



Infectious Disease

Tufts' signature program in infectious disease research includes cross-campus collaborations and industry partnerships focusing on current and future health threats. Our work gathers researchers from computer science, applied mathematics, biostatistics, public health, epidemiology, medical research, and biological sciences and engineering. We strive to build a common language among these disciplines and to create novel analytical approaches and computational tools for the global efforts to counter the public health threats of infectious disease.

CUMMINGS SCHOOL OF VETERINARY MEDICINE

COMPETENCIES AND RESEARCH

Within the Cummings School of Veterinary Medicine's Department of Biomedical Sciences is the Division of Infectious Disease, which is devoted to the study of pathogens that affect human health. The implications for medicine and wellness in this area of study are highly significant, as recognized by the breadth and depth of the work being done by more than a dozen faculty members in this division. Overall, it has 70 members, including staff, technicians, and graduate students.

"Through their knowledge of comparative medicine, veterinarians have a unique perspective that greatly advances infectious disease research," according to Saul Tzipori, director of the division. "Veterinarians trained as scientists have greater depth of knowledge of host-pathogen interaction," he explains, "They regard humans as another mammalian species that shares the same environment and are subject to similar health challenges as animals."

The division provides expertise that links the fields of human and animal health and that facilitates and quickens the process of testing and developing disease therapeutics and preventive treatments advancing solutions in public and population health.

Work in this division falls into several categories:

- **Food and Waterborne Diseases:** Tufts researchers are collaborating with national and international teams to find therapies to prevent or reverse botulism intoxication, a Category A bioterrorist threat. Another group is embarking on human clinical trials for the first therapeutic treatment for bacteria-induced hemolytic uremic syndrome, the single most important cause of kidney failure in children in the U.S. and other developed countries. Another effort is aimed at developing new animal models to study shigellosis, a major cause of diarrhea and dysentery with high morbidity and mortality in many parts of the world.
- **Tick-Borne Diseases:** Important research is being done at Tufts on infections such as Lyme disease, babesiosis, ehrlichiosis, deer tick virus, and tularemia. We are working on identifying phenomena occurring at the level of populations, and in particular, processes and factors that regulate how these infectious agents persist from generation to generation. Our efforts are aimed at providing general concepts on the evolution of infectious agents and at finding principles that can serve as the basis for public-health interventions. A related focus is to measure the public-health burden and epidemiology of these environmental infections.
- **Parasitic Disease:** One of our labs specializes in the use of molecular biology tools to investigate interactions between parasitic worms and their mammalian hosts. Globally, worm infections cause diseases in more than a billion people and create serious problems for companion and farmed animals. We are focusing our attention on the blood flukes that cause human schistosomiasis. We also have

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projects involving cestode tapeworms and several nematode parasites. Our laboratory is exploring the utility of several new molecular tools to improve our ability to investigate host/parasite interactions.

- **Zoonotic Diseases:** Afflictions such as avian influenza, rabies, and tuberculosis and their potential to be transmitted from animals to human populations are an area of research at Tufts that encompasses initiatives in Africa, India, Indonesia, and Nepal. Our efforts, which extend to disease surveillance, include projects aimed at rabies control and poultry health designed to empower local communities and strengthen veterinary services.
- **Biosafety:** Cummings opened its state-of-the-art, regional biosafety laboratory in the spring of 2009. This facility includes Biosafety Level 2 and Level 3 laboratories, a small animal vivarium, an aerobiology suite, and an insectary. This facility will allow Tufts researchers to build upon the work we have been doing for nearly three decades to improve human and animal health through better detection, prevention, and treatment of infectious diseases. The facility also serves as a regional resource for other New England scientists conducting research of public-health importance.
- **Other Initiatives:** Tufts researchers are involved in projects directed at developing temperature-stable vaccines that do not require an uninterrupted chain of refrigeration in order to maintain their efficacy. This could greatly reduce the cost of transportation, storage, and delivery. Another area of study is aimed at finding novel ways to monitor large volumes of source and tap water for accidental or deliberate contamination with certain pathogens. The Environmental Protection Agency recently approved a method developed at Tufts and which has just become commercially available.

PARTIAL LIST OF INVESTIGATORS

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SELECTED RESEARCH SPONSORS

- American Waterworks Foundation
- Centers for Disease Control and Prevention
- Environmental Protection Agency
- Bill & Melinda Gates Foundation
- National Institutes of Health

LABS, GROUPS, AND CENTERS

- Center for Conservation Medicine
- Microbiology and Botulism Research Unit
- The Molecular Helminthology Laboratory
- New England Regional Biosafety Laboratory

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TUFTS UNIVERSITY SCHOOL OF MEDICINE

COMPETENCIES AND RESEARCH

A strong cadre of investigators at the Tufts School of Medicine (TUSM), which includes the Sackler School of Graduate Biomedical Sciences, is working to improve global health by preventing diarrheal and other waterborne infectious diseases and by advancing the scientific understanding of genetic response to pathogens. There are particular competencies in diseases of the developing world, including HIV/AIDS, as well as systemic infection, viral infection, and pathogen-host interaction.

Emphasis on international health has been strengthened with the establishment at TUSM of the Center for Global Health Research, which provides support for investigators in the design, conduct, and funding of clinical research on international health. The School of Medicine's Nutrition/Infection Unit is also home to the Collaborative Center for Drug Abuse and AIDS Research, a partnership among Tufts, Brown University, Johns Hopkins, and their affiliated hospitals.

A key focus of the Sackler School's research is the study of immunologic aspects of disease, including pathogenesis of Epstein-Barr virus infection and various forms of leukemia, as well as work on AIDS, schistosomiasis, trypanosomiasis, cholera, and *E. coli* infection. Additionally, the microbiology laboratory conducts studies on diarrhea, lactobacillus strains, and antimicrobial drugs.

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SELECTED RESEARCH SPONSORS

- National Institute of Allergy and Infectious Diseases
- National Institutes of Health

LABS, GROUPS, AND CENTERS

- Study Center on the Immunogenetics of Infectious Disease
- Tufts University Initiative for the Forecasting and Modeling of Infectious Disease

TUFTS MEDICAL CENTER

COMPETENCIES AND RESEARCH

The Division of Geographic Medicine and Infectious Diseases at Tufts Medical Center is a center of excellence in infectious disease research and training. The center's researchers maintain highly productive and well-funded basic science, translational, clinical, and outcomes research as well as global health programs investigating bacterial, fungal, viral, and parasitic pathogens and diseases. The divisional research budget is in excess of \$4 million per year, with exceptionally strong funding of both basic and clinical research projects.

Clinical research in the Division of Geographic Medicine and Infectious Diseases is a well-established and growing area of research, representing a wide variety of projects, such as epidemiologic studies, clinical trials, translational research and outcomes, and modeling studies. Active areas of inquiry include both HIV and non-HIV infections, transplant-related infections, hospital infections, diarrheal disease, probiotics and host defense, antimicrobial resistance, fungal infections in the intensive care unit and in compromised hosts, borrelia infections, the pharmacodynamics of antimicrobial therapy, cold-adapted vaccines, cytomegalovirus infections, cryptosporidial infections, and decision analysis and meta-analysis of infectious diseases.

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SELECTED RESEARCH SPONSORS

- Bill & Melinda Gates Foundation
- National Institutes of Health
- USAID
- World Health Organization