

# INDIANA UNIVERSITY

University Graduate School  
2005-2006  
Academic Bulletin

## Microbiology and Immunology

School of Medicine  
Indianapolis

### Chairperson

Professor Hal E. Broxmeyer\*

### Departmental URL

[www.iupui.edu/~micro/home.html](http://www.iupui.edu/~micro/home.html)

### Departmental E-mail

[hbroxmey@iupui.edu](mailto:hbroxmey@iupui.edu)

## Graduate Faculty

(An asterisk [\*] denotes membership in the University Graduate School faculty with the endorsement to direct doctoral dissertations.)

### Professors

Richard Bockrath\*, Janice S. Blum\*, Hal E. Broxmeyer\*, David B. Donner\*, Roman Dziarski\*, Xin-Yuan Fu, Roy W. Geib\*, Richard A. Haak\*, Louis M. Pelus\*, Ann Roman\*, Raoul Rosenthal\*, Robert H. Schloemer\*, Arun Srivastava\*

### Associate Professors

Carla J. Aldrich, Ghalib Alkhatib\*, Randy R. Brutkiewicz\*, Cheong-Hee Chang, Alexander L. Dent, Johnny J. He\*, Mary T. Johnson, Mark H. Kaplan\*, Michael J. Klemsz\*, Steven Larsen\*, Glenn J. Merkel\*, Leonard F. Peruski, Martin L. Smith, Warner Wegener\* (Emeritus), Charles E. Wilde III\*

### Assistant Professors

Margaret E. Bauer, Tie Chen, Laura Haneline, Soon-Cheol Hong, Gotz-Ulrich Von Bulow

### Associate Faculty

### Professors

Byron Batteiger\* (Medicine), Zacharie Brahmi\* (Medicine), Darron Brown\* (Medicine), Kenneth Cornetta (Medicine), Kenneth Fife\* (Medicine), Robert Jones\* (Medicine), Chris Miller\* (Dentistry), Mark Pescovitz\*, Stanley Spinola\* (Medicine)

### Associate Professors

D. Wade Clapp\* (Pediatrics), Meei-Huey Jeng (Medicine), Chinghai Kao (Urology), Edward Srour\* (Medicine), David Wilkes\* (Medicine)

### Assistant Professor

Thomas Gardner (Urology)

Graduate Office  
Union Building 518  
Indiana University–Purdue University  
Indianapolis  
Indianapolis, IN 46202  
(317) 278-2490  
Contact: [gradoff@iupui.edu](mailto:gradoff@iupui.edu)

**Graduate Advisor**

Professor Raoul Rosenthal\*, Medical Science Building 420, (317) 274-4398; fax: (317) 274-4398; rrosenth@iupui.edu

**Degrees Offered**

Master of Science and Doctor of Philosophy

**Special Departmental Requirements**

(See also general University Graduate School requirements.)

**Admission Requirements**

The Graduate Record Examination General Test is required, and the Subject Test in cellular and molecular biology is recommended. Undergraduate courses in basic biology, including cell biology and genetics; general and organic chemistry; physics; mathematics, including calculus; and biochemistry. Deficiencies should be removed during the first year of enrollment. Overall grade point average of at least 3.0 (B).

**Master of Science Degree****Course Requirements**

At least 30 credit hours, including thesis, G865 Fundamental Molecular Biology, G817 Eukaryotic Cell Biology, G504 Introduction to Research Ethics, J802 Introduction to Research, at least three courses within a Department of Microbiology and Immunology focus area (excluding J822 General and Medical Microbiology), and 2 credit hours of J830 Seminar in Microbiology. At least 20 of the required 30 credit hours must be in courses other than research.

**Grades**

Overall average of at least a B (3.0).

**Comprehensive Examination**

Required at completion of second semester of study.

**Thesis**

Required (a minimum of 8 credit hours of J810).

**Final Examination**

Oral defense of thesis.

**Doctor of Philosophy Degree****Focus Areas**

The major focus areas are immunology, pathogenesis, and cancer. Students entering the program may design a course of study from one of these areas through a combination of selected course work and research activities.

**Course Requirements**

A total of 90 credit hours, of which a minimum of 26 credit hours must be in courses other than research. Required courses include G817 and G865 or their equivalent, one credit of G504 or equivalent and three semesters of J830 Seminar in Microbiology. Students take 2 credits of J802 Introduction to Research in Microbiology and Immunology. A minimum of four courses (three courses for combined M.D./Ph.D. students) selected from an area of emphasis: immunology, pathogenesis, or cancer. A maximum of 4 credits of J800 can be applied toward the required 26 credit hours of course work. G817 and G865 can

be applied toward the minor requirements with approval of the minor representative. A minimum of 40 credit hours of dissertation research (J810) is required.

### **Grades**

Overall average of at least a B (3.0).

### **Minor**

A minimum of 12 credit hours in a related field or in life science. These credits must be in lecture or laboratory courses other than research and must meet the requirements of the department in which the minor is taken. For the life sciences minor, a minimum of 6 credit hours must be obtained in one department.

### **Ph.D. Minor in Cellular and Molecular Biology of Biomedical Systems**

A minimum of 12 credit hours of course work outside the student's major department, including G865 Fundamental Molecular Biology and either G817 Eukaryotic Cell Biology or F705 Molecular and Cellular Physiology (unless these are required by the major department). Since the minor is intended to expose the student to both cellular and molecular biology, at least one course (and preferably two) from each area should be taken. Courses for the minor must be selected from the following list and approved by the advisory committee, the minor representative of which will be selected from outside the student's major department. Courses: Anatomy D863, D866; Biochemistry B807, B810, G817, B841; Medical and Molecular Genetics Q612, Q620, Q622; Microbiology and Immunology J805, J821, J826, J828, J837, J838; Pharmacology and Toxicology F808, F832, F834, F835, F842, F843; Physiology and Biophysics F705, F710, F724, F765; Graduate G595, G865, G890.

### **Ph.D. Minor in Cancer Biology**

A minimum of 12 credit hours outside of the student's major department, including two courses from the following list of four: Q622 Cytogenetics of Malignancies, F819 Chemical Carcinogenesis, J842 Neoplastic Determinants, BIOL 516 Molecular Biology of Cancer. At least one credit of G504 Introduction to Research Ethics or equivalent must also be taken. The remainder of the minor will be selected from the following courses: Graduate G865, G817, G706, Biochemistry and Molecular Biology B807, B810; Medical and Molecular Genetics Q620, Q622; Microbiology and Immunology J805, J807, J828, J829, J837, J840, J842, J854; Pharmacology and Toxicology F819, F820. The minor program must be approved by the student's advisory committee, which will take into consideration the student's total didactic experience. In the case of combined M.D./Ph.D. students, the committee may approve substitution of appropriate medical school courses. The minor representative on this committee will be selected from outside the student's major department and must be a member of the Cancer Biology Training Program.

### **Qualifying Examination**

Within the first 25 months of studies (18 months for combined M.D./Ph.D.), the student submits a written research proposal in the form of a grant application to the advisory committee. At this time, the student has both a written examination based on course work and an oral examination based primarily on the written research proposal. The student can request an extension of four months from the faculty to take the qualifying examination. Doctoral studies are continued if the qualifying examination and other work, including research, are deemed satisfactory by the majority of the advisory and research committees.

### **Final Examination**

Oral defense of the dissertation.

### **Other Provision**

Submission of a manuscript based on the dissertation research for publication in a primary journal in the field required. Students will develop teaching skills as instructors in J210 during the first two years of graduate training, and additional teaching experiences can be arranged.

## Courses

**J510 Infectious Microbes and Host Interactions (3 cr.)** P: graduate-level biochemistry. Emphasis on the molecular and cellular events which permit pathogenic bacteria and viruses to enter human cells and disrupt cell function while evading the host's immune system.

**J601 Medical Immunology (2 cr.)** Introduction to natural and acquired immune mechanisms, with consideration of their significance to medicine. Topics will include both normal and abnormal immune processes, including recovery from and prevention of disease, immune-mediated pathological processes, tumor immunology, immunodeficiency, and auto-immunity. Designed to precede and complement J602 Medical Microbiology.

**J800 Advanced Microbiology (cr. arr.)\*\*** P: consent of instructor. The approach to problems in microbiology, including the application of techniques of bacteriology, genetics, immunology, mycology, parasitology, virology, and zoology.

**J802 Introduction to Research (2 cr.)** P: consent of instructor. Laboratory research instruction in microbiology and immunology. Purpose is to introduce students to three different research programs in microbiology and/or immunology.

**J805 Molecular Immunology (3 cr.)** P: B500 or equivalent; consent of instructor. Characterization of immunologically relevant molecules in terms of molecular genetics, synthesis and assembly, structure-function and evolutionary relationships, and functional roles in immune responses. Entities to be considered include members of the immunoglobulin superfamily and functionally associated molecules.

**J806 Immunochemistry: Laboratory (cr. arr.)** P: J805 C. Antigen preparation; separation and purification of antibodies; modern methods of antibody determination and analysis.

**J807 Current Topics in Immunology (2 cr.)** PP: graduate standing, J805 or J840 or equivalent or consent of instructor. Discussion and review of current literature in selected topics in immunology. Emphasis on molecular and cellular events in lymphocyte activation and regulation. Topic varies from year to year. May be repeated for credit.

**J810 Research in Microbiology (cr. arr.)\*\*** P: consent of instructor. Data obtained in this course may be used to meet the thesis requirements for graduate degrees.

**J821 Microbial Pathogenicity (3 cr.)** P: consent of instructor. This course will consider in detail the determinants of microbial virulence and the mechanisms of host responses to infection and how these two factors interact in the pathogenesis of infectious diseases.

**J822 General and Medical Microbiology (3 cr.)** Lectures covering the biology of various pathogenic organisms such as bacteria, viruses, fungi, and parasites, their role in human disease with emphasis on determinants of microbial virulence, the mechanisms of host responses to infection, and the role of these factors in the pathogenesis of disease.

**J826 Bacteriology (3 cr.)** P: J601 or J822 or their equivalent and consent of instructor. General concepts of bacteriology.

**J828 Virology: Lecture (3 cr.)** P: BIOC B500 or equivalent and consent of instructor. Basic biological principles of viruses; agents causing diseases in edus, including humans; interactions of edus with their host cells in tissue culture.

**J829 Current Topics in Molecular Genetics of Microorganisms (2 cr.)** P: graduate standing, J821, J828 or G865, consent of instructor. In-depth study of a specific topic in contemporary molecular genetics of microorganisms. Topic varies; may be taken for credit more than once.

**J830 Seminar in Microbiology (1 cr.)** P: consent of instructor. Provides students with background and practical experience in communication of their research.

**J840 Mechanisms of Immune Regulation (2 cr.)** P: consent of instructor. A current overview of the cellular mechanisms which regulate immune responses. Topics include cells and cytokines involved in antigen presentation, lymphocyte activation and function, development, and tolerance.

**J842 Neoplastic Determinants (2 cr.)** G865, G817 or equivalent and consent of instructor. Focus on the genetic basis of the cancer phenotype. Consider effects of DNA sequence mutations; chromosomal rearrangements, and/or introduction of new genetic information on DNA repair, oncogene products and tumor suppressors. Intra- and intercellular consequences of these discrete alterations will be included.

**J854 Hematopoiesis (2 cr.)** P: G817, G865, and consent of the instructor. Principles of blood cell formation, including the regulation of production, biologic function, and cell culture and recombinant DNA technologies that contribute to our understanding. Stem cells, growth factors, cytokine involvement, gene transfer/gene therapy, and clinical applications.

**GRAD G504 Introduction to Research Ethics (2 cr.)** Introduction to the basic concepts of research ethics. The course will cover historical development of concern with ethics in science as well as practical information needed by students working in the science today. Format will be lecture and discussion.

**GRAD G817 Eukaryotic Cell Biology (2 cr.)** P: one semester of biochemistry. Organization and function of subcellular structures. Intracellular coordination of cell activity: protein and RNA trafficking, chromatin dynamics, and intracellular processing of receptor mediated signals.

**GRAD G837 Mammalian DNA Repair and Disease (3 cr.)** P: consent of instructor. The molecular biology of genetic repair and mutation; emphasis on human systems and human disease states related to DNA repair; mechanisms of DNA repair and regulation of DNA repair in mammalian cells.

**GRAD G865 Fundamental Molecular Biology (3 cr.)** P: B800 or equivalent. Principles of molecular structure, function, and biosynthesis; core information regarding prokaryotic and eukaryotic gene continuity and metabolic coordination; introduction to multicellular systems and problems.

\*\*These courses are eligible for a deferred grade.