

UNIVERSITY OF PITTSBURGH
GRADUATE SCHOOL OF PUBLIC HEALTH



Infectious Diseases and Microbiology

INTRODUCTION

Infectious diseases are at the root of some of the world's most pressing public health issues. The faculty, students, and staff of the Department of Infectious Diseases and Microbiology (IDM) in the University of Pittsburgh's Graduate School of Public Health are dedicated to understanding and finding solutions to public health problems involving infectious diseases.

We embrace these problems at an intellectual level, while simultaneously recognizing the potential our efforts have to affect the world's population. Understanding the behaviors of both people and microbes—the host response to infection—is the key to developing methods for treating and preventing infections.

A major component of IDM's mission involves training the next generation of scientists and public health professionals to join in the effort to improve the global condition. IDM graduate degree programs draw upon the disciplines of molecular biology, immunology, epidemiology, medicine, health education, and community intervention, providing students with opportunities to participate in crossdisciplinary research projects that investigate multiple aspects of infectious disease processes.

IDM research and training programs are well funded. Department faculty have brought in more than \$28,000,000 in funding from the National Institutes of Health (NIH) in the last 15 years. This funding base provides the necessary foundation for equipping and staffing laboratories, thus creating a solid and dynamic learning environment.

This brochure introduces prospective students to IDM's graduate degree programs as well as its exciting and cutting-edge research projects. For more information on these topics and to apply to the school, please visit the IDM Web site at www.idm.pitt.edu.

IDM offered "an outstanding and highly productive professional relationship with my advisor and access to novel research methods." Chris Keller (PhD '05)

GRADUATE PROGRAMS

Doctor of Philosophy (PhD)

In this program, the emphasis is on the immunologic and molecular mechanisms by which microorganisms infect hosts and cause disease.

Master of Science (MS)

This program is more limited in scope than the PhD program but has the same basic research emphasis.

Doctor of Public Health (DrPH)

This course of doctoral study prepares healthcare professionals to conduct independent research in an array of infectious disease areas.

Master of Public Health (MPH)

Track A: Infectious Diseases

This track is designed to provide students with an understanding of the biological basis of infectious diseases as well as the epidemiologic basis of disease prevention.

Track B: Communicable Diseases and Behavioral Health Science

This track is designed to prepare healthcare professionals to define, assess, and develop public health interventions.

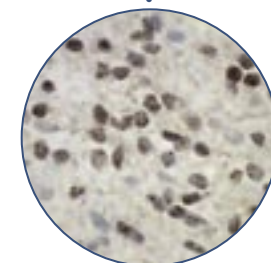
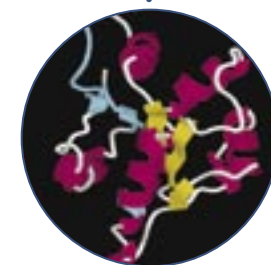
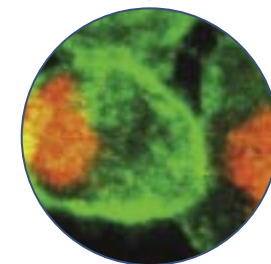
APPLICATION PROCEDURES AND DEADLINES

Admission to all four graduate programs is for the fall term only. Applicants are evaluated with respect to undergraduate academic performance, Graduate Record Exam (GRE) test scores, letters of recommendation, and relevant research or professional experience.

The application deadline is January 15. The IDM Graduate Admissions Committee strongly recommends that applicants submit all materials by this deadline to ensure prompt review.

Financial support (through stipends and tuition waivers) is available for full-time PhD students. A limited number of partial scholarships are available to outstanding new MS and MPH students.

Application materials, as well as tips for submitting materials on time, are available on the IDM Web site, www.idm.pitt.edu.



FACULTY

Seventeen IDM faculty members have primary appointments, and 20 have secondary appointments. The specific research interests of individual faculty members are listed on the IDM Web site.

A RECORD OF SUCCESS

In recent years, IDM graduates have obtained professional positions with such institutions as these:

Centers for Disease Control and Prevention	Naval Medical Research Center
Children's Hospital of Pittsburgh	New York State Department of Health
Dartmouth College	Pfizer Inc.
Emory University	Thomas Jefferson University
Merck Pharmaceuticals	University of California at Los Angeles
National Institutes of Health	University of Chicago
	University of Maryland at College Park

MAJOR RESEARCH AREAS

Natural History, Pathogenesis, and Treatment of HIV Infection

Many IDM faculty members conduct research aimed at understanding the biology of human immunodeficiency virus (HIV) and the ways in which HIV infection gives rise to AIDS. Researchers employ a range of techniques and approaches to address this crucial public health issue.

Some examples of their work include:

- mechanisms of sexual transmission of HIV, such as origins of the virus in semen and the effects of microbicides on HIV infection
- mechanisms of HIV pathogenesis, including defining unique host factors that suppress HIV infection, new cellular pathways of HIV infection, and the relationship of dendritic cells to activation of HIV-specific T-cell immunity to HIV infection
- models of AIDS in nonhuman primates, using HIV infection as a means of testing new vaccines and therapies
- studies showing the ways in which genetic variation in the human host can influence the progression of HIV infection
- the Pitt Men's Study, one of four clinical sites of the NIH Multicenter AIDS Cohort Study (MACS) that has been investigating the natural history of HIV infection in volunteer subjects for more than 20 years, including the epidemiologic risk factors for cardiovascular, liver, kidney, and central nervous diseases in HIV-infected persons on antiretroviral therapy
- assessments of new experimental therapies for HIV infection through the Pittsburgh AIDS Clinical Trials Unit (ACTU), which is housed in Pitt's School of Medicine and is one of more than 30 such NIH clinical sites in existence since 1986

Herpesviruses

Herpesviruses are DNA viruses that establish chronic infections and can lead to a number of diseases, particularly in immunocompromised hosts.

Epstein-Barr Virus (EBV)

EBV is the causative agent of infectious mononucleosis, B cell lymphomas, and a lymphoproliferative disease associated with immunosuppressive therapies used in organ transplantation.

Research efforts focused on EBV include:

- virologic, genetic, and immunologic analysis of the natural history of EBV infection in the immunocompromised host
- investigation of the basic nature of EBV latency in memory B cells
- analysis of potential genetic polymorphisms in the immune genes produced during the course of immune responses to EBV

Kaposi's Sarcoma-Associated Herpesvirus or Human Herpesvirus 8

Kaposi's sarcoma-associated herpesvirus (KSHV), or human herpesvirus 8 (HHV-8), is a newly discovered member of the human herpesvirus family that causes a cancer called Kaposi's sarcoma (KS).

Current projects related to KSHV focus on:

- the prevalence of KSHV infection in various at-risk cohorts and populations
- the association of KSHV with non-KS human cancers and other diseases
- the role of anti-KSHV T-cell immune responses in the prevention of KS
- the interactions between the virus and its cellular receptors
- the risk for developing KS related to host gene expression patterns

Malaria and Tuberculosis

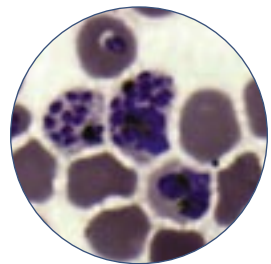
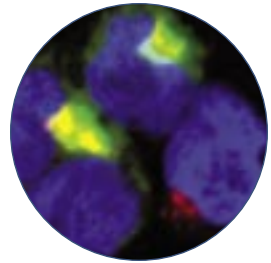
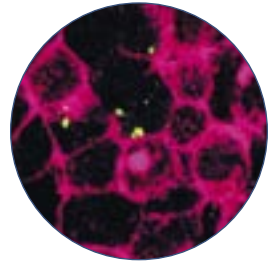
Among the infectious diseases making a tremendous global health and economic impact are malaria and tuberculosis. The global HIV/AIDS pandemic has had a direct impact on the prevalence, nature, and outcomes of these diseases. Goal 6 of the United Nations' Millennium Development Goals is to combat malaria, tuberculosis, and HIV, with its target being to halt and reverse the spread of these diseases by the year 2015.

Malaria

Malaria, a recurring tropical infectious disease, is caused by *Plasmodium falciparum* and has multiple disease outcomes. Investigators in IDM are involved in field-based studies in Siaya and Kisumu in western Kenya. A major focus of this research is aimed at elucidating the molecular determinants of protective and pathogenic immune responses in children with *Plasmodium falciparum* malaria.

Ongoing research projects in this area include:

- studies of the role of cytokines and effector molecules in determining disease susceptibility to malaria
- studies of the molecular basis of immune dysregulation promoted during host-parasite interactions
- analyses of how cytokines, nitric oxide, and prostaglandins mediate development and maintenance of immunity



Tuberculosis

The World Health Organization estimates that one-third of the world's population is infected with *Mycobacterium tuberculosis*, the causative agent of tuberculosis. This global burden is alarming given that we are still in need of an effective vaccine and new drugs to combat *M. tuberculosis*.

Collaborative studies focused on tuberculosis include:

- studies of the local expression of immune factors involved in the formation of inflammatory sites called granulomas
- analysis of the composition and structures of granulomas in animal model systems

AIDS Education and Prevention

HIV Education

IDM faculty—working through the Pennsylvania/MidAtlantic AIDS Education and Training Center (PA/MA AETC)—are experts in HIV/AIDS education development, implementation, and evaluation. Projects measuring the impact of educational intervention between health professionals and the community are ongoing. Areas of education include: HIV treatment, adherence, medical comorbidities, substance use, prevention for HIV-positive persons, mental health issues, and quality management. Opportunities exist to develop skills and knowledge of HIV education content and educational program development.

HIV Prevention

IDM faculty and staff work with the Pennsylvania Department of Health to monitor prevention needs and to assist the HIV Prevention Community Planning Committee with developing a statewide plan. Opportunities exist to develop skills in prevention.

HIV Treatment

IDM faculty work with the Pennsylvania Department of Health to develop a statewide plan for providing access to HIV treatment, improving the quality of HIV care, and increasing coordination among agencies and programs across the state that receive funding from the Ryan White Comprehensive AIDS Resources Emergency (CARE) Act. Opportunities exist to develop skills and knowledge of the HIV care system. The PA/MA AETC is on the cutting edge of current HIV treatment and prevention education for HIV treatment teams.

HIV Clinical Capacity Building

Through the PA/MA AETC, HIV clinical capacity building and care systems development and enhancement are ongoing activities. These are accomplished through training, consultation, and technical assistance throughout the six-state region covered by this program. The Pennsylvania Prevention Project assists agencies that provide HIV prevention services, including with behavioral intervention and the development of faith-based prevention approaches. Opportunities exist in IDM to learn skills in consulting, community intervention, program improvement, and evaluation.

Emerging Infections

New, re-emerging, and drug-resistant infections pose some of the greatest threats to public health. These can be either naturally occurring infections or man-made bioterrorism agents. IDM researchers are developing new strategies aimed at increasing understanding of these diseases and finding suitable prevention and treatment.

Research efforts are focused on such diseases as:

- Q fever—a zoonotic disease caused by *Coxiella burnetii*, an intracellular bacterial infection and potential bioterrorism agent. One single bacterium can cause disease symptoms in an infected individual.
- avian influenza—one of many different strains of the influenza virus that normally only infects birds; however, it evolves rapidly and can transfer from one species to another. The avian influenza strain H5N1 is highly virulent and will pose a serious health risk if it spreads to the human population.
- SARS—a severe, life-threatening respiratory disease caused by a coronavirus, a zoonotic infection acquired from certain mammals that can also spread rapidly from person to person.
- West Nile Virus—spread by mosquitoes, this agent can cause severe central nervous system disorders and death.

Clinical and Molecular Epidemiology

Interdisciplinary research is essential for developing and evaluating new, innovative approaches for diagnosis, prognosis, prevention, and treatment of infectious diseases.

Research in this area, coordinated by primary and secondary faculty in GSPH and the School of Medicine, includes:

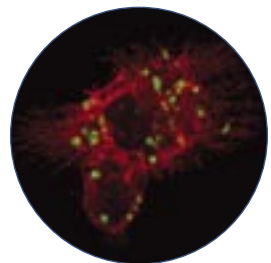
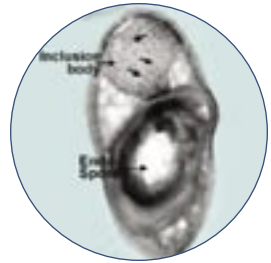
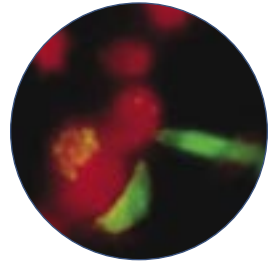
- molecular epidemiology of bacterial pathogens
- enhanced microbiological surveillance methods for detection of naturally occurring and bioterrorism-related outbreaks
- epidemiology of traditional and emerging respiratory viral infections in organ transplant recipients

Development of HIV Vaccines and Immunotherapies

The induction of potent, virus-specific immune responses is an important goal of HIV vaccine and immunotherapeutic strategies designed to control viral replication and disease. IDM researchers are evaluating several candidate vaccines at the preclinical and clinical levels to identify the most potent vaccine that will best protect people from infection and/or disease.

Current approaches include:

- developing DNA-based vaccine vectors containing multiple HIV-antigens that can be injected through intramuscular/intradermal immunizations, as well as prime-boost strategies using adenoviral and virus-like particles to induce broad and strong immune responses
- loading dendritic cells with HIV peptides, proteins or RNA, or virus-infected dead cells to mimic natural infection and provide a variety of antigenic targets that reflect the natural infection-immunity model and are being used in clinical immunotherapy trials of HIV-infected persons as part of the NIH Division of Aids Novel HIV Therapies: Integrated Preclinical/Clinical Program
- developing oral HIV vaccines using noncytotoxic *C. perfringens* strains expressing large amounts of HIV and SIV proteins in the form of inclusion bodies that contain high concentrations of protein





THE UNIVERSITY AND THE CITY

The University of Pittsburgh was founded in 1787, making it one of the oldest institutions of higher learning west of the Allegheny Mountains. One of the leading universities in the United States, it is a member of the prestigious Association of American Universities. The campus in the Oakland neighborhood of Pittsburgh is a 132-acre site adjacent to the renowned University of Pittsburgh Medical Center (UPMC), Carnegie Mellon University, and Schenley Park. The on-campus Petersen Events Center hosts many sporting events and concerts as well as other special programs.

Thriving amid the echoes of its industrial past, Pittsburgh is a vibrant urban center that is rich in ethnic tradition and diverse religious cultures. A tour through the city reveals a patchwork of eclectic neighborhoods. Visit the ethnic groceries, open-air produce markets, and artisan shops of the Strip District or explore the urban appeal of the historic Victorian row houses of the Mexican War Streets. Pittsburgh neighborhoods—distinct in character but connected through common values—define the city.

Not only is it inexpensive to rent a spacious apartment or even buy a house in Pittsburgh, but a Pitt student also can experience all of the city's lively culture, championship sports, and nightlife hotspots on a budget. A valid Pitt ID gets students free or discounted admission to many of Pittsburgh's accessible cultural and sporting events. Even better, a Pitt ID allows students to ride Port Authority buses fare free!

To learn more about Pittsburgh, visit www.pitt.edu/pittsburgh or www.visitpittsburgh.com.

"I'd been to Pittsburgh many times before I moved there, and I've always liked it. It's the right mixture of small town and big city. The people are friendly as in a small town, yet big-city amenities like theaters and museums are easily accessible." Mimi Ghosh (PhD '05)



University of Pittsburgh

*Graduate School of Public Health
Department of Infectious Diseases and Microbiology
Parran and Crabtree Halls
130 DeSoto Street
Pittsburgh, PA 15261*

Phone: 412-624-3331
E-mail: ral9@pitt.edu

www.idm.pitt.edu

The University of Pittsburgh is an affirmative action, equal opportunity institution. Published in cooperation with the Department of University Marketing Communications. UMC5333-1105