical research fellow will continue as the PI of the project. Michaels will remain a collaborator and mentor.

Michaels' studies sponsored by pharmaceutical companies follow.

*GSK/Zanamivir.* This study is an open-label, phase II, multicenter, single-arm study to evaluate the safety and tolerability of intravenous zanamivir in hospitalized subjects with laboratory-confirmed influenza infection. Michaels is the site PI. The study has reached full enrollment. Michaels enrolled five patients, beyond the goal of three per site. As one of the more successful investigators, Michaels reviewed the data and co-wrote a manuscript on outcomes, which was presented at 2016 ID Week and accepted for publication in *Pediatrics*.

*Merck/Cubist, Daptomycin Study of Bacteremia.* This is a single-blinded study of daptomycin versus standard therapy for children with *S. aureus* bacteremia. Michaels has enrolled seven subjects, beyond the goal of five. Pittsburgh is among

the highest-enrolling sites in the United States. The study is close to completing enrollment, and the company has requested that Michaels be among the coauthors for manuscripts stemming from the study.

*Optimer: Fidaxomicin Treatment of C. Difficile.* This was an open-label study testing the safety and efficacy of fidaxomicin for children with *C. difficile* colitis. Michaels enrolled seven subjects, and Pittsburgh was the second-highest-enrolling site. The study is closed and has been presented in abstract form at ID Week. A manuscript titled “A Safety and Pharmacokinetic Study of Fidaxomicin in Children With *Clostridium difficile*-Associated Diarrhea: A Phase IIa Multicenter Clinical Trial” received a positive peer review from the *Journal of the Pediatric Infectious Diseases Society* and was sent back with minor revisions. The authors are waiting for a response regarding acceptance.

*Pfizer/Anidulafungin in Children with Invasive Candidiasis.* This study examines the safety, pharmacokinetics, and pharmacodynamics of the antifungal anidulafungin in a pediatric population. The study is ongoing but is likely to finish enrollment soon.

Michaels also is involved in some unfunded work. A productive collaboration has developed over the past several years among pediatric infectious disease physicians in the United States who are interested in answering research questions that cannot be answered at a single site. The collaboration grew out of the St Jude’s/Pediatric Infectious Diseases Society annual meeting and has led to collaborations looking at respiratory viral infections (paper in revision). In addition, the members have finished entering data on *C. difficile* infections in the population to look at the epidemiology, and they anticipate presenting and publishing in 2018. Finally, the group just launched an investigator-initiated project in collaboration with industry to look at CMV T-cell responses that should prove very exciting and lead to preliminary data for future NIH support.

Michaels has mentored many medical students and residents on scholarly projects, including students investigating problems with families refusing vaccinations, infections in immunocompromised hosts, antimicrobial stewardship, and CMV and EBV infection.

#### ADVISORY COMMITTEE MEMBERSHIPS

- Board member, American Society of Transplantation
- Data Safety Monitoring Committee, Division of Allergy, Immunology, and Transplantation, NIAID
- Sub-board, Pediatric Infectious Diseases Society, American Board of Pediatrics

- Chair, sub-board, Credentials Committee, Pediatric Infectious Diseases Society, American Board of Pediatrics
- Vice chair, Disease Transmission Advisory Committee, Organ Procurement and Transplantation Network, UNOS
- Chair, Pharmacy and Therapeutics Committee, Children’s Hospital of Pittsburgh of UPMC
- Chair, Innovative Use Medication Committee, Pharmacy and Therapeutics Committee, Children’s Hospital of Pittsburgh
- Pharmacy and Therapeutics Committee, UPMC
- Chair, Pediatric Pharmacy and Therapeutics Committee, UPMC
- Pharmacy and Therapeutics Antibiotic Advisory Committee, UPMC
- Pharmacy and Therapeutics Pain Management Advisory Committee, UPMC
- Ad hoc co-chair, Infection Control Committee, Children’s Hospital of Pittsburgh of UPMC
- Clinical Quality Oversight Committee, Children’s Hospital of Pittsburgh of UPMC
- Solutions for Patient Safety Leadership Committee, Children’s Hospital of Pittsburgh of UPMC
- Director, Pediatric HIV Center, Children’s Hospital of Pittsburgh of UPMC
- Scholarship Oversight Committee, Children’s Hospital of Pittsburgh of UPMC
- Medical advisor, laboratory affairs, Planned Parenthood of Western Pennsylvania

#### EDITORSHIPS

- *Pediatric Transplantation*
- *Transplant Infectious Disease Journal*
- Pediatric Infectious Diseases Publication Committee, *Journal of the Pediatric Infectious Diseases Society*

#### MAJOR LECTURESHIPS AND SEMINARS

- “Infections and Extracorporeal Membrane Oxygenation (ECMO),” Eighth Annual Neonatal and Pediatric ECMO Educational Conference, Children’s Hospital of Pittsburgh of UPMC, Pittsburgh, Pa., August 2016
- “Emerging Infections After Pediatric Solid Organ Transplantation,” invited speaker, Fifth World Congress on Pediatric Gastroenterology, Hepatology, and Nutrition, Montreal, Canada, October 2016
- “Pediatric Antimicrobial Stewardship: Lessons Learned,” invited speaker, One Health Seminar, Annual Get Smart Week 2016, State College, Pa., November 2016
- “Increased-Risk Donors in the Era of a Drug Overdose Epidemic,” Organ Donation Symposium, Finger Lakes Donor Recovery Network and University of Rochester Medical Center, Rochester, N.Y., May 2017

- Chair, session on infectious diseases, International Pediatric Transplant Association, Barcelona, Spain, May 2017
- Speaker, CMV update plenary session, International Pediatric Transplant Association, Barcelona, Spain, May 2017
- Chair, session on EBV, International Pediatric Transplant Association, Barcelona, Spain, May 2017
- “Increased Risk Donors: Putting It All Together,” Fellows Symposium on Transplantation, American Society of Transplantation, Grapevine, Texas, September 2017
- “Matching the Patient to the Donor in Pediatric Transplantation,” Fellows Symposium on Transplantation, American Society of Transplantation, Grapevine, Texas, September 2017
- “The Microbiome, Infection, and Alloimmunity,” Fellows Symposium on Transplantation, American Society of Transplantation, Grapevine, Texas, September 2017
- “Rapid-Fire Transplant ID Cases,” panelist/speaker, Meet the Professor, annual ID Week, Infectious Diseases Society of America, San Diego, Calif., October 2017
- “And the Infectious Disease Consultant Says, ‘What?’” panelist/speaker, annual ID Week, Infectious Diseases Society of America, San Diego, Calif., October 2017
- “Infectious Issues of Xenotransplantation,” annual ID Week, Infectious Diseases Society of America, San Diego, Calif., October 2017

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- Alpha Omega Alpha Honor Medical Society
- American Academy of Pediatrics
- Infectious Diseases Society of America
- Pediatric Infectious Diseases Society
- American Society of Transplantation
- American Society for Microbiology
- Society for Pediatric Research
- International Pediatric Transplantation Association
- International Society of Heart and Lung Transplantation

#### HONORS

- *Best Doctors in America*, Woodward/White, Inc., annually since 2003
- *Best Doctors*, *Pittsburgh Magazine*, annually since 2008
- Elected to the Board of the American Society of Transplantation

#### Andrew Nowalk, MD, PhD

##### RESEARCH

*Lyme Disease Epidemic in Western Pennsylvania.* Andrew Nowalk’s primary focus is the study of the Lyme disease epidemic that has been affecting Western Pennsylvania since 2005. He continues to study the local epidemiology of the Western Pennsylvania Lyme disease epidemic through collaborative projects at Children’s Hospital (examining local and national rates of Lyme carditis with Cheyenne Beach, MD, in Pediatric Cardiology; variant presentations of neurologic Lyme disease associated with cranial nerve palsies with Catalina Cleves-Bayon, MD, in Child Neurology; and atypical arthritis presentations with Sriram Ramgopal, MD, in Pediatric Emergency Medicine), as well as with groups at Carnegie Mellon University and Indiana University of Pennsylvania, investigating the geographic spread of Lyme into Western Pennsylvania.

##### *Molecular Characterization of Acinetobacter Resistance.*

Nowalk is a co-investigator with Yohei Doi, MD, PhD, on a project examining proteomic changes in *Acinetobacter baumannii* during evolution of colistin resistance. *Acinetobacter* is a leading cause of multidrug-resistant, hospital-acquired infection. The focus is bacterial adaptation that leads to these phenotypes.

##### *Genomics and Proteomics of Renal Scarring in Pediatric UTI.*

In collaboration with Nader Shaikh, MD, Nowalk and Doi’s laboratory acts as the sample repository for the study titled “Steroids to Actively Reduce Renal Scarring.” This NIH-supported grant tests whether corticosteroids decrease rates of renal scarring in children with febrile UTI. Nowalk provides reference laboratory support for the study and supervises the molecular analyses of the bacterial and human samples. The study has expanded into analysis of the microbiome of the subjects, and the laboratory provides data to correlate bacterial virulence factors and biome constituents that may predispose patients to severe scarring in UTI.

##### *Probabilistic Disease Surveillance and Predictive Models of Infectious Disease.*

In conjunction with Michael Wagner, MD, of the Department of Biomedical Informatics, Nowalk has acted as a consultant to this National Library of Medicine R01, which examines the potential for natural language processing (NLP) algorithms for the early identification of infectious disease epidemics. The joint project, shared with Intermountain Health Care in Salt Lake City, Utah, examines NLP-based detection of respiratory viral infections such



as influenza using a novel instrument to detect cases from electronic health record data from emergency room visits. The project has yielded two recent manuscripts in *PLoS One* and *Applied Clinical Informatics*.

#### ADVISORY COMMITTEE MEMBERSHIPS

- Clinical Resource Management Committee, Children's Hospital of Pittsburgh of UPMC
- Pediatric Intern Selection Committee, Children's Hospital of Pittsburgh of UPMC
- Professional staff past president, Children's Hospital of Pittsburgh of UPMC
- Member, Medical Executive Committee, Children's Hospital of Pittsburgh of UPMC
- Member, Credentials Committee, Children's Hospital of Pittsburgh of UPMC
- Program director, Pediatric Residency Program, Children's Hospital of Pittsburgh of UPMC
- Advisory dean, University of Pittsburgh School of Medicine

#### EDITORSHIPS

- Associate editor, *Atlas of Pediatric Physical Diagnosis*, seventh edition

#### MAJOR LECTURESHIPS AND SEMINARS

- "Lyme Disease: Dos and Don'ts from the Pittsburgh Epidemic," medical grand rounds, Excelsa Westmoreland Hospital, Greensburg, Pa., September 2016
- "Mosquito-Borne Infections From Arbovirus to Zika," family medicine grand rounds, UPMC St. Margaret's Hospital, Pittsburgh, Pa., September 2016
- "Lyme Disease: Dos and Don'ts from the Pittsburgh Epidemic," First Annual John Govi, MD, Memorial Conference, Excelsa Latrobe Hospital, Latrobe, Pa., December 2016
- "Mosquito-Borne Infections and Lyme Disease," UPMC Shadyside Urgent Care, Pittsburgh, Pa., March 2017
- "Common and Emerging Pediatric Infections," Pittsburgh Continuing Medical Education Conference and UPMC 44th Refresher Course in Family Medicine, Pennsylvania Academy of Family Physicians, Pittsburgh, Pa., March 2017
- "Tickborne Disease Update," Southwestern Pennsylvania Chapter, National Association of Pediatric Nurse Practitioners, Pittsburgh, Pa., October 2017

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- Society for Pediatric Research
- American Society for Microbiology

- National Physicians Alliance
- Pediatric Infectious Diseases Society
- Infectious Diseases Society of America
- American Academy of Pediatrics
- Alpha Omega Alpha Honor Medical Society
- American Medical Student Association

#### HONORS

- Best Doctors, *Pittsburgh Magazine*, 2014–2017
- UPMC Patient Satisfaction Award, 2016
- Excellence in Education Award: lecturer, University of Pittsburgh School of Medicine Curriculum Colloquium, 2017

#### Laurie A. Silva, PhD

##### RESEARCH

Laurie Silva joined the division as a research scientist in the Dermody laboratory in May 2016. She leads the team focused on CHIKV. She also serves as the Rangos BSL3 facility manager and is involved in overseeing the renovation of the BSL3 laboratory on the ninth floor of Rangos Research Building.

Silva's research focuses on replication and pathogenesis of CHIKV, an arthritogenic alphavirus that causes debilitating musculoskeletal inflammatory disease. It is transmitted by *Aedes albopictus* and *Aedes aegypti* mosquitoes and is capable of epidemic urban transmission between mosquitoes and humans. Since 2004, CHIKV has caused epidemics involving millions of persons and expanded into new areas, including Europe, the Middle East, the Pacific region, and most recently in the Americas. No licensed vaccines or specific therapeutics are available for this globally important pathogen.

The CHIKV research program seeks to discover mechanisms by which host cell factors contribute to CHIKV replication and pathogenesis. Silva's main project focuses on elucidating the role of COP-I trafficking pathway proteins in the replication cycle of CHIKV. In a genome-wide siRNA screen to identify host factors that are required for efficient CHIKV replication, COP-I coatomer and regulatory factors were some of the top putative hits. Validation experiments using golgicide A, a specific inhibitor of the COP-I regulatory factor GBF1, supported a function for this host factor in the replication cycle of CHIKV. Further experiments suggest that GBF1 may be acting in a non-canonical manner to enhance CHIKV replication. Microscopy experiments suggest that GBF1 localizes to sites of CHIKV RNA

synthesis early in infection and may be critical for the establishment or maturation of viral replication factories. Current experiments aim to determine the precise stage in the CHIKV replication cycle GBF1 is required and whether GBF1 is necessary for the virus to form viral replication factories in the infected cell. Genetic experiments to determine which domains of GBF1 contribute to CHIKV replication are also under way. Collectively, the experiments will illuminate mechanisms by which an important host factor is usurped by CHIKV, provide support for a noncanonical role for GBF1 in viral replication and perhaps host cell function, and guide intervention strategies based on the host target.

Silva mentors two graduate students, Anthony Lentscher and Nicole McAllister, and a research assistant, Adam Brynes. Other CHIKV projects to which Silva contributes include the following.

- Identification of specific host cell glycosaminoglycans to which CHIKV virions bind
- Elucidation of the role of glycosaminoglycans in the pathogenesis of CHIKV
- Validation of other host proteins that were putative hits for CHIKV proviral factors in a high-throughput siRNA screen
- Determination of specific tissues within an infected host that contribute to the immunopathology of CHIKV
- Candidate vaccines for CHIKV

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- American Society for Virology

### Gwen Taylor, PhD

#### RESEARCH

Gwen Taylor joined the division as a research instructor and laboratory manager in the Dermody Laboratory in May 2016. She serves as team lead for Mammalian reoviruses, neurotropic viruses that are highly virulent in young mammals.

Taylor focuses on reovirus pathogenesis and aims to elucidate the process of NF- $\kappa$ B-dependent apoptosis by reovirus in the central nervous system, to identify the contribution of cell type-specific NF- $\kappa$ B signaling to reovirus neural pathogenesis, and to define factors under NF- $\kappa$ B control that mediate apoptotic cell death in the central nervous system. Ultimately, this research enhances the understanding of pathogen-host interactions and may lead to the development of broadly applicable therapeutics for neurotropic virus infections.

Taylor mentors five graduate students, Judy Brown, Jon Knowlton, Christopher Lee, Danica Sutherland, and Paula Zamora, who also work on reovirus. Taylor provides experimental guidance on all other reovirus projects, including the following.

- Defining functions of reovirus nonstructural protein  $\sigma$ NS
- Elucidating pathways used by reovirus to exit infected cells
- Defining the contribution of glycan engagement to reovirus neurologic disease
- Determining the post-attachment functions and associated conformational changes of the reovirus  $\sigma$ 1 attachment protein
- Elucidating the mechanism of reovirus assortment
- Determining the viral factors involved in celiac disease

#### PROFESSIONAL AFFILIATIONS/SOCIETY MEMBERSHIPS

- American Society for Virology

## THREE-YEAR BIBLIOGRAPHY

## 2015

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