PH.D. IN MICROBIOLOGY AND IMMUNOLOGY

Overview

Microbiology and Immunology is a multidisciplinary program encompassing the areas of cellular and molecular immunology, virology, microbial genetics, and pathogenic bacteriology.

The goals of the department's graduate program are to provide each student with the opportunity to acquire the theoretical background and conceptual framework with the technical research skills necessary to attain a PhD. During the first year of study, a broad educational base in all disciplines together with laboratory rotations introduce students to the diverse array of research topics. Students then choose one area of concentration for their research. The varied interests of the faculty provide numerous opportunities for student participation and a broad choice in dissertation research.

Active research in immunology includes the areas of cytotoxicity, programmed cell death, cytokine receptor signaling, clinical and experimental bone marrow transplantation, stem cell biology, gene therapy for cancer treatment, antigen recognition, cell differentiation and communication, aging of the immune system, interleukins, genetic control of immunoglobulin production, gene activation, evolution of the immune response and immune therapy against cancer, infection and autoimmune diseases. Research in other areas includes molecular biology of virus-host interaction in both animal and human systems, control and regulation of bacterial pathogenesis, selective tumor chemotherapy and radiation therapy, and therapy of parasitic infections.

Contact Information

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Admission Requirements

Applicants to biomedical programs should have a bachelor degree in a biological or related discipline (e.g., psychology, chemistry, engineering, physics). Although there are no prerequisite requirements, courses in general biology, cell/molecular biology, calculus, general physics, organic chemistry, physical chemistry, and biochemistry are encouraged. Applications are generally accepted from September to December for fall entry only. Select applicants will be offered an interview.

Competitive Candidates will have the following:

- Excellent academic record
- Competitive GRE exam scores
- Research experience in a laboratory setting
- Publications of abstract and / or papers
- Co-authorship in a peer-reviewed journal is recommended
- Strong letters of recommendation from research scientists who know the candidate well
- Motivation to pursue state-of-the-art biomedical research

Applicants must submit the following:

- Online Application
- Application Fee
- Official Academic Transcripts
- GRE General Test
- English Proficiency Exam (non-native speakers)
- Statement of Purpose
- Resume / CV

Full application instructions can be found here (http://biomed.med.miami.edu/apply/).

Curriculum Requirements

Code	Title	Credit Hours
Biomedical Science Core		
Journal Club [1, 3]		2
PIB 700	Journal Club	
PIB 701	Introduction to Biomedical Sciences [3]	5
PIB 702	Scientific Reasoning	3
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	3-6
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
PIB 783	Professional Development: Skills for Success II	1
PIB 785	PIBS Bioinformatics Workshop [2]	1
PIB 830	Doctoral Dissertation	1
Microbiology & Immunology Required Courses		
MIC 623	Mechanisms of Microbial Virulence	2
MIC 728	Principles of Immunology	3
MIC 775	Advanced Topics in Immunology	3
MIC 751	Advance Topics in Microbiology and Virology	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Research Credits		**24**
MIC 830	Doctoral Dissertation	1-12
MIC 840	Doctoral Dissertation - Post Candidacy	1-12
MIC 850	Research in Residence	1
Total Credit Hours		**60-90**

1 Students in this program take PIB 700 twice for a total of 2 credits. Please see Plan of Study for more information.

2 **Bioinformatics Requirement:** All graduate students are required to complete a bioinformatics workshop or course before they graduate. This requirement can be met by taking either the PIB 706 (Bioinformatics for the Biomedical Sciences) or HGG 660 (Bioinformatics Theory and Practice), both tentatively offered every Spring. Students can also take Bioinformatics Workshops that are offered periodically.

3 Students accepted as Direct Admit into the Accelerated B.S. to Ph.D. track will be eligible to waive PIB 700 and PIB 701 and to replace those courses with other courses suitable for their academic background and training goals.

Suggested Plan of Study

First Year		
Fall		**Credit Hours**
PIB 701	Introduction to Biomedical Sciences	1-5
PIB 702	Scientific Reasoning	1-3
PIB 731	Laboratory Research	1-2
PIB 700	Journal Club	1
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
	Credit Hours	**6-12**
Spring		
PIB 700	Journal Club	1
PIB 731	Laboratory Research	1-2
PIB 783	Professional Development: Skills for Success II	1
EPH 601	Medical Biostatistics I	4
MIC 728	Principles of Immunology	3
MIC 623	Mechanisms of Microbial Virulence	2
	Credit Hours	**12**

Summer		
PIB 830	Doctoral Dissertation	1
	Credit Hours	**1**
Second Year		
Fall		
MIC 775	Advanced Topics in Immunology	1-3
MIC 830	Doctoral Dissertation	3
Students may elect to take additional basic science courses.		
	Credit Hours	**4-6**
Spring		
MIC 830	Doctoral Dissertation	3
Teaching Assistant		
Qualifying Examination		
	Credit Hours	**3**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Third Year		
Fall		
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**4**
Spring		
MIC 751	Advance Topics in Microbiology and Virology	1-3
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**4-6**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Fourth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**3**
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**3**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Fifth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**3**
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**3**

Summer		
MIC 850	Research in Residence	1
	Credit Hours	**1**
	Total Credit Hours	**50-60**

Suggested Plan of Study

Accelerated B.S. to Ph.D. Track

First Year		
Fall		**Credit Hours**
PIB 701	Introduction to Biomedical Sciences [1]	1-5
PIB 702	Scientific Reasoning	1-3
PIB 731	Laboratory Research	2
PIB 700	Journal Club [1]	1
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
	Credit Hours	**7-13**
Spring		
PIB 705	Biostatistics for the Biosciences	3
PIB 700	Journal Club [1]	1
PIB 731	Laboratory Research	1-2
PIB 783	Professional Development: Skills for Success II	1
MIC 728	Principles of Immunology	3
MIC 623	Mechanisms of Microbial Virulence	2
	Credit Hours	**11-12**
Summer		
PIB 830	Doctoral Dissertation	1
	Credit Hours	**1**
Second Year		
Fall		
MIC 775	Advanced Topics in Immunology	1-3
MIC 830	Doctoral Dissertation	3
Students may elect to take additional basic science courses.		
	Credit Hours	**4-6**
Spring		
MIC 830	Doctoral Dissertation	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
MIC 751	Advance Topics in Microbiology and Virology	3.00
Qualifying Examination		
	Credit Hours	**7-12**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Third Year		
Fall		
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	**8**
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6

Students may elect to take additional basic science courses.		
	Credit Hours	**4-9**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Fourth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Students may elect to take additional basic science courses.		
	Credit Hours	**4-9**
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Students may elect to take additional basic science courses.		
	Credit Hours	**4-9**
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	**1**
Fifth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Students may elect to take additional basic science courses.		
	Credit Hours	**4-9**
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Students may elect to take additional basic science courses.		
	Credit Hours	**4-9**
Summer		
MIC 850	Research in Residence	1
	Credit Hours	**1**
	Total Credit Hours	**62-101**

[1] Students accepted as Direct Admit into the Accelerated B.S. to Ph.D. track will be eligible to waive PIB 700 and PIB 701 and to replace those courses with other courses suitable for their academic background and training goals.

Mission

The mission and objectives of the Microbiology and Immunology Ph.D. Graduate Program are to train students who wish to attain the PhD degree by active engagement in the design and performance of basic Microbiology and Immunology research with a Biomedical Focus that is intended to provide each PhD student with:

- A broad scientific reasoning ability and knowledge base in Microbiology and Immunology with a focus on its application in human health;
- Creative, technical, analytical and ethical skills required for carrying out and interpreting experiments in a responsible manner in the area of Microbiology and Immunology;
- The ability to successfully design, produce and publish scientific discoveries emanated from their own research in Microbiology and Immunology; and
- The ability to respond to the increasing demands of collaborative and interdisciplinary research, presentation and communication skills required for presenting results in scientific talks, writing manuscripts and seeking funding through grants and proposals, teaching skills and experience, and professional preparation for a scientific career in academia, industry, health care, patent law or teaching within five years or less.

Goals

The goals of the MIC Graduate Program include training and acquisition of:

- A broad scientific reasoning ability and knowledge base in Microbiology and Immunology
- Technical skills required for experiments in the area of specialization
- Presentation skills required for teaching, scientific talks, manuscripts, and grants
- A preparation for a scientific career in academia, industry, or teaching within 5 ½ years

Student Learning Outcomes

- Students in the Microbiology and Immunology graduate program will complete their training within 5 years of starting graduate school with mastery in “Knowledge of Discipline”, “Responsible Conduct of Research”, “Use of Appropriate Methodology”, “Application of Knowledge/Methodology”, Critical Thinking”, Effective Written Communication”, and “Effective Oral Communication”.
- Students will demonstrate critical thinking skills and the application of the Scientific Method by showing the capability to develop hypotheses, and the ability to evaluate their hypotheses, paying attention to responsible conduct of research as appropriate.