

MICROBIOLOGY AND IMMUNOLOGY

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Courses given in Microbiology and Immunology have the subject code MI. For a complete list of subject codes, see Appendix B.

The Department of Microbiology and Immunology offers a complete 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. Individual 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.

GRADUATE PROGRAMS 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

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 15.

Applicants must file a report of scores on the general subject tests and on an advanced test (normally in cellular and molecular biology, chemistry, or biochemistry) 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 fellowship. Successful applicants have been competitive for predoctoral fellowships such as those from the National Science Foundation and Howard Hughes Medical Institute.

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 and 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, Principles of Biological Techniques, Medical Microbiology, and Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites, are specific requirements of this department. Three courses, Advanced Genetics, Molecular Biology, and Cell Biology, are part of the core curriculum that is required of many graduate students in Stanford Biosciences.

In Spring Quarter of the second year, each student defends orally a formal research proposal on a topic outside the intended thesis project. The outline of this proposal is due to the Graduate Program Steering Committee by March 1st. Based on successful performance on this proposal, the student is admitted to candidacy. In the Autumn Quarter of the second year, a research proposal based on the student's own thesis topic is defended to his or her thesis committee. Teaching experience and training are also part of the graduate curriculum. All graduate students are required to act as teaching assistants for two quarters. In addition, first- and second-year graduate students are required to participate in a bi-weekly journal club.

COURSES

MI 25N. Modern Plagues—Stanford Introductory Seminar. Preference to freshmen. The molecular and medical aspects of several new and old microorganisms that infect humans. Goal: to place modern human plagues in scientific and historical perspective and to provide an introduction to the fields of molecular biology and microbiology.

3 units, Spr (Boothroyd)

MI 103. Parasites/Pestilence: Infectious Public Health Challenges—(Same as HUMBIO 103.) Parasitic and other diseases with public health impact. Pathogenesis, clinical syndromes, complex life cycles, and the interplay among environment, vectors, hosts, and reservoirs in historical context to understand public health policy approaches to halting disease transmission. Focus is on WHO TDR (World Health Organization Tropical Disease Research) targeted disease entities: river blindness (onchocerciasis), sleeping sickness (African Trypanosomiasis), leishmaniasis, schistosomiasis, mycobacterial disease (tuberculosis and leprosy), malaria, toxoplasmosis, dracunculiasis, intestinal helminthes, and miscellaneous and emerging infections. Guest lecturers and experts in disease control and research of local and international renown. Problem sets, exams, and original proposal to solve a current disease.

3 units, Spr (Smith)

MI 115A. Humans and Viruses—(Same as HUMBIO 115A.) Overview of human virology. Topics illustrate concepts in biology and the social sciences, focusing on emerging infections, viral classification, transmission and prevention, vaccination and treatment, eradication of disease, viral pathogenesis, mechanisms of virally-induced cancer, and viral evolution. Topics: molecular biology of genetic shift and drift in influenza virus, cellular tropism of HIV, developmental biology of virally-induced birth defects, clinical aspects of infantile diarrhea, social aspects of the common cold, policy issues of blood antibody tests, factors in pathogenesis and transmission of prions. Prerequisites: Human Biology core or consent of instructor.

4-6 units, Win (Siegel)

MI 115B. The Vaccine Revolution—(Same as HUMBIO 115B.) Advanced seminar. The human aspects of viral disease, focusing on recent discoveries, especially in the area of vaccine development and emerging infections. Journal club format: students select articles from primary scientific literature, write formal summaries, and synthesize it into a literature review on a specific topic. Emphasis is on the development of critical reading, analysis, experimental design, and interpretation of data. Students give four oral presentations and lead discussions based on their

scientific journal reading. Enrollment limited to 10. Prerequisite: 115A.
5 units, Spr (Siegel) alternate years, given 2004-05

MI 127N. Infectious Disease: Fact and Fiction—Stanford Introductory Seminar. Preference to freshmen. Modern science has developed methods of fighting infectious diseases and their human toll including public sanitation, vaccination, and antibiotics, but infections such as HIV, ebola, and dengue, and bioterrorism, remain a threat. Civilizations have historically dealt with frightening topics like this through the arts. The science behind infectious diseases and their treatments, and its portrayal in the movies. Old and new horror and science fiction films including *Invasion of the Body Snatchers*, *Outbreak*, *The Andromeda Strain*, *Blade*, *Alien*, and *X-Files* episodes. Readings include *Scientific American* and other primary scientific journals. Students critique a film from the perspective of a scientist.

3 units, Aut (Schneider)

MI 185. Topics in Microbiology—In-depth coverage of basic topics: diversity, molecular regulation, growth, bioenergetics, and unique metabolic processes. Student papers on current topics (e.g., antibiotic resistance, molecular approaches to bioremediation) for presentation. Prerequisites: Chemistry 31, 33, 35. Recommended: Biological Sciences 31.

3 units, Win (Matin, Staff)

MI 198A,B,C,D,E,F. Directed Reading: Microbiology—Fields of research open to students are decided in consultation with sponsoring faculty member.

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

MI 199. Undergraduate Research—Individual study or research by arrangement with a faculty member. Possible fields: microbial molecular biology and physiology, microbial pathogenicity, immunology, virology, and molecular parasitology. Prerequisites: consent of instructor.

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

MI 200. Immunology for Medical Students—(Same as PATH 220, IMMUNOL 200; medical students register for MI 200 only.) The basic concepts of immunology and the role of the immune system in a variety of diseases, utilizing case presentations of diseases including autoimmune diseases, infectious disease, transplantation, immunodeficiency diseases, hypersensitivity reactions, and allergic diseases. Weekly problem sets based on case reports and publications drawn from the clinical literature. Emphasis is on application of the fundamental concepts of immunology.

0-4 units, Win (Lewis, Staff)

MI 201. Infectious Basis of Disease—The spectrum of human illness induced by viruses, bacteria, fungi, and medical parasites, including protozoans and helminths. Classification, epidemiology, transmission, pathogenesis, diagnosis, treatment, control, vaccination, and other preventive measures. Emphasis is on the syndromic approach to disease. Lectures, demonstrations, lab sessions, and small group evaluation of clinical correlates. Use of CWP, laboratory demos, and interactive multimedia instructional program, MICROBE. Prerequisite: second-year medical student.

0-9 units, Aut (Siegel, Staff)

MI 203. Biological Stress Response—Current literature Possible topics: the nature and molecular regulation of the stress response; biochemistry and structural biology molecular chaperones; the role of stress proteins in the pathogenic process; psychoneuroendocrinology; multi-drug resistance. Limited enrollment. Prerequisites: Biological Sciences core, upper-division course in molecular biology/genetics or biochemistry.

3 units, Spr (Matin, Staff) alternate years, not given 2004-05

MI 206. Animal Viruses—For advanced graduate and medical students. The structure, molecular biology, and genetics of RNA and DNA animal viruses. Lectures on the molecular biology of virus replication and gene expression and the nature of the host-virus interaction. Concise treatment of eukaryotic molecular and cell biology in the context of viruses. Problem sets, discussion groups. Prerequisites: Biological Sciences core, an understanding of molecular biology, biochemistry.

3 units (Mocarski, Staff) alternate years, given 2004-05

MI 209. Medical Microbiology—For graduate and advanced undergraduate students. Required of first-year graduate students in Microbiology and Immunology. Introduction to the concepts of microbial pathogenesis with emphasis on the mechanisms employed by pathogenic microorganisms in establishing infection in the host, and the responses of the host to infection. Prerequisite: understanding of biochemistry and molecular biology.

1-3 units, Aut (Falkow)

MI 210. Advanced Pathogenesis of Bacteria, Viruses and Eukaryotic Parasites—For graduate, medical, and advanced undergraduate students. Required for 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. Problem sets and recent literature pertaining to microbial pathogenesis. Prerequisite: 209.

5 units, Win (Sarnow, Staff)

MI 211. Advanced Immunology I—(Same as IMMUNOL 201.) For graduate students and advanced undergraduates. Topics: genetics and structure/function relationships of antibodies, T-cell receptors, MHC antigens; accessory molecules; lymphocyte differentiation and activation; cellular regulation of immune responses; autoimmunity and other problems in clinical immunology. Prerequisites: biochemistry, basic immunology course; consent of instructor for undergraduates.

3 units, Win (Chien, Staff)

MI 212. Advanced Immunology II—(Same as IMMUNOL 202.) Readings of immunological literature and specific areas of immunology. Classic problems and emerging areas are covered based on primary literature. Student and faculty presentations. Prerequisite: 201.

3 units, Spr (Garcia, Staff)

MI 213. Advanced Immunology III—(Same as IMMUNOL 203.) Immunological literature and. Possible themes: the history of immunology, classic problems and emerging areas, or new topics in immunology.

3 units, Sum (Staff)

MI 215. Principles of Biological Technologies—(Same as IMMUNOL 215.) Required of first-year graduate students in Microbiology and Immunology. 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, organic chemistry, and physics.

2 units, Spr (Kirkegaard)

MI 231. Stem Cells and Gene Therapy—Cell mediated and gene therapy as a novel form of drug delivery. Vectors, cell types, and relevant genetic and acquired diseases are discussed in a series of lectures, and in student and guest presentations. Prerequisites: biochemistry and molecular biology.

2-3 units, Spr (Nolan, Blau)

MI 299. Directed Reading—Prerequisite: consent of instructor. See faculty list for section numbers.

1-18 units, Aut, Win, Spr, Sum, by arrangement

MI 399. Graduate Research—Students who have satisfactorily completed the necessary foundation courses may elect research work in general bacteriology, bacterial physiology and ecology, bacterial genetics, microbial pathogenicity, immunology, parasitology, and virology. Prerequisite: consent of instructor. See faculty list for section numbers.

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

MI 459. Frontiers in Interdisciplinary Biosciences—(Crosslisted in multiple departments in the schools of Humanities and Sciences, Engineering, and Medicine. Students should enroll through their affiliated department; otherwise enroll in CHEMENG 459.) See CHEMENG 459 or http://biox.stanford.edu/chemeng_index.html for description.

1 unit, Aut, Win, Spr (Robertson)