

SCHOOL OF MEDICINE

MICROBIOLOGY AND IMMUNOLOGY

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Courses offered by the Department of Microbiology and Immunology are listed under the subject code MI on the *Stanford Bulletin's* ExploreCourses web site.

GRADUATE PROGRAMS IN MICROBIOLOGY AND IMMUNOLOGY

The Department of Microbiology and Immunology offers a program of training leading to the Ph.D. degree, as well as research training, courses, and seminars for medical students and postdoctoral fellows. Research interests focus on two broad areas: host/parasite interactions, and the function of the immune system. Laboratories investigate mechanisms of pathogenesis and the physiology of viruses, bacteria, and protozoan parasites, as well as the lymphocyte function in antigen recognition, immune response, and autoimmunity.

MASTER OF SCIENCE

A regular M.S. program is not offered, although this degree is awarded under special circumstances. Candidates for master's degrees are expected to have completed the preliminary requirements for the B.S. degree, or the equivalent. In addition, the candidate is expected to complete 45 quarter units of work related to microbiology; at least 25 of these units should concern research devoted to a thesis. The thesis must be approved by at least two members of the department faculty.

DOCTOR OF PHILOSOPHY IN MICROBIOLOGY AND IMMUNOLOGY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

Application, Admission, and Financial Aid—Prospective Ph.D. candidates should have completed a bachelor's degree in a discipline of biology or chemistry, including course work in biochemistry, chemistry, genetics, immunology, microbiology, and molecular biology. The deadline for receipt of applications with all supporting materials is December 1.

Applicants must file a report of scores on the general subject tests of the Graduate Record Examination (GRE). It is strongly recommended that the GRE be taken before October so that scores are available when applications are evaluated.

In the absence of independent fellowship support, entering predoctoral students are fully supported with a stipend and tuition award. Highly qualified applicants may be honored by a nomination for a Stanford Graduate Fellowship. Successful applicants have been competitive for predoctoral fellowships such as those from the National Science Foundation.

Program for Graduate Study—The Ph.D. degree requires course work and independent research demonstrating an individual's creative, scholastic, and intellectual abilities. On entering the department, students meet an advisory faculty member; together they design a timetable for completion of the degree requirements. Typically, this consists of first identifying gaps in the student's undergraduate education and determining courses that should be taken. Then, a tentative plan is made for two to four lab rotations (one rotation per quarter). During the first year of graduate study in the department, each student also takes six or seven upper-level (200-series) courses. Three of these courses are requirements of the department: MI 215, Principles of Biological Techniques; MI 230, Medical Microbiology and Infectious Diseases; and MI 210, Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites. Three courses are part of the core curriculum that is required of many graduate students in Stanford Biosciences: BIO 203/DBIO 203/GENE 203, Advanced Genetics; BIO 230, Molecular and Cellular Immunology; and BIO 214/BIOC 224, Advanced Cell Biology.

In Autumn Quarter of the second year, a research proposal based on the student's own thesis topic is defended to the thesis committee. In Spring Quarter of the second year, each student defends orally a formal research proposal on a topic outside the intended thesis project. This qualifying examination proposal is due to the graduate program steering committee by May 1. Based on successful performance on this proposal, the student is admitted to candidacy. Teaching experience and training are also part of the graduate curriculum. Graduate students are required to act as teaching assistants for two courses. In addition, first- and second-year graduate students are required to participate in a bi-weekly journal club.

MICROBIOLOGY AND IMMUNOLOGY (MI)

UNDERGRADUATE COURSES IN MICROBIOLOGY AND IMMUNOLOGY

MI 104. Innate Immunology

(Same as IMMUNOL 204, MI 204) Innate immune mechanisms as the only defenses used by the majority of multicellular organisms. Topics include Toll signaling, NK cells, complement, antimicrobial peptides, phagocytes, neuroimmunity, community responses to infection, and the role of native flora in immunity. How microbes induce and defeat innate immune reactions, including examples from vertebrates, invertebrates, and plants.

3 units, Spr (Schneider, D)

MI 115B. The Vaccine Revolution

(Same as HUMBIO 155B) Advanced seminar. Human aspects of viral disease, focusing on recent discoveries in vaccine development and emerging infections. Journal club format: students choose articles from primary scientific literature, write formal summaries, and synthesize them into a literature review. Emphasis is on analysis, experimental design, and interpretation of data. Oral presentations. Enrollment limited to 10. Prerequisites: HUMBIO 155H, MI 155V.

6 units, alternate years, not given this year

MI 115C. Human Virology Inquiry Project I

Intensive group tutorial in human virology including classification, clinical features, molecular virology, pathogenesis, immune response, epidemiology, prevention, drug development, and vaccinology. Pertinent examples from all human virus families. Student presentations and discussion in a small group setting. Research and writing intensive. First quarter of a two quarter sequence. Limited enrollment. Prerequisites: Consent of instructor and written application required for enrollment.

6 units, Aut (Siegel, R)

MI 115D. Human Virology Inquiry Project II

Intensive group tutorial in human virology including classification, clinical features, molecular virology, pathogenesis, immune response, epidemiology, prevention, drug development, and vaccinology. Pertinent examples from all human virus families. Student presentations and discussion in a small group setting. Research and writing intensive. Second quarter of a two quarter sequence. Limited enrollment. Prerequisites: MI 115C, consent of instructor and written application required for enrollment.

6 units, Win (Siegel, R)

MI 130. Medical Microbiology and Infectious Diseases

(Same as MI 230) For graduate students and undergraduates. Required of first-year graduate students in Microbiology and Immunology. Biological properties of microbes associated with diseases of humans; identification and laboratory diagnosis; principles of prevention and treatment; introduction to microbial genetics and evolution as it pertains to pathogenicity. Prerequisite: background in molecular biology.

3 units, not given this year

MI 155H. Humans and Viruses I

(Same as HUMBIO 155H) Introduction to human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis is on host pathogen interactions and policy issues. Topics: polio and vaccination, smallpox and eradication, yellow fever and history, influenza and genomic diversity, rubella and childhood infections, adenovirus and viral morphology, ebola and emerging infection, lassa fever and immune response.

6 units, not given this year

MI 155V. Humans and Viruses II

Introduction to human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues. Topics: measles and viral epidemiology, rotavirus and world health, rabies and infections of the brain, HPV and cancer-causing viruses, herpes simplex and viral latency, CMV and viral teratogenesis, retrovirology and endogenous viral sequences, HIV and viral treatment, viral hepatitis and chronic infections, prions and diseases of life style. Prerequisite: MI155H.

6 units, not given this year

MI 185. Topics in Microbiology

For advanced undergraduates. Topics include diversity, molecular regulation, growth, bioenergetics, and unique metabolic processes. Presentation of student papers on current topic selected with student input. Prerequisites: CHEM 31X, Biology core.

3 units, not given this year

MI 198. Directed Reading in Microbiology and Immunology

Fields of study are decided in consultation with sponsoring professor. Prerequisite: consent of instructor.

1-15 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

MI 199. Undergraduate Research

Investigations sponsored by individual faculty members. Possible fields: microbial molecular biology and physiology, microbial pathogenicity, immunology, virology, and molecular parasitology. Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

GRADUATE COURSES IN MICROBIOLOGY AND IMMUNOLOGY**MI 204. Innate Immunology**

(Same as IMMUNOL 204, MI 104) Innate immune mechanisms as the only defenses used by the majority of multicellular organisms. Topics include Toll signaling, NK cells, complement, antimicrobial peptides, phagocytes, neuroimmunity, community responses to infection, and the role of native flora in immunity. How microbes induce and defeat innate immune reactions, including examples from vertebrates, invertebrates, and plants.

3 units, Spr (Schneider, D)

MI 209. Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites: Part I

For graduate students and advanced undergraduates; required of first-year graduate students in Microbiology and Immunology. Emphasis is on mechanisms to establish infection in the host and responses of the host to infection. Current literature. Prerequisite: background in biochemistry and molecular biology.

4 units, not given this year

MI 210. Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites

For graduate and medical students, and advanced undergraduates; required of first-year graduate students in Microbiology and Immunology. The molecular mechanisms by which microorganisms invade animal and human hosts, express their genomes, interact with macromolecular pathways in the infected host, and induce disease. Current literature.

4 units, Win (Sarnow, P)

MI 211. Advanced Immunology I

(Same as IMMUNOL 201) For graduate and medical students and advanced undergraduates. Molecules and cells of the innate and adaptive immune systems; genetics, structure, and function of immune molecules; lymphocyte differentiation and activation; regulation of immune responses; autoimmunity and other problems in immune system dysfunction. Prerequisites: undergraduate course in Immunology and familiarity with experimental approaches in biochemistry, molecular biology, and cell biology.

3 units, Win (Chien, Y)

MI 215. Principles of Biological Technologies

(Same as IMMUNOL 215) The principles underlying commonly utilized technical procedures in biological research. Lectures and primary literature critiques on gel electrophoresis, protein purification and stabilization, immunofluorescence microscopy, FACS. Prerequisites: biochemistry. Required of first-year graduate students in Microbiology and Immunology, and the Immunology program.

3 units, Spr (Kirkegaard, K)

MI 230. Medical Microbiology and Infectious Diseases

(Same as MI 130) For graduate students and undergraduates. Required of first-year graduate students in Microbiology and Immunology. Biological properties of microbes associated with diseases of humans; identification and laboratory diagnosis; principles of prevention and treatment; introduction to microbial genetics and evolution as it pertains to pathogenicity. Prerequisite: background in molecular biology.

3 units, not given this year

MI 233. The Biology of Small Modulatory RNAs

(Same as GENE 233, PATH 233) Open to graduate and medical students. How recent discoveries of miRNA, RNA interference, and short interfering RNAs reveal potentially widespread gene regulatory mechanisms mediated by small modulatory RNAs during animal and plant development. Required paper proposing novel research.

2 units, Aut (Fire, A; Chen, C), alternate years, not given this year

MI 234. Fundamentals of RNA Biology

(Same as GENE 234, PATH 234) For graduate or medical students and (if space allows) to active participants from other segments of the Stanford Community (e.g., TGR students); undergraduates by instructor consent. Fundamental issues of RNA biology, with the goal of setting a foundation for students to explore the expanding world of RNA-based regulation. Each week a topic is covered by a faculty lecture and journal club presentations by students.

2 units, Aut (Chen, C; Fire, A; Sarnow, P)

MI 240. Professional and Leadership Development

Foundational skills; how to communicate, resolve conflict, negotiate, and present. Workshop format integrating theory and practice. Application required; see <http://www.stanford.edu/class/immunol240>.

2 units, Spr (Radermacher, A; Finan, D; Allen, J)

MI 250. Frontiers in Microbiology and Immunology

Required of first- and second-year students in Microbiology and Immunology. How to evaluate biological research. Held in conjunction with the Microbiology and Immunology Friday noon seminar series. Before the seminar, students and faculty discuss one or more papers from the speaker's primary research literature on a related topic. After the seminar, students meet informally with the speaker to discuss their research.

1 unit, Aut (Schneider, D), Win (Schneider, D), Spr (Schneider, D)

MI 299. Directed Reading in Microbiology and Immunology

Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

MI 370. Medical Scholars Research

Provides an opportunity for student and faculty interaction, as well as academic credit and financial support, to medical students who undertake original research. Enrollment is limited to students with approved projects.

4-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

MI 399. Graduate Research

Students who have completed the necessary foundation courses undertake investigations in general bacteriology, bacterial physiology and ecology, bacterial genetics, microbial pathogenicity, immunology, parasitology, or virology sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)

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