

MICROBIOLOGY AND IMMUNOLOGY

mic.as.miami.edu

Dept. Code: MIC

Introduction

The University of Miami is one of only four institutions in the United States that offers a four-year combined undergraduate program in Microbiology and Immunology. You will study, a) microorganisms (which can be good and bad for your health, found in food, and in our environments) and b) how your body's immune defense system defeats and controls harmful microorganisms. Our major provides you with courses of general interest as well as a solid preparation for future scientists or medical professionals. To apply this knowledge to health policy, we partnered with the School of Nursing Public Health program to offer an optional dual degree and double major track opportunity for our students.

Microorganisms: You will learn about bacteria that cause serious infections including the plague, meningitis, and tuberculosis; not so serious infections like staphylococci causing a boil; and those that inhabit your bodies in symbiotic relationships (your microbiome). Regarding viruses, you will learn about emerging viruses like SARS-CoV-2 (causative agent of COVID-19) and Zika, endemic and pandemic viruses like the flu, and those causing chronic infections like HIV/AIDS. Parasites such as those cause malaria and fungi round out the breadth and depth of our offered coursework.

Immune system: You will study its mechanisms to avoid microbial infections in the first place; how it will cause the body's resistance to them either by natural infection or vaccination; how pathogens like HIV and tumors are able to overcome the multiple barriers of the immune system to cause AIDS and cancer, and their up-to-date virological and, respectively, immunological therapies. Finally, you will understand how a mistuned immune system can cause allergies such as asthma or autoimmune diseases such as type I diabetes.

Our program provides you with:

- a broad knowledge base
- laboratory experiences and the opportunity to conduct research in one of our laboratories at the Miller School of Medicine
- the ability to attend a broad spectrum of seminars offered through our home department at the Miller School of Medicine
- opportunities to communicate and write in a scientific manner
- exposure to critical thinking within our field

Students that have finished our program have gone on to careers at other prestigious institutions which include research, medicine, dentistry, physician assistant, pharmacy, optometry, epidemiology, perfusionist, law and many more.

Educational Objectives

To expose students to the various disciplines within the field of Microbiology and Immunology, including virology, parasitology, microbial genetics, immunology and medical bacteriology.

To introduce students to special projects and/or research opportunities in laboratories at the School of Medicine.

To provide laboratory experience for the development of skills required for the conduct of research.

To make students aware of current cutting edge research in the field of Microbiology and Immunology by attending seminars of speakers from within and outside the University.

Degree Programs

A Bachelor's of Science degree is awarded to all microbiology and immunology majors upon completion of the requirements. All MIC majors are required to have a minor (science or non-science). Students will receive a CHM minor provided that they earn a C- or better in every course of the minor while in residence at UM. A total of 19 credits are required for the CHM minor. All students should declare their CHM minor when they begin our program in ASHE 200 by filling out a change of major form. On this form, you can declare also additional majors/minors as well as cognates., a student's choice of minor may be science or non-science.

Advanced Writing and Communication

To satisfy the College of Arts and Sciences writing requirement in the discipline, students majoring in Microbiology and Immunology should take at least one course from the following: MIC 280, MIC 304

Departmental Honors

Students that wish to gain a deeper understanding of Microbiology and Immunology can choose to write a thesis, which is due during their final semester. The following items constitute receiving Departmental Honors in Microbiology and Immunology.

1. Overall GPA 3.3 or higher.
2. A minimum of three credits (in MIC 451, MIC 452, MIC 453) is required to obtain departmental honors. and must be completed under the mentorship of a primary or secondary faculty in Microbiology and Immunology Department.
3. The final version of the honors thesis in pdf format, is due the first Friday of November (for fall graduates) or April (for spring graduates).
4. This pdf document should adhere to the following formatting guidelines:
 - a. Length 10-15 pages, 1" margins (top/bottom/sides), 12 pt. font
 - b. Can include both figures and graphs.
 - c. The thesis must be based on research activities that involved the student. This could include either "wet" bench work or analyzing experimentally derived data.
 - d. The thesis must be organized in standard scientific journal format. Abstract, Introduction, Results, Discussion, Methods, and References
5. Final pdf must be approved and sent in by the mentor to Dr. Schesser and Roger.

MIC 100. Microbiology as it Relates to Humans (EXP). 3 Credit Hours.

An introductory microbiology course for the summer scholars program. Microorganisms are in every facet of our lives and make up a microscopic world. Right now, your body is inhabited by over 40 trillion bacteria. Due to the evolution of our immune systems, we have been able to coexist with this world. It is when our immune systems weaken or when our otherwise healthy immune system encounters a particularly nasty pathogen that we become vulnerable. This course will cover the topics of how our immune system works, how microbial pathogens cause disease, how beneficial microbes protect us from disease, and some of the other activities perform that impact our world. The laboratory will provide you with invaluable experience in growing, staining, viewing and identifying microorganisms through the use of practical techniques and procedures. An in lab presentation of your "unknown organism" will culminate what you have learned.

Components: LAB.

Grading: GRD.

Typically Offered: Summer.

MIC 201. Modern Plagues and Society. 3 Credit Hours.

An examination of four infectious diseases (AIDS, tuberculosis, malaria, and COVID-19) that currently impact a significant fraction of the human population. This course will examine the infectious microbes themselves, efforts of researchers to contain these diseases, and how politics, infrastructure, and geographical factors determine individual and public health outcomes. A special emphasis is placed on the unique role the University of Miami physicians and scientists played during the early phases of the AIDS epidemic.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MIC 202. Your Health and Immune System/ Microbiome. 3 Credit Hours.

Recent advances in the prevention and treatment of diseases that we and loved ones' experience. Many of these advances in prevention, diagnosis, and treatment strategies are our based on immunological principles. The course will examine how advances in our understanding of the immune system are having unprecedented effects on both health care and society. The immune system must shield us from bacterial, fungal, and viral invasion while harmoniously co-existing with beneficial microbes in our Microbiotas. The immune system is also a surveillance system that recognizes and kills the emerging enemies within: cancer cells. The course will discuss recent advances in immunology, genetic manipulation, and the Microbiota; their consequences on emerging notions of personalized health and medications; the creation of tailored biological therapies against cancer and other maladies; and what all this means for the cost healthcare, the difficult choices, and the politics of medicine. We will critically examine popular of representations of these medical advances, being careful to distinguish fact from fiction and accurate representation from exaggerated claims.

Requisite: Not for Microbiology and Immunology Majors or Minors.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MIC 280. UMiami Scientifica Magazine - Writer. 0 Credit Hours.

UMiami Scientifica is a premier scientific publication at the University of Miami. The magazine, focuses on the STEM fields and publishes quarterly. Students who write for the magazine will learn to write clearly, concisely and in a manner that can be understood by the layperson. Successfully completing an article does not mean that an article will be published.

Components: THI.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

MIC 301. Introduction to Microbes and the Immune System. 3 Credit Hours.

Basic principles of microbiology and immunology; the microbiology component will include basic properties of bacteria, viruses, and parasites and how microbes interact with multicellular organisms in both disease and non-disease settings. The immunology component presents the players and basic concepts of immune responses as they apply to combat infectious pathogens, autoimmunity, allergy and transplantation. Course is required for microbiology and immunology majors; recommended for biology, chemistry and biochemistry majors and those considering the health sciences

Components: LEC.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 304. Introduction to Microbes and the Immune System (Lab). 3 Credit Hours.

Basic laboratory principles of microbiology and immunology. Students are instructed on how to handle, culture, and identify microorganisms. Microscope care/use, various staining techniques, ELISA, blood typing, bacterial transformation, and more. This laboratory is required of all microbiology and immunology majors.

Components: LAB.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 321. Immunobiology. 3 Credit Hours.

Mechanisms underlying the cooperation between T-cells, B-cells, and antigens leading to humoral and cell mediated responses. The significance of immune cells and their products pertaining to autoimmunity, transplantation, and the surveillance of neoplastic cells is covered.

Prerequisite: MIC 301 or MIC 303.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MIC 322. Medical Parasitology. 3 Credit Hours.

Course discusses the biochemistry, physiology, pathogenicity, immunology, and mechanism of drug action and resistance of medically important parasitic protozoa, trematodes, nematodes, and cestodes.

Prerequisite: MIC 301 or MIC 303.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MIC 323. Microbial Biology and Pathogenesis. 3 Credit Hours.

Fundamental properties of microbes as well as host-microbe relationships at the molecular and cellular levels.

Prerequisite: MIC 301.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MIC 444. Lab Techniques and Experimental Design. 3 Credit Hours.

In this course, students will learn both microbiological and immunological methodologies including colony-forming unit assays, cell culture- and mouse-based infection systems, mouse genotyping, and flow cytometry. Experimental design will be emphasized by directly participating in ongoing research projects. Students will become certified to handle experimental animals and attend department research seminars by faculty and graduate students. In addition to laboratory-based activities, students will be reading and discussing research findings from the primary literature.

Must be a MIC major; can only count once for MIC major elective credits. Cannot be counted toward MIC minor. Pre-requisite: MIC 304 and permission of instructor.

Components: LAB.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 451. Special Projects in Immunobiology. 2-6 Credit Hours.

Wet bench laboratory research with faculty in the Microbiology and Immunology (M&I) Department at the Miller School of Medicine. Students will be actively participating in all aspects of hypothesis-driven scientific research ranging from familiarity with the literature to conducting and analyzing experiments relating to immunology.

Pre-requisite: MIC 304 completed with a B grade or higher.

Components: THI.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 452. Special Projects in Microbiology. 2-6 Credit Hours.

Wet bench laboratory research with faculty in the Microbiology and Immunology (M&I) Department at the Miller School of Medicine. Students will be actively participating in all aspects of hypothesis-driven scientific research ranging from familiarity with the literature to conducting and analyzing experiments relating to microbes.

Pre-requisite: MIC 304 completed with a B grade or higher.

Components: THI.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 453. Special Projects in Parasitology. 3 Credit Hours.

Microscopy based analysis with a parasitology faculty member in the Microbiology and Immunology Department.

Requisite: MIC 304 with a B+ or higher.

Components: IND.

Grading: GRD.

Typically Offered: Fall & Spring.

MIC 460. Advanced Topics in Microbiology and Immunology (A). 3 Credit Hours.

An extensive and detailed examination of a number of topics covered in the core courses of the major. The goal is for upper-division undergraduate students to take the knowledge base they acquired in their major core courses into 'cutting edge' research areas. Each topic (of a total of 6 to 8) will be presented by a Faculty member with expertise in the area. Topics may include reproductive immunology, microbes, HIV vaccine development, cancer immunotherapy, SARS-CoV-2 and the immune system, autoimmunity in the CNS, and immune-based metabolic diseases.

Prerequisite: MIC 301 and MIC 321.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MIC 470. Advanced Topics in Microbiology and Immunology (B). 3 Credit Hours.

An extensive and detailed examination of a number of topics covered in the core courses of the major. The goal is for upper-division undergraduate students to take the knowledge base they acquired in their major core courses into 'cutting edge' research areas.

Prerequisite: MIC 321, and MIC 323.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MIC 506. Mycotic Agents of Disease. 4 Credit Hours.

Components: LEC.

Grading: GRD.