Graduate Program

Faculty Research Interests

UTMB M&I Graduate Program
The University of Texas Medical Branch
Programs of Study

Microbiology and immunology offers an interdepartmental program leading to the PhD degree. Subspecialty areas in which candidates can obtain training include bacterial and viral pathogenesis, parasitology, microbial genetics, molecular virology, host defense, autoimmunity, immunotoxicology, and structural, molecular and systems biology.

Students will be engaged in laboratory research beginning in the first year. Students are required to take four eight-week laboratory rotations with at least two independent faculty members. The primary objective is to assist the students in identifying an area of dissertation specialization and a dissertation mentor. It is expected that students spend an average of 18 hours per week in the laboratory. Students should identify a primary supervisory/mentoring professor by the end of the first year. Formal course work is generally completed by the end of the second year. After passing qualifying examinations, students submit a research proposal and select a dissertation supervisory committee. Upon approval of the proposal and appointment of the supervisory committee, students are admitted to candidacy.

Research Facilities

Students have access to state-of-the-art research facilities within faculty laboratories and may utilize extensive core facilities at the University. The Department of Microbiology and Immunology occupies more than 34,000 square feet of space in the Medical Research Building and is well equipped for modern microbiological and immunological research. Other graduate program faculty direct laboratories located in the Galveston National Laboratory and within several other departments, institutes and centers across the campus including Anesthesiology, Biochemistry & Molecular Biology, Internal Medicine, Pathology, Pediatrics, and Surgery. The department also maintains collaborative research activities with NASA, and investigators at the Johnson Space Center may mentor program graduate students. Several core facilities support research projects and provide access to state-of-the-art equipment and technologies for flow cytometry and cell sorting, confocal microscopy, cryo-electron microscopy, NMR, X-ray crystallography, proteomics, genomics, bioinformatics, and the generation of transgenic mice. Peptide and nucleic acid sequencing and synthesis, and synthetic organic chemistry services are also available. The Moody Medical Library is a modern medical library with extensive journal collections and on-line services.

Financial Aid

All accepted students will receive a graduate assistantship, which includes a stipend and health insurance coverage. Following the students acceptance into a mentoring professor’s laboratory, the assistantship will be covered by the professors grant support or from fellowships. Students are encouraged to apply for fellowship support from intramural sources, training grants, and outside agencies. Tuition for departmental graduate assistants will be covered from grants and other departmental sources.

Student Group

The department has an average enrollment of more than 30 graduate students. Of these, about 1/3 are international students.

Location

The city of Galveston, with a population of about 50,000, is a pleasant and historic island community. It is the commercial center of Galveston County and a popular resort on the Gulf of Mexico. In addition to UTMB, the island is home to Galveston College and the Galveston campus of Texas A&M University.

The scientific facilities of the NASA Johnson Space Center are located about 45 miles north of Galveston nearby Houston.
The University and the Medical Branch

The University of Texas Medical Branch (UTMB) is one of four Health Science Centers in the University of Texas System and includes the Graduate School of Biomedical Sciences, the School of Allied Health Sciences, the School of Nursing, the School of Medicine, the Institute for Human Infections & Immunity, and the Institute for the Medical Humanities. UTMB is one of the largest centers for biomedical education and research in the Southwest and the seventh largest employer in the Houston/Galveston metropolitan area. UTMB employs more than 1200 faculty members. The graduate faculty numbers more than 300 members. More than 2400 students (graduate, medical, nursing, and allied health sciences), nearly 700 medical residents and fellows, and numerous postdoctoral trainees make the campus their home.

Correspondence and Information

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Research Interests

I have a long-standing interest in the study of pathogenesis of infectious diseases, particularly experimental animal models of acute viral diseases including viral hemorrhagic fevers and arbovirus encephalitides. Because of my training as a pathologist, I am most interested in disease mechanisms and tissue-based studies of infectious agent localization and host responses. I am currently the director of Research Histopathology Laboratory and the Associate Director of the Experimental Pathology Core of the Galveston National Laboratory.

Publications


Xiayong Bao, PhD
Associate Professor of Pediatrics

Respiratory syncytial virus (RSV), human metapneumovirus (hMPV), viral proteins-host interactions, innate antiviral signaling, roles of small non-coding RNAs in viral replication and host gene regulation, and antiviral compound discovery

Research Interests

My laboratory focuses on the host-virus interaction, particularly in the infection of RSV and hMPV, with the goal to generate suitable vaccine candidates to prevent paramyxovirus infection and to develop therapeutic approaches. We have been exploring RSV/hMPV-induced innate antiviral signaling pathways and the molecular mechanisms by which RSV/hMPV uses to evade host immunity. We are also interested in the mechanisms by which novel families of non-coding RNAs employ to control paramyxovirus replication.

Publications


Our laboratory is undertaking basic research on the development of vaccines against flavivirus diseases. This includes West Nile, Japanese encephalitis, yellow fever and dengue. We undertake studies on the excellent yellow fever 17D vaccine as a model to understand the molecular basis of attenuation of this vaccine. This is of major importance as the 17D vaccine virus has been used as an attenuated backbone to generate licensed chimeric vaccine viruses against dengue and Japanese encephalitis. We are also undertaking similar studies on the live attenuated Japanese encephalitis vaccine strain SA14-14-2. In addition, recombinant DNA technology and infectious clone technology/reverse genetics are being used to identify molecular determinants of virulence of West Nile virus with the aim of mutating these virulence determinants to develop candidate attenuated vaccine strains. In addition, we investigate the molecular epidemiology of flaviviruses as it is important to understand genetic and antigenic variation of a particular virus for design of candidate vaccines that are effective against all known forms of a particular virus. A number of collaborations have been established with other virologists at UTMB including Drs. David Beasley, Dennis Bente, Nigel Bourne, Alex Freiberg, Gregg Milligan, Bob Tesh, Tian Wang and Scott Weaver that include studies on dengue, yellow fever, Crimean-Congo hemorrhagic fever, and tick-borne encephalitis viruses.

**Publications**


David Beasley, PhD

Associate Professor, Department of Microbiology & Immunology

Molecular basis of virulence and antigenic variations between West Nile virus (WNV) strains; arbovirus vaccines and diagnostics; Good Laboratory Practice

Research Interests

Dr. Beasley's research currently focuses on the molecular basis of virulence and antigenic variations between strains of West Nile virus and other flaviviruses. His lab's wider research activities include studies related to the development of improved diagnostic and therapeutic reagents and vaccines for flaviviruses and other arboviruses. Dr. Beasley is the Director of Regulatory and Scientific Affairs for the Institutional Office of Regulated Nonclinical Studies where he oversees the implementation and operation of GLP-based quality systems to facilitate conduct of animal model development and efficacy studies at ABSL3/ABSL4 necessary to support future licensure of medical countermeasures for biodefense and emerging disease agents under the FDA's Animal Rule. He is also the Associate Director for the World Health Organization Collaborating Center for Vaccine Research, Education and Training on Emerging Infectious Diseases.

Publications


Dennis A. Bente, DVM, PhD
Associate Professor, Department of Microbiology & Immunology
Galveston National Laboratory

Pathogenesis and transmission of tick-borne hemorrhagic fever viruses, BSL4, hemorrhagic fevers, animal models, tick vector biology, host-vector-virus interaction.

Research Interests

The goal of my research is to better understand the transmission and pathogenesis of tick-borne hemorrhagic fever viruses and to develop countermeasures to combat the disease. The intersection between arbovirology and hemorrhagic fever research requires that we take an interdisciplinary approach involving virology (classical techniques as well as molecular techniques such as reverse genetics), immunology (human and animal models), and tick physiology. We are in the fortunate situation to be the first laboratory in the world to establish a tick-host transmission model in a BSL4 setting. A number of collaborations have been established with other virologists at UTMB including Drs. Barrett, Ksiazek, Forrester, Beasley, Thangamani, Freiberg and Geisbert that include studies on Crimean-Congo hemorrhagic fever virus, Kyasanur forest disease virus, Alkhurma hemorrhagic fever virus, West-Nile virus.

Our research Program Involves Collaborations with:
- Oxford University, Institute of Zoology, U.K.
- Viral Special Pathogens Program, Centers for Disease Control and Prevention
- U.S. Army Medical Research Institute for Infectious Diseases, Fort Detrick
- Integrated Research Facility, NIH, Bethesda
- Koç University, Istanbul, Turkey
- Marmara University, Istanbul, Turkey
- Central Veterinary Institute, Lelystad, The Netherlands

Publications

Istvan Boldogh, DM&B, PhD

Professor of Microbiology & Immunology

Cytomegalovirus, virus-membrane interactions, reactive oxygen species in pathogenesis, oxidative stress, mitochondrial abnormalities in inflammation, and aging processes

Research Interests

Dr. Boldogh’s program is centered on studies of oxidative stress, which, due to reactive oxygen species (ROS), is continuously generated during respiration, and is also induced by exogenous environmental pollutants. ROS is also generated endogenously by intracellular oxidases due to inflammation, infections and drug treatment. Although a variety of cellular processes have evolved to eliminate ROS, oxidative stress occurs when there is an imbalance between production of ROS and antioxidant defense. Hundreds to thousands of mitochondria are present in all eukaryotic cells perform multiple cellular functions, and are the major source of cellular energy and ROS. In mitochondria, ROS are formed by the univalent reduction of molecular oxygen mediated by respiratory complexes and via reactive compounds such as semi-ubiquinone. The long-term goal is to use multidisciplinary approaches to understand the basic mechanisms by which mitochondrial ROS augments airway inflammation, etiological agents in aging, and how they cause age-associated diseases localized to the heart, lungs and central nervous system, induce mutations and promote tumor formation and progression.

Publications


Nigel Bourne, PhD

Professor of Pediatrics and Microbiology & Immunology

Genital herpes; hepatitis C virus; vaccines and antiviral agents

Research Interests

In my laboratory we are interested in the development of in vivo models to explore the pathogenesis of infectious diseases and their use to evaluate strategies for disease prevention and treatment. One of our principle areas of interest has been genital and neonatal Herpes simplex virus infection. We are continuing to explore the pathogenesis of these infections as well conducting research on vaccines and chemoprophylactics for their prevention and antiviral agents for their treatment. As part of our research on the use of chemoprophylactics to protect the vaginal epithelium we have also begun studies with an important bacterial pathogen Chlamydia trachomatis. In addition we have used in vivo models to explore a number of congenital infections of clinical importance including cytomegalovirus and toxoplasmosis.

Publications


Alexander Bukreyev, PhD

Professor of Pathology and Microbiology & Immunology

Viruses, filoviruses Ebola and Marburg, vaccines, immune response, immunopathogenesis, immune evasion, antibodies, antivirals, genetic diversity, natural host.

Research Interests

Dr. Bukreyev’s program focuses on development of vaccines, antibody treatments and small molecule treatments against filoviruses Ebola and Marburg and on investigation of the mechanisms of their high pathogenicity. The program includes the following specific topics:

- Characterization of antibody responses to filovirus infections in humans, in collaboration with Dr. James Crowe, Jr. (The Vanderbilt University).
- Development of therapeutic human monoclonal antibody treatments for filoviruses, in collaboration with Dr. James Crowe, Jr.
- Development of mucosal respiratory tract vaccines against filoviruses based on human and non-human paramyxovirus vectors.
- Investigation of mechanisms of “immune paralysis” caused by filoviruses.
- Development of therapeutics targeting filoviral replication and interferon-antagonist functions, in collaboration with Dr. Sergei Nekhai (Howard University) and Dr. Chris Basler (Mount Sinai School of Medicine).
- Comparative immunology of bats as a reservoir of filoviruses, in collaboration with Dr. Chris Basler.
- Ebola virus population structure, genetic diversity and evolution, in collaboration with Dr. Raul Andino (The University of California in San Francisco).
- Genome sequencing of emerging viral pathogens, including paramyxoviruses and filoviruses, in collaboration with Dr. Scott Weaver (UTMB).

To get insight into these specific topics, molecular tools, including reverse genetics (i.e. development of genetically modified filoviruses from the DNA-copies of their genomes and use of mini-genomes), immunological tools such as multi-parameter flow cytometry, and human immune cells and animal models are utilized. The research includes experiments in a BSL-2 lab and in BSL-4 labs of the Galveston National Laboratory.

The research is supported by an R01 and multiple multi-PI grants from NIH and DTRA (DoD).


Publications

Antonella Casola, MD

Professor of Pediatrics and Microbiology & Immunology

RSV, hMPV

**Research Interests**

Dr. Casola is a physician-scientist specialized in pediatric infectious diseases, with research expertise in the area of respiratory viral pathogens, lung inflammation, and cellular signaling. Her research is focused on the investigation of viral- and host-specific mechanisms that contribute to the pathogenesis of respiratory viral infections. Over the past several years, she has identified several inducible intracellular signaling pathways activated by respiratory syncytial virus (RSV) in airway epithelial cells with particular emphasis on the role of reactive oxygen species in RSV-induced lung inflammation both in vitro and in vivo, using a mouse model of RSV infection. Recent investigations in her laboratory have uncovered a very important role of the endogenous gaseous mediator hydrogen sulfide in paramyxovirus replication and cellular signaling. Dr. Casola’s research efforts include investigating the pathogenesis of respiratory diseases caused by human metapneumovirus (hMPV). Using a reverse genetic system necessary to generate recombinant hMPV, her lab is currently investigating specific viral protein functions, with the ultimate goal to understand disease pathogenesis and design effective vaccines, taking advantage also of a mouse model of hMPV infection which allows to investigate hMPV-induced lung disease and test novel antivirals and therapeutic agents.

**Publications**


Alejandro Castellanos-Gonzalez, PhD
Assistant Professor, Department Internal Medicine, Division Infectious Diseases.

Genetic manipulation in Cryptosporidium, Cryptosporidiosis: drug and vaccine development and Molecular diagnostic.

Research Interests

I’m interested in the use of reverse genetics to study genes expressed in the intestinal parasite "Cryptosporidium". Unfortunately this parasite lacks the necessary enzymes to conduct gene silencing by the typical pathway. Therefore, one of my first ideas as Jr Faculty at UTMB was to develop a novel method to block gene expression in this parasite using pre-assembled complexes of RNA and Argonaute enzyme (with slicer activity). Currently we are using this technology to identify novel targets for drug and vaccine development. My laboratory also is interested in the development of molecular methods to detect infectious agents at the point of care by using a novel technique called “Recombinase Polymerase Amplification” (RPA) which is used to amplify DNA under isothermal conditions. Currently, we are developing multiplex assays to conduct diagnostic in a paper-based DNA test.

Publications


Dr. Chopra’s research focuses on host-parasite interactions; molecular pathogenesis of pathogenic microorganisms; structure-function relationships of bacterial virulence determinants; regulation of virulence gene expression, cell signaling, oxidative stress responses, expression of genes under simulated microgravity conditions, in vivo expression of virulence genes, host responses to microbial agents and bacterial vaccines; antiviral agents; regulation of inflammation in inflammatory bowel, pulmonary, and cardiovascular diseases, role of antioxidants in burn patients, and studies on anthrax and plague.

**Publications**


Yingzi Cong, PhD
Professor of Microbiology & Immunology and Pathology

Research Interests

The host and microbiota have evolved mechanisms for coexistence over millions of years. Accumulating evidence indicates that a dynamic mutualism between the host and the commensal microbiota has important implications for health, and microbial colonization contributes to the maintenance of intestinal immune homeostasis. However, alterations in communication between the mucosal immune system and gut microbial communities have been implicated as the core defect that leads to development of chronic intestinal inflammation and cancer as well as other diseases, such as diabetes, obesity etc. Dr. Yingzi Cong’s basic research programs focus on investigating host immune system-microbiome interaction in the intestines, pathogenesis of inflammatory bowel disease, and development of mucosal vaccines, which are based on the analysis of unique murine models of inflammatory bowel disease using a battery of reagents that have been developed recently. A number of research projects are underway in his laboratory and these NIH funded studies involve a number of significant collaborations both at UTMB as well as with other Universities and Research Institutes. Specifically, individual projects include:

1. The role of T cells reactive to commensal bacterial antigens in mucosal immunity and pathogenesis of IBD.
3. microRNA regulation of host response to commensal bacteria and pathogenesis of IBD.
4. Regulation of intestinal IgA response to microbiota and pathogens
5. Development of mucosal vaccines.

Representative Publications


Matthew M. Dacso, MD, MSc, FACP

Director of Global Health Education, Coordinating Center for Global Health, Associate Professor of Medicine, Department of Internal Medicine.

Research Interests

My research lies at the intersection of international socio-economic development studies and global health. Specifically, I focus on educational and programmatic/operational research. I study best practices in international medical work, including medical missions, academic partnerships, and global health electives. I am interested in improving how students prepare for, integrate and add value to international partnerships through global health work. I also study how strengthening research capacity in resource-limited settings can impact community health, health systems, and human resources for health. I am currently researching how to promote interprofessional education in the areas of emerging infectious disease epidemiology, health policy, global health leadership, and novel diagnostics for neglected tropical diseases.

Publications


Sara Dann, PhD
Assistant Professor, Departments of Internal Medicine (Infectious Diseases) and Microbiology & Immunology

Research Interests
Dr. Dann’s research focuses on understanding the interaction of enteric microbes (including the indigenous microbiota and enteric pathogens) with the host mucosal immune system. Her goals are aimed at defining the role of acute infections in triggering chronic intestinal inflammation, and the involvement of innate immunity in this process. She is also currently studying how metabolites produced by the intestinal microbiota promote susceptibility to enteric infections and modulate protective host defenses.

- Mucosal immunology
- Innate immunity
- Intestinal inflammation
- Enteric pathogens
- Translational research

Publications


Pathogenic bacteria and their products induce innate immune response in the human host

**Research Interests**

The major focus of my research is on respiratory and intestinal bacterial infections with expertise in the study of interactions between commensal and pathogenic bacteria at mucosal interfaces. Although a certain level of inflammation is required for protection against many bacterial infections, failure to control the extent and intensity of the inflammatory cascade can result in immunopathology that damages the host and worsens an infection. As such I recently discovered a modulator of pathophysiological inflammation, which is a human cysteine proteinase inhibitor called cystatin-9 (CST9). We are currently developing CST9 as a therapeutic treatment for multi-drug resistant strains of Klebsiella pneumoniae (a causative agent of pneumonia) for translation to drug development. We are also delineating the mechanism of how CST9 modulates host innate immunity as well as bacterial virulence in various experimental in vitro and in vivo models of infection.

Another aspect of my research focuses on the role of gut-derived bacteria, and their products (namely flagellin) escaping from the intestine into the circulation following burn injury. Burn injury is associated with a loss of gut barrier function and that the gut serves as an ‘engine’ for multiple organ dysfunction syndrome (MODS) causing various forms of critical illness due to the dissemination of bacterial components into the systemic circulation. We have shown that gut-derived bacteria and bacterial products escape the intestine via the intestinal lymphatics to the mesenteric lymph nodes and systemic circulation where they induce systemic inflammation and organ damage. This process is now known as translocation and is of growing interest in the study of the intestinal microbiome. The objective of my current studies is to determine the involvement of gut microbiome-derived flagellin in systemic post-burn pathogenesis in vitro and in vivo. We have termed this dissemination “flagellemia”. This research is translational with the potential to establish a novel therapeutic paradigm that will prevent the binding of flagellin to TLR5 reducing burn mortality.

**Publications**


Janice Endsley, PhD  
Associate Professor of Microbiology & Immunology  

**Research Interests**

My research is focused on mechanisms and regulation of immunity to Mycobacterium tuberculosis (M.tb). We utilize human subjects, infected human lung tissue, and animal models of experimental TB for these studies. An important component of my work is investigations to determine how human immunodeficiency virus (HIV) disrupts T cell and macrophage function in the host immune response to M.tb. We additionally study immune dysfunction in TB/HIV co-infected human subjects through ongoing collaborations with scientists at the Kenya Medical Research Institute in Nairobi. Our lab developed the humanized mouse as a small animal model of HIV/M.tb co-infection that is now being used to study the immune basis for aggressive TB and latent TB reactivation in the setting of HIV co-infection. The goal of these basic studies is to identify mechanisms that can be targeted by host directed therapies or vaccines. Through collaboration, I additionally investigate novel vaccination strategies to generate mucosal immunity to Burkholderia species and M.tb.

**Publications**


Alexander N. Freiberg, PhD

Associate Professor, Department of Pathology, Director Robert E. Shope BSL-4 Laboratory

Pathogenesis of henipaviruses and bunyaviruses; structural virology; antivirals and vaccine development

**Research Interests**

The main interest of my laboratory is to develop a basic understanding of the host-pathogen interaction and development of disease following infection with emerging RNA viruses. This includes studies on viral pathogenesis, virus assembly, and vaccine and antiviral drug development. We are particularly interested in infections caused by henipaviruses (Nipah and Hendra), bunyaviruses (Rift Valley fever virus), and flaviviruses (Tick-borne encephalitis viruses) and primarily are focusing on invasion of the central nervous system and development of neuropathogenesis. The goal is to better understand the molecular mechanisms and role of the host cell-mediated immune response during disease development. For this work, we are using various primary endothelial and neuronal cells, virology and molecular biology techniques, reverse genetics, and small animal models to characterize host cell responses and activation of cellular signaling pathways in specific target cells in response to infection.

An additional research interest focuses on understanding the structure and assembly of bunyaviruses. We are analyzing the arrangement and interaction of the Rift Valley fever virus surface glycoproteins. The information gained from these studies is intended to be used to advance structure-based vaccine development efforts and help identifying glycoprotein regions involved in receptor binding.

Finally, in collaboration with other groups here at UTMB, other universities and biotechnology, we are working on the identification and characterization of broad-spectrum antivirals and on testing novel vaccine platforms against Filo-, Bunya-, Henip-, Arena- and Flaviviruses.

**Publications**


Oxidative response networks and inflammation in Chagasic Cardiomyopathy, Vaccine efficacy against T. cruzi and Chagas disease, Strategies for the elimination of tropical infectious diseases

Research Interests

Chagasic cardiomyopathy (CCM) is a major public health threat in Latin America and Mexico, and recognized as an emerging infectious disease in the U.S. Dr. Garg’s research program focuses upon two major areas dealing with CCM pathogenesis and vaccine development. The studies in the first program are aimed at understanding a) the parasite-induced changes in gene regulation and the signaling cascade that contribute to myocardial cytoskeletal rearrangement and mitochondrial dysfunction; and b) the role of free radicals in initiation and/or sustenance of the pathological processes, i.e., inflammation, oxidative damage, and clinical severity of cardiac disease. A second program focuses on screening the T. cruzi genome and identifying of vaccine candidates. The goal of these studies is to develop an optimal vaccine cocktail that provides maximal protective immunity to T. cruzi in a variety of host strains. Collaborators are at UTMB and several laboratories in Argentina and Mexico.

Publications


Roberto P. Garofalo, MD

Professor of Pediatrics and Microbiology & Immunology

Respiratory syncytial virus immunopathogenesis; inflammation; cytokine transcription; eosinophils; epithelial cell signaling

Research Interests

After my residency in Pediatrics at University of the Studies, School of Medicine and Surgery, Milano (Italy), I worked at the Children’s Hospital of Buffalo for 4 years in Infectious Disease and Virology. Since 1991, I have been a faculty member of the Division of Immunology/Allergy/Rheumatology, Department of Pediatrics, UTMB.

Publications


Thomas W. Geisbert, PhD

Professor of Microbiology and Immunology

Pathogenesis of Ebola, Marburg, Lassa, Junin, Machupo, Nipah, and Hendra viruses; vaccines, treatment

Research Interests

Our laboratory focuses on the pathogenesis of emerging and re-emerging viruses that require Biosafety level (BSL)-4 containment and on the development of countermeasures against these viruses. Our work particularly emphasizes studies on viruses causing hemorrhagic fever (HF) including Ebola virus, Marburg virus, and Lassa virus. Efforts focus on: 1) developing, refining and characterizing animal models that accurately reproduce human viral HF infection; 2) identifying critical pathogenic processes of viral HF infections that could be exploited as targets for therapeutic interventions. Particular emphasis is placed on determining the basis of coagulopathy and shock that characterize HF viral infections; and 3) measuring the therapeutic benefits of interrupting pathogenic processes that are important in the development of HF viral infection. Currently, there are no vaccines against Ebola, Marburg, or Lassa viruses approved for use in humans. Our laboratory focuses primarily on using recombinant vesicular stomatitis virus (rVSV) as a vaccine vector for viral HF. We have shown that rVSV-based HF viral vaccines can completely protect nonhuman primates against Ebola HF, Marburg HF, and Lassa fever. Specific interest areas include modifying rVSV vectors for optimal safety and immunogenicity, identifying antigens needed to develop a multiantigen vaccine that can protect against major groups of HF viruses, and determining the role of cellular and host immune responses in protection.

Publications


Mechanisms of allergic inflammation are the focus of research in this laboratory. In 1973 we identified histamine releasing factors that now have been shown to be among the chemokine family of cytokines. These proteins have important effects on all the cells recruited and activated during chronic allergic reactions: basophils, eosinophils, monocytes and lymphocytes.

IgE is the principal allergic antibody. It combines to cells through a high affinity receptor. This interaction is essential for initiation of allergic responses. Recently we have begun an investigation of cells expressing this receptor. We have shown mast cells, basophils, monocytes, eosinophils, and Langerhans cells in allergic tissues have this receptor on their surface.

Currently we are focusing on novel ways to evaluate allergic patients and to provide effective care. We have developed a program to carefully evaluate the course of patients via telemedicine.

**Publications**

Haitao Hu, PhD

Assistant Professor of Microbiology & Immunology

Antiviral immunity, host-virus interactions, HIV/AIDS, vaccine, viral vectors, HIV latency, T cell biology

Research Interests

**HIV immunopathogenesis, opportunistic infections and host immunity:** HIV and its associated opportunistic pathogens continue to cause a global epidemic. A safe and protective HIV vaccine or effective cure strategy remains unavailable. Using immunology and molecular/genomic approaches, our group studies host-virus interactions (HIV and CD4 T cells) and antiviral immunity in HIV infection and vaccination. With current funding support from NIH and the Robert Mapplethorpe Foundation, we investigate how memory CD4 T cells specific to different pathogens are differentially infected by HIV and how this is related to reactivation of opportunistic infections in AIDS patients.

**Host-vaccine vector interactions and vaccine immunology:** Other ongoing research includes projects focusing on host-vaccine vector interactions and vaccine immunology. We utilize a range of model systems, including cell culture (gene editing/CRISPR Cas9), animal models (non-human primate and mouse) and clinical specimens from HIV vaccine trials, to understand innate immune pathways governing host-vaccine vector interactions, how recombinant viral vectors (derived from adenovirus, poxvirus or herpes virus) may impact the properties of AIDS vaccine-elicited immune responses and how this further affects the outcomes of HIV vaccination.

**HIV Latency research:** A third research direction in the laboratory aims to 1) understand molecular mechanisms regulating the establishment of HIV latency and 2) to identify novel latency-reactivating agents as part of the shock-kill cure strategy. The goals of these studies are to better understand the immunobiology of HIV infection and to generate key knowledge that advances development of effective HIV vaccine and/or cure strategy. Research in our group represents collaborative efforts involving UTMB and outside collaborators including MHRP, HVTN and other groups.

Publications

Grant Hughes, PhD

Assistant Professor of Experimental Pathology

My research unites insect-microbe interactions, vector biology and infectious disease addressing two core questions: How do microbial symbionts affect the ability of an insect to transmit pathogens? What are the underlying molecular mechanisms that influence symbiont-host interactions? I also investigate applied microbial strategies to control arthropod-borne diseases and am actively developing novel tools to genetically manipulate mosquitoes.

Research Interests

My research unites insect-microbe interactions, vector biology and infectious disease addressing two core questions: How do microbial symbionts affect the ability of an insect to transmit pathogens? What are the underlying molecular mechanisms that influence symbiont-host interactions? I also investigate applied microbial strategies to control arthropod-borne diseases and am actively developing novel tools to genetically manipulate mosquitoes. I address these questions using Aedes aegypti mosquitoes and Zika virus.

Publications


Tetsuro Ikegami, BVSc, PhD
Associate Professor, Department of Pathology, Member, Sealy Center for Vaccine Development, the Center for Biodefense and Emerging Infectious Diseases, and the Center for Tropical Diseases.

*Molecular virology and genetics of bunyaviruses; vaccine development; Rift Valley fever virus

Research Interests

Rift Valley fever is a mosquito-borne zoonotic disease (ruminants and humans) endemic to Africa. Rift Valley fever phlebovirus (RVFV) is a segmented ambisense RNA virus, which belongs to the genus Phlebovirus of family Phenuiviridae in the order Bunyavirales. RVFV is classified as Category A Priority Pathogen by NIH/NIAID, and an overlap select agent by HHS and USDA. Our laboratory uses reverse genetics to understand fundamental virology of bunyaviruses and apply it into the vaccine development. We work toward the development of highly safe and efficacious live-attenuated vaccine, as well as alternative safe vaccine candidates, using mouse challenge models with various pathogenic RVFV strains.

Publications

James LeDuc, PhD
Professor, Microbiology & Immunology, Robert E. Shope, M.D. and John S. Dunn Distinguished Chair in Global Health, Director, Galveston National Laboratory

Research Interests
Epidemiology of infectious diseases, global health, and the interface between health and security.

Publications

Book Chapters

Peer Reviewed Publications

National Academy of Sciences committee reports
Shinji Makino, DVM, PhD

Professor of Microbiology & Immunology

Molecular virology and pathogenesis of SARS coronavirus, MERS coronavirus and Rift Valley fever virus

Research Interests

Dr. Makino studies the molecular biology and virus-host interactions of two different groups of RNA viruses, Coronavirus and Bunyavirus. His coronavirus research group investigates various aspects of virus-host interactions that are involved in the replication and pathogenesis of severe acute respiratory syndrome (SARS) coronavirus, the etiological agent of human respiratory disease SARS, and Middle East respiratory syndrome (MERS) coronavirus, a newly emerged virus in the Middle East that causes a severe respiratory disease with a high mortality rate. His bunyavirus research group has developed the reverse genetics system for Rift Valley fever virus (RVFV), a bunyavirus that causes severe epidemics in ruminants and is also recognized as a human pathogen. In humans, RVFV, a potential agent of bioterrorism, can cause fever and myalgia, a hemorrhagic syndrome, ocular disease, and encephalitis. His group utilizes the RVFV reverse genetics platform to study virus replication, assembly and virus-host interactions and also develop novel RVFV vaccines.

Publications


Vineet Menachery, PhD
Assistant Professor, Department Microbiology and Immunology.

Coronavirus Immunity, Systems Biology, Systems Genetics, Aging Immunity, Emergence, Host-defense, interferon responses, viral antagonism of host immunity.

Research Interests

My major focus is on three related research areas: 1) emergence and infection by novel coronaviruses, 2) the role of host factors/comorbidities in coronavirus infection and outcomes, and 3) viral-host interactions that dictate success of infection. The emergence of SARS-CoV, and more recently, MERS-CoV, underscores the continued threat of cross-species transmission events leading to damaging viral outbreaks in humans. With this in mind, our experimental platforms seek to leverage available metagenomics data, robust reverse genetic systems, and knowledge of the CoV life cycle to prepare for future emergent coronavirus outbreaks. Notably, viral capacity is also dependent on host aspects including age, genetics, and immune status. As such, a second research focus considers the impact of these comorbidities on specific host factors and infection outcomes. Our efforts seek to define critical host factors and the impact of comorbidities on their function in the context of infection. With this knowledge, therapeutics can be designed to disrupt critical disease pathways, limit pathogenesis, and possibly stem future outbreaks. The third and final area explores virus-host interactions that govern disease outcomes. Integrating aspects of the first two areas of interest, we seek to define both viral and host factor that play a critical role in modulating or inducing the immune response. These interactions, individually and often in combination, determine disease severity and success of viral infection. By understanding these critical factors in both the virus and the host, we can develop critical insights with implications for global public health.

Publications


Jere McBride, PhD

Professor, Departments of Pathology and Microbiology & Immunology, and Program Director, Experimental Pathology Graduate Program

Obligately intracellular bacteria; pathobiology, immunity, molecular pathogenesis, vaccine development and diagnostics

Research Interests

Ehrlichia spp. are obligate intracellular bacteria that have evolved sophisticated molecular mechanisms to survive in phagocytes, and thus provide an excellent model system to study interkingdom molecular interactions between prokaryotes and eukaryotes involved in infection and immune evasion. Ehrlichia have very small genomes and survive and replicate in professional phagocytes by activating and modulating host cell signaling pathways such as Wnt and Notch, and reprogramming host cell gene transcription through nucleomodulin effectors that bind host DNA. The research focus of Dr. McBride’s laboratory is in four areas, 1) understanding the role of post translational modifications in pathogen-host interactions, 2) revealing how Ehrlichia exploits conserved host cell pathways to subvert innate host defense mechanisms, 3) defining the molecular basis and mechanisms of humoral immunity to intracellular bacteria, and 4) development of subunit vaccines, immunodiagnostics and therapeutics for the ehrlichioses. Through our investigations, we have defined ehrlichial type 1 effectors instrumental in a cellular reprogramming strategy, identified novel molecular effector-host interactions with conserved host cell pathways to subvert innate host defense mechanisms, defined ehrlichial nucleomodulins that target host cell genes and reprogram host cell gene transcription. In translational areas of research, we have defined immunoprotective proteins/epitopes, identified novel mechanisms of antibody-mediated immunity, developed immunodiagnostics, subunit vaccines and therapeutics for the ehrlichioses.

Publications

7. Luo T, Dunphy PS, Lina TT, McBride JW. Ehrlichia chaffeensis exploits canonical and noncanonical host Wnt signaling pathways to stimulate phagocytosis and promote intracellular survival. Infect. Immun. 2015; 84:686-700. PMCID: PMC4771358 (Selected by the editors as an article of significant interest—“Spotlight” p.611).
10. Dunphy PS, Luo T, and McBride JW. Ehrlichia chaffeensis exploits host SUMOylation pathways to mediate effector-host interactions and promote intracellular survival. Infect. Immun. 2014; 82:4154-68. (Selected by the editors as an article of significant interest—“Spotlight” p.3989); PMCID: PMC4187855.
Professor, Departments of Internal Medicine (Infectious Diseases), Microbiology & Immunology, and Pathology; Director, Center for Tropical Diseases

Immunopathogenesis and immunity in leishmaniasis; impact of malnutrition on immune function and risk of infection; drug discovery for leishmaniasis

Research Interests

My research is focused on the study of the immunopathogenesis and immunity of leishmaniasis, the role of malnutrition in susceptibility to infection, and the discovery of new drugs for treatment of leishmaniasis. We utilize experimentally infected mice and hamsters, and people infected with Leishmania in endemic regions of the world to accomplish our studies. We currently have collaborative projects in Kenya. In human and experimental infection we are trying to determine the mechanisms of impairment of macrophage effector function. In particular we are studying the parasite- and cytokine-induced signaling pathways that initiate a program of ineffective macrophage activation and lead reduced parasite control and progressive disease. In malnourished mice we are investigating the mechanisms of lymph node dysfunction that lead to increased parasite dissemination. In malnourished children we are studying the deficits in innate immune function and risk of infectious disease morbidity and mortality. Using novel ex vivo tissue explant systems we are using high-throughput screens to structure-activity relationship analysis to optimize several lead compounds that show promise for the treatment of leishmaniasis.

Publications


Gregg N Milligan, PhD

Professor, Departments of Pediatrics and Microbiology & Immunology

Viral immunology, immunity to herpes simplex virus, immunity to West Nile Virus

**Research Interests**

The research in my laboratory focuses on cell-mediated immunity to viruses. We utilize a genital herpes simplex virus infection of mice as a model of epithelial and neuronal viral infection. Using vaccination with attenuated strains of HSV-2 as a paradigm for an effective herpes virus vaccine, we are investigating the activation and expression of B and T cell effector function in the genital tract and peripheral nervous system against HSV-2 infection. Additionally, we are examining the differentiation and maintenance of antigen-specific memory CD4+ and CD8+ T cells within the genital mucosa and sensory ganglia. We are also interested in interactions between viral pathogens and the innate immune system and how these interactions shape the adaptive immune response. For these studies we utilize single-cycle flavivirus particles to examine the role of specific pathogen pattern receptors and innate immune signal pathways in the development of innate and adaptive immune responses to West Nile Virus.

**Publications**


Chad Mire, PhD
Assistant Professor of Microbiology and Immunology

Filoviruses, Henipaviruses, Animal Models, Pathogenesis, Virus-host Interactions, Vaccines, Therapeutics

Research Interests

Our research interests are focused on emerging and re-emerging infectious diseases that require high containment work at biosafety level 4 (BSL4) such as Ebola virus (EBOV), Marburg virus (MARV), Nipah virus (NiV) and Hendra virus (HeV). We use reverse genetics to “recover” viruses that have introduced mutations which give us the ability to investigate the specific mechanisms of virus-host interactions that are critical for virus replication and/or virus-mediated disease. We take a two-pronged approach to characterize these viruses in vitro and in vivo to help us understand what is important for virus replication and/or virus-mediated disease thereby potentially revealing pathways for small molecule inhibitors or therapeutics which can be targeted for protective benefit.

Another focus of the lab is developing recombinant vesicular stomatitis virus (rVSV) vaccines against emerging and re-emerging infectious diseases with a particular interest in designing multivalent or cross-protective filovirus vaccines. As of 2017, the monovalent rVSV EBOV vaccine has shown tremendous promise during a ring vaccination trial in West Africa. Our goal is to improve upon this platform to create a single vaccine capable of protecting multiple species of EBOV as well as MARV.

Publications

10 selected publications of 49


* Co-first author
Vladimir Motin, PhD
Professor, Departments of Pathology and Microbiology & Immunology
Yersinia pestis pathogenesis; vaccine; therapeutics

Research Interests
Currently, my major research interest is the pathogenesis of Yersinia pestis, the etiological agent of plague. Although plague is not a public heath problem in most parts of the world, its potential for contagion, the lack of an effective vaccine, and the recent emergence of multiple antibiotic resistance strains place this organism squarely at the top of the United States’ select agent list as a potential candidate for bioterrorism use. The long-term goal of my research is to elucidate the molecular mechanisms that underlie the nature of the acute bacterial infectious process caused by Y. pestis. The identification of the environmental signals that the bacteria encounter in the host cells and the potential virulence genes regulated by those signals will lead to a better understanding of the process of cross-talk between pathogen and its host during the infection. The unraveling of the Y. pestis virulence network will allow us to determine novel targets for therapeutics beyond antibiotics, to generate new vaccines and develop robust diagnostic assays.

Publications


Research Interest

The interest of my laboratory is the etiology and pathogenesis of viral infections caused by RNA viruses. Our research mixes aspects of both virology and immunology in order to assess the impact of virus and/or host factors on the development of clinical disease, generation of the immune response and development of immune memory. To delineate the role of influenza determinants of virulence, we are currently evaluating viral components that influence virulence using natural reassortants of attenuated and wild type viruses as well as manipulation of the virus genome using reverse genetics. We are interested in the role of pro-inflammatory cytokines, expression of cell surface mediators and the processes of cellular signaling on the development of clinical disease. Currently I am developing human respiratory and immune system models using tissue engineering practices to study pathogens such as HIV, SARS, avian-influenza virus and others. These engineered tissue constructs allow us to study human responses to pathogens as replacements for animal models.

Publications


David W. Niesel, PhD
Sr. VP and Chief Research Officer; Dean, Graduate School of Biomedical Sciences; Lawrence E. Ethridge Professor, Department of Microbiology and Immunology

In vivo virulence gene expression; bacterial pathogenesis; novel methods of antibiotic resistance detection

Research Interest

Dr. Niesel’s laboratory has investigated the pathogenesis of Gram positive (Streptococcus pneumoniae) and Gram negative pathogens (Salmonella, Shigella) for more than 30 years. He has performed studies investigating gene expression in vivo and in microgravity environments, early host immune responses to bacterial infection, rapid methods to detect antibiotic resistance, and mechanisms of attenuation and pre-vaccine development. He holds four patents including one pending for a rapid (10-90 minutes) novel sensitive method (down to $10^{-18} \text{M}$) for antibiotic resistance detection in complex populations of bacteria. He has worked with tier one select agents in the high biocontainment facilities at the Galveston National Laboratory.

Publications


Johnny W. Peterson, PhD

Samuel Baron Distinguished Professor of Microbiology & Immunology

Toxins; inflammation; molecular pathogenesis of bacterial infections of the intestine; therapeutics against diarrheal disease and anthrax

**Research Interest**

Dr. Peterson’s research activities have been in the areas of toxin-mediated bacterial diseases, including cholera, anthrax, and salmonellosis. The majority of the lab’s current research is focused on the evaluation of drugs, monoclonal antibodies, and vaccines that block the pathogenesis of anthrax. Screening of potential therapeutics is performed in tissue culture assays with the B. anthracis toxins before they are selected for further evaluation in small animal models of inhalation anthrax. Through collaboration, Dr. Peterson is investigating the molecular mechanism(s) by which the anthrax lethal factor kills macrophage cells designing and synthesizing more effective inhibitors of anthrax lethal factor and edema factor, as well as enterotoxins that stimulate intestinal adenylate cyclase. Ultimately, this research will advance the treatment or prophylaxis against inhalation anthrax and selected diarrheal diseases.

**Publications**


My research interests are in the regulation of the human mucosal immune responses in acute and chronic inflammation, in particularly those involved in the progression of the inflammatory bowel disease (IBD) and the colorectal cancer (CRC). Since a key event in an immune response is antigen recognition, I have been characterizing a population of earlier non appreciated non professional antigen presenting cells (APCs), known as intestinal myofibroblasts/fibroblasts (IMFs or stromal cells) that are abundant in the human intestine. Currently, my study are focused on (1) how different T cell subtypes are regulated in gut mucosa, and what is contribution of IMFs to this processes; (2) how mucosal T cell populations affect the phenotype and function of the stromal cells in gastro-intestinal tract during inhealth and chronic inflammation; (3) role of epigenetic changes in IMF phenotype associated with the IBD and CRC; (4) role of the epithelial-to mesenchymal transition and mesenchymal cells contribution to the mucosal stromal cells in health and disease; (5) how interaction of the intestinal stromal cells with pathogenic and non-pathogenic bacteria affect these cells immune function during tolerance and chronic inflammation.

**Publications**


Richard B. Pyles, PhD

Professor, Departments of Pediatrics and Microbiology & Immunology

Microbiome/mucosal interactions, Herpesvirology; HIV; molecular virology; viral pathogenesis; mucosal innate immunology

**Research Interests**

I have spent the majority of my career studying the molecular interactions between pathogens and their target cells. I trained in molecular virology and since have applied my experiences to bacteriology and the study of selected human microbiomes and their interaction with mucosal surfaces. Over the last decade I have focused my research efforts on urogenital, nasal and respiratory mucosal surfaces that are first exposure sites for the majority of pathogens using small animal and novel ex vivo human culture systems as models. My lab group is also involved in clinical research and trials of novel mucosal delivery devices helping to power the creation of cryo-repositories of useful materials for our work. Our efforts have produced novel reagents, cell culture and animal models and a solid track record of funding. My research approach has been multi-disciplinary and collaborative allowing the study and comparison of a variety of viral and bacterial pathogens and their associated mucosal sites to identify novel prevention and intervention approaches. Most of my primary research has been focused in women’s health and on protection of the vaginal mucosa against STI pathogens. We have succeeded in developing the first system that allows for the propagation of an intact human microbiome in a refined culture model of the vaginal mucosa. We have leveraged this success and through collaborations have now developed similar culture systems for the penile urethra, alveoli and the nasal mucosae. My approaches are rooted in molecular biology creating a complimentary set of tools that will continue to be refined to enhance our study of efficacy and potential toxicity of candidate interventions and mucosal delivery systems. A selection of relevant publications follows.

**Publications**


Complete List of Published Work in My Bibliography:
Krishna Rajarathnam, PhD

Professor, Department of Biochemistry & Molecular Biology, Department of Microbiology and Immunology, Sealy Center for Structural Biology and Molecular Biophysics

Chemokines, leukocyte trafficking, GPCR activation, glycosaminoglycans, protein engineering, protein therapeutics

Research Interests

My lab is interested in understanding the structural basis and molecular mechanisms by which chemokines recruit and activate leukocytes in health and disease. We use cellular and animal models, and structural, biochemical and computational methodologies to understand the molecular mechanisms of immune response. Our ultimate goal is to use this information for designing inhibitors for inflammatory and infectious diseases.

Publications


Ricardo Rajsbaum, PhD
Assistant Professor of Microbiology & Immunology

Viruses-Host interactions, Innate immunity, Pattern recognition receptor signaling, ubiquitin and E3-ubiquitin ligases in regulation of virus replication, Antagonism of innate immune response by viruses.

Research Interests

Work in the Rajsbaum laboratory focuses on the study of host-pathogen interactions and innate immune responses to viruses. Innate and cell-intrinsic immune responses are essential to protect host cells against pathogens. Members of the tripartite motif (TRIM) family of E3-ubiquitin ligases are involved in antiviral immunity by directly inhibiting viral replication or by sensing and transmitting signals to induce antiviral cytokines. However, to establish productive infection, viruses have developed sophisticated mechanisms to counteract host immune responses, including targeting TRIM proteins. Our lab is interested in elucidating the mechanisms by which TRIM proteins and other signaling molecules regulate antiviral functions and how viruses (Influenza, dengue, Zika, West Nile, Ebola, Nipah and other viruses) evade these immune responses. We and others have shown that members of the TRIM family (TRIM5, TRIM6, TRIM25) catalyze the synthesis of unanchored polyubiquitin chains that activate antiviral signaling pathways. In addition, new evidence indicates that TRIMs and ubiquitination of viral proteins can have both antiviral and proviral functions depending on the host environment. Our lab aims to dissect these molecular mechanisms that regulate virus replication using in vitro biochemical methods, primary immune cells, and in vivo animal models. We also hope to identify new components of innate immune signaling pathways and viral factors that could be targeted for therapeutic intervention.

Publications


Antigen processing; T-cell presentation; mucosal immunity; H. pylori, inflammatory bowel disease, gastric cancer, peptic ulcer disease

Research Interests
My research interests include various aspects of mucosal immune regulation. Research efforts in my laboratory have helped elucidate the role of mucosal epithelial cells and myofibroblasts in local T cell regulation during gastrointestinal inflammation. The interactions of H. pylori and the gastric epithelium are being used as a relevant model system of chronic mucosal inflammation. Also, we are interested in understanding the H. pylori and host interactions that lead to inflammation and tissue damage. Further, as gastric cancer is a deadly form of cancer because there are no reliable diagnostic markers, our lab is involved in studies to characterize early biomarkers of disease for diagnostic purposes.

Publications


Pei-Yong Shi, PhD

I.H. Kempe Professor of Human Genetics, Department of Biochemistry & Molecular Biology, Department of Pharmacology & Toxicology, Sealy Center for Structural Biology & Molecular Biophysics

Flavivirus replication, host-virus interactions, drug discovery, vaccine, and diagnosis.

Research Interests

The Shi lab integrates both academic and industrial expertise for basic and translational research. Our research focuses on flaviviruses that cause significant human diseases, such as Zika, dengue, West Nile, and Japanese encephalitis viruses. Despite their global public health burden, there is no clinically approved therapy for flavivirus infection. To address this huge unmet medical need, we take a multidisciplinary approach (i) to study the molecular mechanism of viral replication and (ii) to translate the knowledge into antiviral/vaccine products. Many of our projects are highly collaborative with both academic and pharmaceutical partners around the world. We also aspire to apply the knowledge achieved from the flavivirus research to drug discovery and vaccine development for other viral pathogens.

1. **Flavivirus replication.** Understanding viral replication at a molecular level is essential for development of novel intervention. Our basic research is designed to decipher how viral and cellular factors modulate each other during viral infection, leading to productive viral replication and effective immune response. Our experimental approach includes biochemistry, structural biology, chemical biology, molecular biology, and disease modeling in vivo. The goal of these studies is to define the mechanisms of viral replication and host response that could be used for therapeutics and vaccine development. Progressing at the forefront of basic research provides a competitive edge for our translational research. In return, the translational research poses new questions and provides unique tools (such as inhibitors) for the viral replication research.

2. **Drug discovery.** Four strategies have been pursued to identify flavivirus inhibitors: (i) High-throughput screening (HTS) using viral infection assays; (ii) HTS using viral enzyme assays; (iii) structure-based in silico docking and rational design; (iv) repurposing clinical compounds (that have been previously developed for other indications) for potential treatment of flavivirus infection. New insights derived from viral replication research (described above) have enabled us to design new inhibitors of viral proteins or inhibitors of host factors that are essential for viral infection. Through collaboration with medicinal chemists and pharmacologists, we advance these inhibitors towards preclinical and clinical development.

3. **Vaccine development.** We discovered and invented a novel vaccine approach using mutant viruses defective in 2'-O methylation of viral RNA. Viruses that replicate in the cytoplasm cannot access to the host nuclear capping machinery. These viruses have evolved viral methyltransferase(s) to methylate N-7 and 2'-O cap of their RNA; alternatively, they ‘snatch’ host mRNA cap to form the 5’-end of viral RNA. The function of 2'-O methylation of viral RNA cap is to mimic cellular mRNA and to evade host innate immune restriction. A cytoplasmic virus defective in 2'-O methylation is replicative; but its viral RNA lacks 2'-O methylation, and is recognized and subsequently eliminated by host immune response. We are applying this novel vaccine approach to flaviviruses. In addition, we pursue other approaches for flavivirus vaccine development.

Publications


Research Interests

Dr. Soong’s research focuses on tropical infectious diseases caused by insect-transmitted pathogens. Using mouse and cell culture infection models, she examines how innate and adaptive immune responses against bacteria, viruses, and parasites are regulated, which host- and pathogen-derived factors are responsible for disease pathogenesis, and which molecules can be incorporated into the disease control regimen. Special focus is placed on the activation and dysregulation of infected target cells (endothelial and dendritic cells, neutrophils, and macrophages), as well as on their impact on T cell responses, during acute versus chronic infection. New lines of research include host cellular signaling, tissue-specific gene expression profiles, and genetic susceptibility variants for leishmaniasis and scrub typhus. She also has collaborations with other scientists on animal models of Zika virus infection and vaccine development for viral infection.

Publications


Robin Stephens
Associate Professor, Departments of Internal Medicine (Infectious Diseases) and Microbiology & Immunology

Research Interests

Malaria still kills 0.8 million people a year, mostly children in sub-Saharan Africa. Vaccine work has entered a very hopeful stage, but very little is known about the factors determining immunity to this parasitic disease. Work in our laboratory focuses on the immunology and pathology of malaria infection. CD4+ Memory T and B cells are essential for effective immunity; however there are many aspects of their development and maintenance that are not yet understood. Our aim is to understand the mechanisms of protection and maintenance of these cells.

- CD4+ T cell memory to blood stages of Plasmodium chabaudi chabaudi (AS), mouse malaria
- Effector function (Th1, Tfh) commitment in memory cells in malaria
- Vaccine strategies to generate protective effector memory T cells
- B cell memory and splenic microenvironment
- T cell memory and cytokines in P. Falciparum infection in collaboration with field laboratories
- Techniques: Multi-color flow cytometry, microchip analysis, in vivo studies

Publications


2. Carpio, VH, Opat, MM, Montañez, ME, Banerjee, PP, Dent, AL and Stephens, R. 2015. IFN-γ and IL-21 Double Producers are Bcl6-Independent and they survive into the Memory Phase in Plasmodium chabaudi infection. PLoS ONE, 10(12):e0144654.

Jiaren Sun, MD, PhD

Professor, Departments of Microbiology & Immunology and Pathology

Immune responses to virus infection and inflammatory diseases

Research Interests

Zika, dengue, yellow fever, hepatitis C, and West Nile viruses are closely related and all belong to the same family of viruses (Flaviviridae). These viruses inflict enormous amounts of morbidity and mortality in patients worldwide. Dr. Sun’s laboratory studies mechanisms of viral infection, immune recognition, and function and clinical sequelae of these infectious diseases. Using molecular and cellular immunology tools in animal models and tissue cultures, we have recently discovered that outcomes of congenital Zika disease depend on timing of infection, and that interferon-lambda, a type III interferon, is effective in blocking maternal-fetal viral transmission in human and animal models of Zika infection. His team is currently investigating how unique mechanisms operating for the virus-vector-mammalian host cross-talk, its impact on tissue-specific immune responses, and disease outcomes. These steps can be targeted for better clinical intervention and future vaccine development.

Publications


HIV-associated neurological disorders (NeuroAIDS)

Research Interests

HIV-1 infection causes a spectrum of neurological/cognitive complications (NeuroAIDS), but the pathogenic mechanisms are poorly understood and effective therapies are not available. NeuroAIDS presents a huge opportunity for both basic and translational research. We are interested in the pathogenic processes that contribute to the development of NeuroAIDS. A focal point of our NIH-funded current research is on the HIV-associated pathological pain, a neurological complication suffered by many millions of HIV-1/AIDS patients. In collaboration with other investigators (including Dr. Ben Gelman and Sue Carlton at UTMB), we are working to elucidate the molecular, synaptic and glial mechanisms by which HIV-1 infection and the co-morbid factors (e.g. drugs of abuse and antiretroviral treatments) cause the pathological pain. In particular, we focus on the potential role of Wnt signaling in the pathogenesis. With the new knowledge generated, we aim to develop innovative therapeutics to treat the pain syndrome. We use interdisciplinary methodologies, including molecular biology, neuron imaging, gene knockout, electrophysiology and behavioral testing, in our studies on animal models, postmortem patient specimens and primary cultures of neurons and glia. Students/postdocs and other research scientists who are interested in joining the exciting projects are welcome to contact Dr. Tang (email: shtang@utmb.edu; Tel: 772-1190).

Publications

Robert B. Tesh, MD
Professor of Pathology and Microbiology & Immunology

Epidemiology and ecology of arthropod-borne and other zoonotic viral diseases. Virus discovery

Research Interests

My primary research interests are the epidemiology and pathogenesis of arthropod-borne and zoonotic viral diseases. My work involves field studies of the natural history of the viruses and laboratory investigations on their pathology in animals. I am also director of the World Reference Center of Emerging Viruses and Arboviruses. This is a large virus collection, which includes most of the known arboviruses as well as reagents (antibodies and antigens) for them. These are distributed at no cost to qualified investigators throughout the world. The Reference Collection is an invaluable resource for persons interested in comparative studies of viral interrelationships and pathogenicity. We are also actively involved in the discovery, characterization and taxonomic classification of new viruses.

Publications

Research Interests

The Torres' lab is interested in pursuing studies to understand the pathogenic process of Shiga toxin producing E. coli (STEC) and other pathogenic E. coli strains and the interaction of these pathogens with the intestinal mucosa, with most of these studies combining genetic approaches and animal model testing. Further, the laboratory has also made significant progress in understanding the pathogenic mechanisms of Burkholderia mallei and B. pseudomallei, with a special emphasis in defining the immune responses to infection, allowing us to test multiple virulence factors as vaccine candidates and other therapeutic approaches to protect against Burkholderia aerosol infections. Our research group has contributed to the knowledge of pathogenic E. coli virulence factors, particularly those adhesins associated with human infections, to define the bacterial factors mediating intestinal tissue tropism, and to our understanding of immunogenic antigens and their value as vaccine candidates. In the case of Burkholderia pathogenesis, we have advance the field of host immune responses to infection, identifying novel immunogenic antigens as effective vaccine candidates.

Publications

Recent publications in the E. coli field


Recent publications in the Burkholderia field

Host innate immunity to and the pathogenesis of emerging and re-emerging RNA viruses, including SARS-CoV, MERS-CoV, RVFV, and Avian Influenza A viruses

Research Interests

1. Pathogenesis of emerging and re-emerging RNA viruses
2. Innate antiviral signaling pathways against viral infections
3. Immune evasion of RNA viruses
4. Cytokines and inflammation and vaccine strategies against RNA viruses
5. Development of vaccines and treatments for SARS-CoV, MERS-CoV, and other RNA viruses

My primary research is focused on understanding how RNA viruses trigger the host immune responses and how permissive hosts defend against emerging and re-emerging viruses. Specifically, we study the molecular and cellular interplays whereby the innate immune responses are initiated and regulated and how an unregulated innate immunity leads to diseases and mortality. We are particularly interested in dissecting the antiviral signaling pathways by which pathologically relevant host cells mount innate immune responses to invading viruses. We are also interested in how viruses evade the host defense system. The ultimate goal of our studies is to understand and identify novel molecules of the innate immune system as targets for preventive and therapeutic intervention against SARS-CoV, MERS-CoV, and other emerging RNA viruses. Various state-of-art approaches involving virology, immunology, biochemistry, molecular biology, and genetics are used to establish and characterize cell lines/clones with specific gene KO or knock down (KD) (i.e., loss-of-function) or constitutive expression (i.e., gain-of-function) phenotypes, and identify the role(s) of selected genes in the host antiviral defense. We are also interested in evaluating the impact of the cellular interplays on the pathogenesis of viruses in vitro, via using two and/or three-dimensional culture systems. Our research is currently supported in part by grants and contracts from the National Institutes of Health, and other Pharmaceutical industries.

Publications

David H. Walker, MD

Professor, Departments of Pathology and Microbiology and Immunology
Director, Center for Biodefense and Emerging Infectious Diseases

Immunity to and pathogenesis of arthropod-transmitted obligately intracellular bacterial infections (Rickettsia, Orientia, and Ehrlichia)

Research Interests

My research interests are broadly in the area of obligately intracellular bacteria that are transmitted by arthropod vectors. Three research topics are focused on immune mechanisms against rickettsiae, orietniae and ehrlichiae and identification of the secreted and surface protein antigens that stimulate immunity. Although the diseases caused by rickettsiae include many long known and feared life-threatening infections such as Rocky Mountain spotted fever and epidemic typhus, elucidation of their molecular composition and effector immune mechanisms remain productive lines of investigation. In contrast, human ehrlichiosis are truly emerging tick-transmitted infectious diseases that were unknown until recently and are causing increasingly prevalent, severe infections. Nearl everything regarding ehrlichial pathogenesis and immunity is in the process of being discovered and investigated at present for these novel organisms. Scrub typhus caused by Orientia tsutsugamushi affects 1 million persons annually with 10% lethality. Vaccine development is an urgent need, but the mechanisms of immunity are poorly understood. My investigative armamentarium includes outstanding mouse models of spotted fever, scrub typhus, and typhus rickettsioses and monocytotropic ehrlichioses, including a tick-transmission model, which lend themselves to the study of pathogenesis as well as immunity. The molecular studies of rickettsiae have focused on major immunodominant outer membrane proteins, including S-layer proteins, surface proteins with hydrophilic domains containing multiple repeat units and candidate adhesins. Recent data revealed that non-surface exposed T-cell stimulatory antigens shared among widely divergent rickettsiae provide significant crossprotection. The molecular studies of Ehrlichia chaffeensis, E. canis, and E. muris have focused on immunodominant proteins and are now using proteomic and genomic approaches to identify protective antigens. Research on our recently developed valid models of scrub typhus are being utilized to determine the mechanisms of immunity to Orientia tsutsugamushi.

Publications


Tian (Tina) Wang, PhD

Professor of Microbiology & Immunology and Pathology

Mosquito-borne emerging RNA viruses, Immunopathogenesis, Host Immunity, Vaccines, Animal models

Research Interests

Dr. Wang’s research is primarily focused on viral pathogenesis and host immunity to West Nile virus infection. West Nile virus, a neurotropic mosquito-borne flavivirus, has been the leading cause of viral encephalitis in the United States for more than one decade. We are interested in understanding the mechanism of immune defense and identifying factors contributing to induction of long-lasting protective immunity. More recently, we have extended our studies to other emerging mosquito-borne RNA viruses, including Zika virus and Chikungunya virus.

Publications


Scott C. Weaver, PhD

Director, Institute for Human Infections and Immunity; Scientific Director, Galveston National Laboratory; Professor and Chair, Department of Microbiology & Immunology

Ecology, epidemiology, evolution, and pathogenesis of arboviral diseases; vaccine development

Research Interests

Our research focuses on the ecology, evolution, epidemiology and pathogenesis of arboviral diseases, arbovirus-mosquito vector interactions, and vaccine development for arboviral disease prevention. Current projects include emergence mechanisms, pathogenesis and vector transmission of Zika and chikungunya viruses. We are also developing a newly discovered mosquito-specific alphavirus, Eilat virus as a vaccine and diagnostic antigen platform, as well as developing vesiculoviruses as new vaccine vectors. We also lead the CDC-funded Western Gulf Center of Excellence in Vector-borne Diseases involving 8 academic and multiple public health institutions in Texas and the World Reference Center for Emerging Viruses and Arboviruses.

Publications


Dr. White’s laboratory focuses on the protozoan parasites of the genus Cryptosporidium, which are emerging as major causes of diarrhea worldwide. Studies include development of novel methods of parasite propagation, using novel methods of gene silencing for drug development, development of improved diagnostic tests, and drug screening. He has published over 125 peer-reviewed publications in addition to numerous book chapters.

Publications


**Research Interests**

Hepatitis C virus (HCV) is a small, enveloped, positive-stranded RNA virus belonging to the family Flaviviridae. HCV often leads to serious liver diseases, including liver fibrosis, cirrhosis and hepatocellular carcinoma. HCV infection has also been linked to metabolic diseases, such as NAFLD (non alcoholic fatty liver disease) and type 2 diabetes. Our current research focuses on two major areas that are least understood. First, we are studying the mechanism of hepatitis C virus assembly process to understand how it could form lipoviro particles (virus-lipoprotein hybrid), which likely allow it to avoid host immune detection leading to chronic infection. Second, we are studying virus host interactions involved in HCV-induced pathogenesis, including liver fibrosis and hepatocellular carcinoma.

**Publications**


