

# MEDICAL MICROBIOLOGY AND IMMUNOLOGY

## Graduate Study in Medical Microbiology and Immunology

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Within the context of Creighton as a Jesuit, Catholic University, the School of Medicine provides value-centered education for students to develop mastery of their chosen field of study. The Medical Microbiology and Immunology programs offer an environment ideal for fostering critical judgment, scholarly initiative, and disciplined inquiry.

### Program Goals

At the completion of this graduate program in Medical Microbiology & Immunology, students will:

1. Demonstrate advanced knowledge in the fields of Medical Microbiology and Immunology.
2. Demonstrate independent critical and analytical thinking, both within their field of study, and beyond for the use of their knowledge for service to others.
3. Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work.
4. Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state of the art laboratory tools and techniques.
5. Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike.

These five objectives provide a general framework for the development of graduate students as critical and analytical thinkers in their fields of study. Presented below are more specific objectives for the Ph.D. and M.S. programs.

### Admission Requirements

The student's academic record and performance will be a major factor in acceptance. The undergraduate curriculum must include fundamental courses in both the biological and chemical sciences. For doctoral students, a strong foundation in undergraduate microbiology, immunology, molecular biology and biochemistry are desired. However, lack of advanced courses in some of these areas will not necessarily preclude consideration for admission into the doctoral program. A minimum GPA of 3.0 on a scale of 4.0 is required. The applicant is required to submit results from the Graduate Record Exam (GRE) prior to admission. A minimum combined score of 300 is required for the verbal and quantitative sections, and a minimum score of 4.0 is required for the analytical writing component.

The Graduate School requires all students from countries in which English is not the native language to demonstrate competence in English by a score of 90 on the Internet-based Test (iBT) TOEFL (Test of English as a Foreign Language) examination at the graduate level.

## Doctor of Philosophy (Ph.D.) Program

The objective of the program is to prepare highly qualified students for a broad range of possible careers in research and teaching in medical microbiology and immunology and related health science fields. Study for the Ph.D. degree emphasizes independence in scientific pursuit, with a particular emphasis on research. Course work and dissertation research are designed to bring the student to a high-level of competence in microbiology and immunology with particular expertise in the area chosen for dissertation research. You will be expected to demonstrate a high capacity for original and independent thought, and apply this creativity, educational background, and knowledge of the scientific method to dissertation research.

## Master of Science (M.S.) Program

The objectives of the program include preparation of the student for one or more of the following careers:

1. teaching of medical microbiology and immunology at the undergraduate level, and
2. participation in supervised or team research in universities, industry or government.

In addition, the program will prepare outstanding students for pursuit of the Ph.D. degree. Study for the Master's degree emphasizes a combination of course work and laboratory experience to familiarize you with microbiology and immunology and to educate you in the scientific method. It can be a time when you identify a primary interest in microbiology and immunology, or a time when you first become introduced to the fields of microbiology and immunology.

### Degree Programs

M.S., Medical Microbiology and Immunology (<http://catalog.creighton.edu/graduate/graduate-programs-courses/medical-microbiology-and-immunology/ms-medical-microbiology-and-immunology/>)

Ph.D., Medical Microbiology and Immunology (<http://catalog.creighton.edu/graduate/graduate-programs-courses/medical-microbiology-and-immunology/phd-medical-microbiology-and-immunology/>)

### Courses

#### MIC 541. Medical Microbiology and Immunology. 3 credits. FA

Introductory course focusing on foundations of general bacteriology and virology, antibacterial therapy and mechanisms of antibacterial resistance, infectious diseases caused by bacteria, viruses, fungi, and parasites, and the host defenses against these microorganisms. R, L. P. Second year Pharm.D. student or degree seeking graduate student. Upper level undergraduate or other students require approval from course director.

#### MIC 543. Essentials of Immunology. 3 credits. SP

Lecture course covering the major areas of contemporary immunology including host resistance to infection, the chemistry of antigens and physiology of the immune system, immunogenetics and transplantation immunology, immunological techniques, tumor immunology, and immunopathology. P. MIC 541, or IC.

**MIC 721. Foundations of Microbiology. 4 credits.**

Lecture course that emphasizes (1) the foundations of general bacteriology and virology, (2) microorganisms of medical importance and the diseases, (3) antimicrobial, and (4) scientific logic for critical analysis of original research articles in the field. A required course for graduate students in the program.

**MIC 733. Advanced Microbial Pathogenesis. 3 credits. AY, SP**

Lectures, seminars, literature review, and group discussion concerning mechanisms by which microorganisms cause disease. P. MIC 617 or IC.

**MIC 735. Diagnostic Microbiology. 4 credits. AY, SP**

Laboratory and conferences which deal with selection of clinical specimens for diagnosis, isolation of pathogenic microorganisms and preparation of media for their growth. 4 R. L arr. P. IC.

**MIC 739. Bacterial Physiology. 3 credits. AY, SP**

Study of molecular, cellular, and genetic processes in bacteria. Includes molecular structure and function, cell division, synthesis of macromolecules, and metabolism.

**MIC 740. Host Defense. 3 credits. SP**

The student will be provided with the information to have a clear understanding of various subject areas, including antigen recognition, development of B& T cells, constitutive host defenses, immunopathology, inflammation, transplantation, allergy, and tumor immunology. Lecture presentations, assigned reading and computer-aided instruction. P. MIC 541, MIC 617 or IC.

**MIC 745. Cellular And Molecular Immunology. 3 credits. SP**

This course will focus on the basic and clinical aspects of cellular and molecular immunology. 2 R&L arr. P. MIC 740 or IC.

**MIC 746. Advanced Immunology. 3 credits. AY, FA**

Lectures and conferences providing a coordinated and detailed account of current immunology at an advanced level. Students will be expected to familiarize themselves with the original literature, and emphasis will be given to the more rapidly progressing areas. 3 R&L arr. P. MIC 543 or IC.

**MIC 749. Molecular Virology. 3 credits. AY, FA**

Study of the physical, chemical, and biological properties of viruses. Selected topics will include such areas of investigation as cultivation and identification, replication, host-virus interactions, interference, and viral oncogenesis. P. MIC 617 or IC.

**MIC 753. Advanced Antimicrobial Agents And Chemotherapy. 3 credits. AY, FA**

Chemistry, pharmacology, and biology of antibiotic substances and their use in therapy of infectious diseases. P. MIC 617 or IC.

**MIC 790. Current Topics in Medical Microbiology and Immunology. 2 credits. FA**

Lectures and literature discussion covering recent advances in the fields of microbiology, immunology, and virology, with roughly a third of the course devoted to each field of study. P. MIC 541, MIC 617.

**MIC 791. Department Seminar And Teaching. 1 credit.**

The student is required to register each semester of his/her residence. The maximum credit applicable toward a degree is two for the M.S.; six for the Ph.D. This course is graded satisfactory/unsatisfactory.

**MIC 793. Directed Independent Readings: Selected Topics In Medical Microbiology And Immunology. 1-4 credits. FA, SP, SU**

Conferences and reading assignments providing an opportunity for in-depth study of recent developments and associated problems in carefully selected and highly specialized areas of medical microbiology such as parasitology, mycology, clinical microbiology, pathogenesis, immunology, and epidemiology and public health.

**MIC 795. Directed Independent Study. 4 credits.**

**MIC 797. Directed Independent Research for Master's Degree Students. 1-8 credits. FA, SP, SU**

Investigative work on selected subject. (Non-thesis research optional). L&R arr.

**MIC 799. Master's Thesis. 1-6 credits. FA, SP, SU**

Research, under departmental supervision, in connection with the preparation of the Master's thesis. Student must register for this course in any term when engaged in formal preparation of the Master's thesis; however, six credit hours are the maximum applicable toward the degree.

**MIC 893. Directed Independent Readings: Selected Advanced Topics In Medical Microbiology And Immunology. 1-4 credits. FA, SP, SU**

Conferences and reading assignments providing an opportunity for in-depth study of recent developments and associate problems in carefully selected and highly specialized areas of medical microbiology such as parasitology, mycology, clinical microbiology, pathogenesis, immunology, and epidemiology and public health.

**MIC 897. Directed Independent Research for Doctoral Students. 1-8 credits. FA, SP, SU**

Investigative work on a selected subject.

**MIC 899. Doctoral Dissertation. 1-6 credits. FA, SP, SU**

Research, under departmental supervision, in connection with the preparation of the doctoral dissertation. Student must register for this course in any term when engaged in formal preparation of the doctoral dissertation; however, 20 credit hours are the maximum applicable toward the degree.