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 TO LEARN MORE.
IMMUNOLOGY AND MOLECULAR PATHOGENESIS

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:
- Dan Littman, MD, PhD, New York University School of Medicine: Regulation of T cell physiology by the commensal microbiota
- Nick Lukacs, PhD, University of Michigan:  Epigenetic regulation of Immune responses: Infection and Treg cells
- Gwendalyn J. Randolph, PhD, Washington University School of Medicine: Inflammatory Disease & the trafficking of cells/molecules through lymphatic vessels
- Padmini Salgame, PhD, Rutgers New Jersey Medical School: Pathogenesis and Transmission of Mycobacterium tuberculosis
- Joseph Sun, PhD, Memorial Sloan Kettering Cancer Center: Adaptive Responses of Natural Killer Cells during Viral Infection
- Jianke Zhang, PhD, Thomas Jefferson University: Apoptotic and Necrototic Signaling in Embryos and Lymphocytes

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 forefront 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:
- Alexander Bally: Genetic and Epigenetic Regulation of PD-1 and T cell differentiation
- James Bowen: Mechanisms of Flavivirus Antagonism of Innate Immune Signaling in Human Dendritic Cells
- Jaclyn Espinosa: Contributing Factors to Immune Cell Repertoire and Effects on Alloreactivity
- Matt Kudelka: Decoding the Cellular Glycome: Mucin-type O-glycans in Health and Disease
- Junghwa Lee: Regulation of CD4 T Cell Responses during Vaccination and Viral Infection
- Colleen McGary: Investigating the contribution of CD4+ T cell subsets to SIV disease progression and persistence
- Dana Tedesco: T cell Immunity in Liver Disease
- Shardule Shah: Heat Shock Factor 1 Regulation of Multiple Myeloma Pathogenesis

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, though students who arrive with an advanced degree (MS, MPH, etc.) may complete it in a shorter time.

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.

Our website lists required courses and recommended electives.

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 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 Yerkes National Primate Research Center

Financial support includes a tuition scholarship, health insurance and a competitive stipend ($30,000 for the 2017 – 2018 academic year). Funding is guaranteed as long as the student is making satisfactory progress toward their degree. 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
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201 Dowman Drive
Atlanta, GA 30322

(404) 727-2547
gdbbs@emory.edu
biomed.emory.edu
biomed.emory.edu/program_sites/imp

LANEY GRADUATE SCHOOL DEGREE PROGRAMS

| Anthropology | Art History | Behavioral Sciences and Health Education | Bioethics | Biological and Biomedical Sciences | 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 | Biomedical Engineering | Biostatistics | Business | Chemistry | Clinical Psychology | Cognition and Development (Psychology) | Comparative Literature | Computer Science and Informatics | Development Practice | Economics | English | Environmental Health Sciences | Environmental Sciences Epidemiology | Film and Media Studies | French | Health Services Research and Health Policy | Hispanic Studies | History | Islamic Civilizations Studies | Mathematics | MD/PhD | Neuroscience and Animal Behavior (Psychology) | Nursing | Nutrition and Health Sciences | Philosophy | Physics | Political Science | Religion | Sociology | Women’s, Gender, and Sexuality Studies |