



**University Graduate School
2007-2008
Academic Bulletin**

Pharmacology and Toxicology

**School of Medicine
Indianapolis**

Chairperson
Michael R. Vasko*

Acting Director, State Department of Toxicology
Peter Method

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Graduate Faculty

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

Dean and Walter J. Daly Professor
D. Craig Brater* (Medicine)

Charles Fisch Professor
Larry Jones* (Medicine)

Paul Stark Professor
Michael R. Vasko*

H. H. Gregg Professor of Oncology
Ahmed R. Safa*

Robert Wallace Miller Professor of Oncology
Leonard C. Erickson*

Showalter Professor
Henry R. Besch Jr.* (Medicine)

Professors

Joseph A. DiMicco*, James E. Klaunig*, Grant D. Nicol*, Gerry Oxford*, Sherry F. Queener*, Beat U. Raess, Subbiah P. Sivam*, Lynn R. Willis* (Emerita), Jian-Ting Zhang*

Associate Professors

Victor Elharrar*, Donald R. Koritnik

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Assistant Professors

Nikolai Broustovetski, Theodore R. Cummins, Barbara A. Hocevar, Lisa M. Kamendulis, William J. Sullivan

Adjunct Graduate Faculty

Adjunct Professors

Lucinda Carr* (Medicine), David Flockhart* (Medicine), Stephen Hall* (Medicine), Mark Kelley* (Pediatrics), Anantha Shekhar* (Psychiatry), Jeffrey Travers* (Dermatology)

Adjunct Associate Professors

John Callaghan (Medicine)

Adjunct Assistant Professor

Cynthia Hingtgen*

Director of Graduate Program

Dr. Ahmad R. Safa*, Cancer Center, R4 119, (317) 278-4952, asafa@iupui.edu

Special Departmental Requirements

(See also [general University Graduate School requirements.](#))

Admission Requirements

Undergraduate grade point average should be well above 3.0 (B). Graduate Record Examination General Test is required for the Ph.D. and for the M.S.

Pharmacology Program¹

Coordinator of Pharmacology Graduate Program

Professor Grant D. Nicol, Medical Science Building A401, (317) 274-7844, gnicol@iupui.edu

Degrees Offered:

Master of Science

Doctor of Philosophy

Master of Science Degree

Course Requirements

A total of 36 credit hours, including courses in biochemistry, physiology, and pharmacology, plus research. For the M.S. in Pharmacology or Toxicology, students would not be allowed to take more than 24 credit hours of academic course work and must take a minimum of 12 credit hours of independent research toward a scientific publication.

Thesis

Required. In special cases, published research may be substituted for the thesis. Consult the director of graduate studies.

Final Examination

Oral or written or both.

Doctor of Philosophy Degree

Course Requirements

A total of 90 credit hours, including dissertation. At least 32 credit hours must be taken in the department, exclusive of research. Other requirements for completing the Ph.D. program are that students publish two first-author papers or have a statement from the student's research committee indicating that these will be forthcoming. The second requirement is that students must achieve two of the following: (i) submit a grant application, (ii) co-author a third paper, and (iii) present two abstracts at regional, national, or international meetings.

Minor

Students generally minor in biochemistry or physiology. Students working toward an approved minor in life science should consult the department in planning their program.

Advisory Committee

An advisory committee is appointed when the student first registers for classes.

Qualifying Examination

Written and oral, over concepts and research in pharmacology.

Final Examination

Oral defense of dissertation.

Toxicology Program

Coordinator of Toxicology Graduate Program

Professor James E. Klaunig, Medical Science Building A401, (317) 274-7844, jklauni@iupui.edu

Degrees Offered:

Master of Science
Doctor of Philosophy

Master of Science Degree

Course Requirements

A total of 36 credit hours. For the M.S. in Pharmacology or Toxicology, the students would not be allowed to take more than 24 credit hours of academic course work and must take a minimum of 12 credit hours of independent research toward a scientific publication.

Thesis

Required. In special cases, published research may be submitted for the thesis. Consult the director of graduate studies.

Final Examination

Oral or written or both.

Doctor of Philosophy Degree

Course Requirements

A total of 90 credit hours, including dissertation. At least 32 credit hours must be taken in the department, exclusive of research. Other requirements for completing the Ph.D. program are that students publish two first-author papers or have a statement from the student's research committee indicating that these will be forthcoming. The second requirement is that students must achieve two of the following: (i) submit a grant

application, (ii) co-author a third paper, and (iii) present two abstracts at regional, national, or international meetings.

Minor

Students generally minor in pharmacology or pathology. Students working toward an approved minor in life sciences should consult the department in planning their program.

Advisory Committee

An advisory committee is appointed when the student first registers for classes.

Qualifying Examination

Written and oral, over concepts and research in toxicology.

Final Examination

Oral defense of dissertation.

Courses

[See also "Pharmacology" in the entry for the [Medical Sciences](#) Program, Bloomington, in this bulletin.]

F598 Drugs, Diseases, and Poisons (3 cr.) P: a course in basic biology or physiology equivalent to BIOL K324 or BIOL 501. Introductory course in pharmacology and toxicology primarily for senior undergraduate students. The course provides an overview of the molecular basis of drug action and pharmacological properties of several of the major drug groups used in medical science.

F602 Pharmacology: Lecture (5 cr.) P: BIOC B800, PHSL F613, F614. Mode of action of drugs as a basis for therapy.

F603 Pharmacology: Laboratory (2 cr.) Taught in conjunction with F602.

F801 Introduction to Research in Pharmacology and Toxicology (1-3 cr.) Application of basic laboratory methods to pharmacological problems. Consideration of theoretical principles, instrumentation, and applications.

F803 Renal Pharmacology (3 cr.) P: F602. Physiological and metabolic responses of the kidneys to various classifications of drugs.

F804 Introduction to Pharmacology and Toxicology I (3 cr.) This course will teach the fundamental principles of pharmacology and toxicology for the beginning graduate student, as an introduction to the discipline.

F806 Cellular Pharmacodynamics (3 cr.) P: BIOC B810, PHSL F765. The effects of drugs and hormones on intracellular systems and cellular metabolism will be examined to define mechanisms of drug action.

F808 Myocardial Biology (3 cr.) The cellular biology of muscle, with emphasis on the regulation of the internal ionic milieu and its effect on function of cardiac cells. The contractile proteins and the ion transport systems, Na⁺, K⁺ -ATPase, sarcoplasmic reticulum, and mitochondria will be considered in detail.

F809 Neuropharmacology (3 cr.) P: F602 and BIOC B835, or permission of instructor. Drugs which affect the nervous system, with particular emphasis on their central action. Although neurochemical effects will be stressed, evidence from neurophysiology and behavior will also be considered.

F810 Pharmacology of Autonomic Cardiovascular Control: Central and Peripheral Mechanisms (3 cr.) The physiology and pharmacology of sympathetic and parasympathetic nervous control of the cardiovascular system; pharmacology of synaptic mechanisms in peripheral and central pathways controlling autonomic outflow.

F811 Concepts in Pharmacology (2 cr.) The course will survey classic and recent literature that establishes current ideas and approaches to research topics in pharmacology. Basic concepts of various disciplines will be applied to pharmacology research.

F812 Research in Toxicology (1-12 cr.) Independent laboratory research to fulfill dissertation requirements for either a master's or a doctorate degree in toxicology. Students must be enrolled in graduate studies in the Department of Pharmacology and Toxicology to register for this course.

F813 Clinical Pharmacokinetics (3 cr.) Design and complete mathematical analysis of pharmacokinetic studies in humans. The clinical utility of pharmacokinetics will be stressed, but the course will also have definite value for those involved with drug studies in animals.

F814 Introduction to Pharmacology and Toxicology II (3 cr.) P: F804. This course will expand on fundamental principles of pharmacology and toxicology, surveying recent advances in the field.

F816 Clinical Toxicology (3-5 cr.) P: F602. Signs and symptoms resulting from common poisons and drugs. Chemical analyses as aids in diagnosis.

F817 Principles in Toxicology (3 cr.) This course will teach basic concepts in toxicology such as mechanisms of cell injury, carcinogenesis, and effects of xenobiotics.

F819 Chemical Carcinogenesis (3 cr.) This course examines the biochemical and molecular mechanisms by which chemicals cause cancer. Emphasis will be on the uptake, metabolism, cellular targets and specific stage(s) of the cancer process that are affected by chemical carcinogens. Discussions will expand on the basic principles of carcinogenesis as they apply to the latest advances in the field.

F820 Cancer Chemoprevention (3 cr.) This course will examine the biochemical and molecular mechanisms of natural and synthetic cancer chemopreventive agents.

F825 Research in Pharmacology (cr. arr.) Independent laboratory research for fulfilling dissertation requirements.

F826 Seminar in Toxicology (1 cr.) Literature and research reports by students and staff.

F830 Seminar in Pharmacology and Toxicology (1 cr.) Literature and research reports by students and staff.

F832 Drug-Protein Interactions (3 cr.) Drug-protein interactions such as drugs modifying enzyme action, drugs acting at cell membrane receptors; drug binding to extracellular proteins. Emphasis is placed on measuring drug-protein interaction. Analysis of experimental design, calculation of sample data, and applications such as radioimmunoassays will be considered.

F835 Molecular Mechanisms of Drug Action (3 cr.) Biochemical mechanisms underlying drug actions and reactions including toxicologic effects of drugs will be covered, with emphasis on molecular mechanisms involving drug receptor interaction, the actions of drugs and hormones on regulatory mechanisms in various disease states.

F836 Physiological Disposition of Drugs (3 cr.) Factors affecting the absorption, distribution, metabolism, and excretion of drugs will be discussed in terms of environmental, biochemical, and physiochemical parameters. Pertinent literature will be reviewed and special problems discussed.

F838 Cellular and Molecular Toxicology (3 cr.) This course examines the cellular mechanisms that mediate xenobiotic toxicity at the cellular, biochemical and molecular level. The course emphasizes mechanisms through which toxic chemicals act to evoke cell injury and cell death.

F840 Advanced Pharmacology and Toxicology (2-5 cr.) P: F602. Advanced studies of pharmacodynamic mechanisms in cardiovascular, central nervous system, and renal pharmacology and toxicology. Experimental design related to recent advances and current hypotheses concerning drug action and toxicity. May be repeated three times for credit.

F841 Advanced Topics in Toxicology (1-3 cr.) This course will involve a series of lectures and discussions on new advances in toxicology. The course will focus on metabolic, cellular, and molecular mechanism by which toxic agents produce injury.

F842 Tumor Metabolism and Chemotherapy (3 cr.) P: F602, BIOC B800. Biochemical alterations in neoplasia and mechanisms of chemical, hormonal, and viral carcinogenesis.

F843 Pharmacology of Cellular Transduction (3 cr.) This course focuses on mechanisms involved in cellular signal transduction ranging from the molecular biology of receptors to the role of transduction cascades in drug action. Students will participate extensively in discussion of issues.

F850 Experimental Design Analysis in Pharmacology and Toxicology (3 cr.) P: F602. This course presents experimental methods and data analysis used in pharmacological and toxicological experimentation. Emphasis will be on experimental design.

Cross-Listed Courses

Biochemistry

B800 Medical Biochemistry (5 cr.)

B868 Advanced Molecular Biology (1-3 cr.)

Pathology

C603 General Pathology (6 cr.)

C859 Research in Pathology (cr. arr.)

¹ See also "Pharmacology" in the entry for the [Medical Sciences](#) Program, Bloomington, in this bulletin.