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.

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 12.

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 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 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 are requirements of the department: MI 215, Principles of Biological Techniques; MI 209, Medical Microbiology; 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: BIOSCI 203/DBIO 203/GENE 203, Advanced Genetics; BIOSCI 230, Molecular and Cellular Immunology; and MCP 221/BIOSCI 214, Cell Biology of Physiological Processes.

In Spring Quarter of the second year, each student defends orally a formal research proposal on a topic outside the intended thesis project. The 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. 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 courses. In addition, first- and second-year graduate students are required to participate in a bi-weekly journal club.

COURSES

MI 103. Parasites and Pestilence: Infectious Public Health Challenges—(Same as HUMBIO 153.) 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 World Health Organization tropical disease research-targeted disease entities including: river blindness, sleeping sickness, leishmaniasis, schistosomiasis, mycobacterial disease (tuberculosis and leprosy), malaria, toxoplasmosis, dracunculiais, and intestinal helminthes. Guest lecturers in disease control. Original proposal to solve a current disease.
4 units, Spr (Smith, D)

MI 104. Innate Immunology—(Undergraduate section; see 204.)
3 units, Spr (Schneider, D)

MI 115A. Humans and Viruses—(Same as HUMBIO 155A.) 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.
6 units, alternate years, not given this year

MI 115B. The Vaccine Revolution—(Same as HUMBIO 155B.) Advanced seminar. Human aspects of viral disease, focusing on recent discoveries 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 analysis, experimental design, and interpretation of data. Oral presentations. Enrollment limited to 10. Prerequisite: 115A.
6 units, Win (Siegel, R)

MI 185. Topics in Microbiology—Topics include diversity, molecular regulation, growth, bioenergetics, and unique metabolic processes. Student papers for presentation on current topics such as antibiotic resistance and molecular approaches to bioremediation. Prerequisites: CHEM 31, 33, 35. Recommended: BIOSCI 31.
3 units, Win (Matin, A)

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, Win, Spr, Sum (Staff)

MI 199. Undergraduate Research—Students undertake 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, Win, Spr, Sum (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; multidrug resistance. Limited enrollment. Prerequisites: Biological Sciences core; upper-division course in molecular biology/genetics or biochemistry.

3 units, not given this year

MI 204. Innate Immunology—(Undergraduates register for 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 205. Immunology in Health and Disease—(Same as IMMUNOL 205.) Basic concepts of adaptive and innate immunology and the role of the immune system in a variety of human diseases. Emphasis is on application of the fundamental concepts of human immunology. Case presentations of diseases including autoimmune diseases, infectious disease, transplantation, genetic and acquired immunodeficiencies, hypersensitivity reactions, and allergic diseases. Problem sets based on lectures and current clinical literature. Laboratory in inflammation and histology of lymphoid organs. (Medical students enroll in IMMUNOL 205 for the required 4 units.)

2-4 units, Win (Lewis, D)

MI 209. Medical Microbiology—For graduate students and advanced undergraduates; required of first-year graduate students in Microbiology and Immunology. Introduction to the concepts of pathogenesis by bacteria, viruses ,and eukaryotic parasites emphasizing 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, Win (Chen, C)

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. Current literature.

4 units, Spr (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 clinical immunology. Prerequisites: undergraduate course in Immunology; and familiarity with experimental approaches in biochemistry, molecular biology, and cell biology.

3 units, Win (Chien, Y)

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: IMMUNOL 201/MI 211

3 units, Spr (Staff)

MI 213. Advanced Immunology III—(Same as IMMUNOL 203.) Key experiments and papers in immunology. Student presentations and faculty participation; faculty describe their experimental process and scientific papers. Prerequisite: IMMUNOL 201/MI 211 or IMMUNOL 202/MI 212.

3 units, Sum (Staff)

MI 214. Biodefense and Biosecurity—Science and policy behind American and international biosecurity and biodefense. Is the international community prepared to defend against a naturally-occurring disease or a bioterror attack? Topics include the scope of the problem, agent pathogenesis, threat of biological weapons, responding to a biological attack, microbial forensics, international health, the threat of naturally emerging infectious disease, and policy against these threats. Guest lecturers.

2 units, Win (Siegel, R)

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

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, alternate years, not given this year

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, Win, Spr (Sarnow, P)

MI 299. Directed Reading in MIcrobiology and Immunology—Prerequisite: consent of instructor.

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