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 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.

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 4.

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 209, Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites, Part I; and MI 210, Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites, Part II. 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 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.

COURSES

MI 25N. Modern Plagues—Stanford Introductory Seminar. Preference to freshmen. Molecular and medical aspects of new and old microorganisms that infect humans. Goal is to place modern human plagues in scientific and historical perspective. Factors that lead to emergence and control. Write-2

3 units, Spr (Boothroyd, J)

MI 104/204. 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 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 select 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. Prerequisite: 115A.

6 units, alternate years, not given this year

MI 155H. Humans and Viruses I—(Same as HUMBIO 155H.) Intensive 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: 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, Aut (Siegel, R)

MI 155V. Humans and Viruses II—Intensive 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 treatement, viral hepatitis and chronic infections, prions and diseases of life style. Prerequisite: 155H.

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 31X, Biological Sciences core.

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—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 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, Win (Sarnow, P)

MI 210. Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites: Part II—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, Spr (Chen, C)

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

3 units, Spr (Garcia, K)

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, offered occasionally

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.

3 units, Spr (Kirkegaard, K)

MI 232. Topics in Regenerative Medicine—(Same as DBIO 232.) Forum. Students and researchers discuss current developments in regenerative medicine at Stanford to spark collaboration. Topics include novel applications in biological and chemical engineering, stem cell biology, biotechnology, and human disease. May be repeated for credit.

2 units, Aut, Win, Spr (Blau, H; Fuller, M)

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 next 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 (Schneider, D)

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)