



EMORY
LANEY
GRADUATE
SCHOOL



GRADUATE DIVISION OF BIOLOGICAL AND BIOMEDICAL SCIENCES

IMMUNOLOGY AND MOLECULAR PATHOGENESIS

The Immunology and Molecular Pathogenesis (IMP) program offers exceptional interdisciplinary training in molecular and cellular immunology and the role of the immune system in the pathogenesis of infectious disease. The IMP program provides students with a unique opportunity to study all aspects of pathogenesis, ranging from basic immunology to the molecular biology of viral, bacterial, and protozoal pathogens.

Opportunities for dissertation research are available in all areas of immunology, and include projects investigating the immune response to pathogens, autoimmunity, transplantation immunology, and cancer. The research programs of the faculty members use a wide range of experimental approaches in immunobiology, molecular and cell biology, pathobiology, and genetics. In addition, many IMP program faculty work at the interface between basic and applied research (i.e., translational research including vaccine development, transplantation, and autoimmunity).

A number of faculty in Emory's IMP program collaborate extensively with scientists at the U.S. Centers for Disease Control and Prevention (CDC), which is located directly adjacent to Emory. The CDC is the world leader in uncovering new diseases and identifying infectious agents. It has strong basic science programs in molecular pathogenesis covering a broad range of microbes, including viruses, bacteria, fungi, and parasites. Several CDC scientists are faculty members in the IMP program.

PROFESSIONAL DEVELOPMENT

The Laney Graduate School offers a range of programs that encourages students to develop their professional skills, engage with broader professional communities, and prepare for their careers.

VISIT [GS.EMORY.EDU](https://gs.emory.edu) TO LEARN MORE.

TRAINING AREAS

The IMP doctoral program provides outstanding training in three areas.

IMMUNOBIOLOGY teaches students the fundamental mechanisms that control the immune response. Projects in this area cover the entire spectrum of immunological research and include understanding the response against pathogens, transplantation immunology, cancer immunology, and autoimmunity.

PATHOGENESIS OF INFECTIOUS DISEASE concentrates on (a) fundamental events by which microbes invade the host, establish themselves, and avoid the immune system, (b) elucidation of innate and adaptive immune responses to bacterial, protozoal, and viral infections, and (c) vaccine development.

MOLECULAR VIROLOGY focuses on viral packaging, the structure/function relationships of viral proteins, viral replication, and effects of viruses on cellular proliferation, transformation and apoptosis.

A number of IMP faculty member research projects extend across several of these areas, providing students ample opportunities for exceptional interdisciplinary training.

SEMINAR SERIES

IMP program students and faculty attend a regular weekly seminar series that includes invited guest lecturers and student presentations.

Invited guests come from around the world to share their latest research to students, postdoctoral fellows, and faculty in the IMP program. This series enables both faculty and students to stay current with progress in their own and related fields. Students select one outside speaker each year and have ample opportunities to interact with the invited speakers.

Some recent invited seminar speakers and topics include:

- Ari Melnick, PhD, Weill Cornell Medical College: *Epigenetic Mechanisms in Humoral Immune Response & Lymphoma*
- Julie Overbaugh, PhD, Fred Hutchinson Cancer Research Center: *Defining the pathways to eliciting antibodies against HIV*
- Marion Pepper, PhD, University of Washington: *Understanding germinal-center derived IgM+ memory cells*
- Vincent Racaniello, PhD, Columbia University: *One brain, three viruses*
- Jeffrey Ravetch, MD, PhD, The Rockefeller University: *Fc Receptors: New insights into antibody diversification*
- Arlene Sharpe, MD, PhD, Harvard University: *Diverse Functions of the PD-1 Pathway*

On alternating weeks, the IMP program attends student Research-In-Progress seminars. These seminars serve as a supportive environment for students to acquire experience in the essential skill of sharing ongoing research with professional colleagues. They are also an important way for the audience to learn from their colleagues' work.

COMMUNITY, RESOURCES AND OPPORTUNITIES

The IMP program provides a collaborative environment that encourages and supports innovative research. Students can work with and learn from not only the IMP faculty, but also from over 300 faculty members in the Graduate Division of Biological and Biomedical Sciences. These professors, their graduate students and postdocs, and the many labs they operate are Emory's greatest resource.

In addition, the Emory community has numerous facilities that provide reagents and expertise for immunological projects. Within the School of Medicine are core facilities to support research projects, including Flow Cytometry, Transgenic Mice, Microchemical and Proteomics, and Bioinformatics. State of the art animal facilities at several locations on campus house multiple species, including a large population of non-human primates at the Yerkes National Primate Research Center. The Yerkes Center also houses the Emory Vaccine Center, directed by Rafi Ahmed, Ph.D., who is an IMP faculty member.

The proximity and close relationship between the IMP program and CDC provides a unique opportunity to interact with scientists and public health officials at the frontier of international vaccine research efforts.

FACULTY

The faculty of the IMP program are members of nine basic science or clinical departments in the School of Medicine, the Biology Department of Emory College, the Yerkes National Primate Research Center, and the CDC. There are many interactions among program faculty, including collaborative research projects, joint research group meetings, and joint participation with students and faculty in the other doctoral programs of the Graduate Division of Biological and Biomedical Sciences.

A complete list of IMP program faculty members, with links to publications, laboratories and other information, is available on the IMP program website at www.biomed.emory.edu/program_sites/imp.

STUDENTS

The IMP program welcomes applications from individuals with science-based undergraduate degrees, and highly values graduate training in immunology, virology and biological sciences. Applicants with other backgrounds should contact the recruitment director to discuss the appropriateness of the program.

Our website has information about our current students, including research projects. Here is a sample of recent graduates and their dissertation projects:

- Zachary Ende: *Viral Determinants of Subtype C HIV-1 Transmission in Zambian Heterosexual Couples*
- Osric Forrest: *Pathological conditioning of neutrophils in airway inflammation*
- Chester Joyner: *Immunology and pathogenesis of acute and relapsing malaria*
- Sonia Laurie: *Coinhibitory receptor control of T cell responses in transplantation*
- Amanda Mener: *The consequences of antibody binding to red blood cells in alloantibody responses*
- Jonathan Sia: *Modulation of innate-adaptive immune crosstalk during Mycobacterium tuberculosis infection*
- Alexander Wein: *The roles of IL-36gg and CXCR6 in the immune response to respiratory viral infection*

Graduates of the IMP program work in academia, government, and the private sector. Recent graduates have successfully competed for faculty positions at the University of Washington, Baylor University, Harvard, George Washington University, and Emory University. Our alumni have also gone on to become Lead or Chief Researchers at the CDC and NIH as well as Research Scientists at companies such as Unum Therapeutics and GlaxoSmithKline.

CURRICULUM

Students usually complete the program in 5 or 6 years.

The curriculum is designed to develop a solid basis of knowledge in immunology and virology, a deep expertise in a specialty, strong research skills, and the ability to integrate their specialty and research with issues from other areas in immunology and pathogenesis.

Year 1 Students take a common sequence of courses in biochemistry, biostatistics, immunology, and virology.

Students complete three 8-10 week laboratory rotations. These provide opportunities for students to participate in active research projects in different areas and to become acquainted with faculty members who may become mentors and advisors.

By the end of Spring semester, students select a dissertation mentor.

Year 2 Students take three advanced level immunology/pathogenesis courses and a grant writing course.

At the beginning of the Spring semester, students take a comprehensive oral examination to assess their grounding in immunology/pathogenesis concepts and experimental design.

Also at the end of Spring semester, students select a dissertation committee that will guide the preparation of a dissertation proposal.

By the end of the summer between years 2 and 3, in conjunction with their dissertation mentor, students submit a National Institutes of Health application grant-style proposal, to be presented and approved by their dissertation committee.

Year 3 With the guidance of the dissertation mentor and the dissertation committee, students develop the expertise and skills needed to carry out a dissertation research project.

Years 4+ Students conduct original scholarly research, publish manuscripts, and complete a written and oral thesis defense.

At this stage, students are encouraged to present their research at regional and national scientific meetings.

Please see our website for more details regarding student requirements and courses.

TRAINING IN TEACHING

The central focus of Ph.D. training in the IMP program is training investigators and scholars. This training also includes preparation in the art of teaching peers, colleagues, and less experienced students in science. Hence, all students participate in a program of training and experience in pedagogy and other elements of teaching, through the Teaching Assistant Training and Teaching Opportunity Program (TATTO) administered by the Graduate School.

After a brief summer workshop (usually before the second year), students are assigned by the Graduate Division of Biological and Biomedical Sciences to assist a faculty member as a lecturer, laboratory instructor or discussion leader for one semester. The Graduate Division of Biological and Biomedical Sciences offers additional TATTO courses, as well as additional teaching opportunities.

FACULTY PROFILE



Rafi Ahmed, Ph.D., Director of the Emory Vaccine Center, Professor of Microbiology and Immunology, and member of the National Academy of Science. Dr. Ahmed is one of the leading experts and world-renowned lecturers on immunological memory and T-cell exhaustion. His discoveries include the discovery that T-cell memory persists for decades without antigen, that long-lived plasma cells persist in the bone marrow of patients to maintain immunity to infections, and the mechanisms that lead to T-cell exhaustion, including the role of the PD-1. As Director of the Emory Vaccine Center, he oversees efforts to create new technologies that will make our most challenging problems such as AIDS, malaria, tuberculosis, influenza, respiratory viruses and cancer a thing of the past. Among his many honors, Dr. Ahmed recently received the Robert Koch Award for his pioneering research on regulation of the immune system.

About Emory:

Emory University is one of the major biological research and medical referral centers in the Southeast and is among the fastest growing Medical Centers in the United States. Emory is consistently ranked in the top 20 institutions nationally for NIH research support and ranks at or near the top of institutions for students with NIH predoctoral fellowships. Emory is recognized as a leader in higher education in sustainability and has won numerous awards. The Best Colleges has placed Emory in the top 10 in the nation in the categories of greenest universities and the most beautiful college campuses.

The Graduate Division of Biological and Biomedical Sciences (GDBBS) has around 400 graduate students in eight interdisciplinary Ph.D. programs:

- Biochemistry, Cell and Developmental Biology
- Cancer Biology
- Genetics and Molecular Biology
- Immunology and Molecular Pathogenesis
- Microbiology and Molecular Genetics
- Molecular and Systems Pharmacology
- Neuroscience
- Population Biology, Ecology and Evolution

Over 330 world-renowned researchers mentor students admitted to these programs, giving them a unique opportunity to train with faculty at:

- American Cancer Society
- the U.S. Centers for Disease Control and Prevention
- Children's Healthcare of Atlanta, Inc.
- Emory College
- the Robert W. Woodruff Health Sciences Center
- the Rollins School of Public Health
- The Carter Center
- Veterans Administration Medical Center, Atlanta
- the Winship Cancer Institute
- the National Primate Research Center

The average time to degree is typically around 5.5 to 6 years. Training is interdisciplinary and students have the flexibility to perform their thesis work with GDBBS faculty outside their chosen program. Students typically perform three rotations before affiliating with a faculty member for their dissertation research.

The application deadline is December 1st for the following fall semester.



Requests for Additional Information:

Recruitment and Admissions
James T. Laney School of Graduate Studies

(404) 727-2547
gdbbs@emory.edu

biomed.emory.edu
biomed.emory.edu/program_sites/imp

LANEY GRADUATE SCHOOL DEGREE PROGRAMS

Anthropology	Biostatistics	Computer Science and Informatics	French	Immunology and Molecular Pathogenesis*	Molecular and Systems Pharmacology*	Philosophy
Art History	Business (PhD)	Development Practice	Genetics and Molecular Biology*	Islamic Civilizations Studies	Neuroscience*	Physics
Behavioral Sciences and Health Education	Cancer Biology*	Economics	Health Services Research and Health Policy	Mathematics	Neuroscience and Animal Behavior (Psychology)	Political Science
Biochemistry, Cell and Developmental Biology*	Chemistry	English	Hispanic Studies	MD/PhD	Nursing	Population Biology, Ecology, and Evolution*
Bioethics	Clinical Psychology	Environmental Health Sciences	History	Microbiology and Molecular Genetics*	Nutrition and Health Sciences	Religion
Biomedical Engineering	Cognition and Development (Psychology)	Environmental Sciences				Sociology
	Comparative Literature	Epidemiology				Women's, Gender, and Sexuality Studies

*The Graduate Division of Biological and Biomedical Sciences is home to eight interdisciplinary graduate programs.