



INDIANA UNIVERSITY

**University Graduate School
2008-2009
Academic Bulletin**

Pharmacology and Toxicology

School of Medicine Indianapolis

Chairperson

Michael R. Vasko*

Acting Director, State Department of Toxicology
Peter Method

Departmental E-mail

ahermann@iupui.edu

Departmental URL

medicine.iu.edu/body.cfm?id=4385

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)

Paul Stark Professor

Michael R. Vasko*

H. H. Gregg Professor of Oncology

Ahmad R. Safa*

Robert Wallace Miller Professor of Oncology

Leonard C. Erickson*

Showalter Professor

Grant D. Nicol*

Chancellor's Professor

Joseph A. DiMicco*

Robert B. Forney Professor of Toxicology

James E. Klaunig*

Andrew and Peggy Thompson Chair in Hematology/Oncology

Jian-Ting Zhang*

Graduate Office
Union Building 207
Indiana University–Purdue University Indianapolis
Indianapolis, IN 46202
(317) 274-1577
Contact: gradoff@iupui.edu

Professors

Gerry Oxford*, Sherry F. Queener*, Beat U. Raess, Subbiah P. Sivam*, Lynn R. Willis* (Emerita)

Associate Professors

Victor Elharrar*, Donald R. Koritnik, Richard M. Nass

Assistant Professors

Nikolai Broustovetski, Kai-Ming Chou, Theodore R. Cummins, Barbara A. Hocevar, Lisa M. Kamendulis, Rajesh Khanna, William J. Sullivan, Jr.*

Adjunct Graduate Faculty

Adjunct Professors

David Flockhart* (Medicine), Mark Kelley* (Pediatrics), Linda Malkas (Oncology), Anantha Shekhar* (Psychiatry), Jeffrey Travers* (Dermatology)

Adjunct Associate Professors

John Callaghan (Medicine), Daniel Rusyniak (Emergency Medicine)

Adjunct Assistant Professors

Cynthia Hingtgen*, Andy Hudmon* (Biochemistry), Karen Pollok (Pediatrics), Michael Rubart-von der Lohe* (Pediatrics)

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

Pharmacology Graduate Student Advisor

William J. Sullivan, Jr., Ph.D., Medical Science Building A401, (317) 274-7844, wjsulliv@iupui.edu

Degrees Offered

Master of Science and Doctor of Philosophy

Master of Science Degree

Course Requirements

For the M.S. in Pharmacology, students must take a minimum of 15 credit hours of academic course work and must take a

minimum of 15 credit hours of independent research toward a scientific publication.

Thesis

Required.

Final Examination

Not applicable.

Doctor of Philosophy Degree

Course Requirements

All Pharmacology Ph.D. students will be required to take 28 hours of coursework (of that 6 hours will be rotations); the remaining 62 hours will be research and seminar, for a total of 90 hours. Other requirements for completing the Ph.D. program are (1) publishing two first-author papers, or submitting a statement from the student's research committee indicating that these will be forthcoming; and (2) achieving two of the following: (a) submitting a grant application, (b) co-authoring a third paper, and (c) presenting two abstracts at regional, national, or international meetings.

Minor

Students generally minor in life sciences. Students should consult the Graduate Student Advisor 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.

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

Toxicology Program

Toxicology Graduate Student Advisor

Lisa M. Kamendulis, Ph.D., Medical Science Building A401, (317) 274-7844, lkamendu@iupui.edu

Degrees Offered

Master of Science, Doctor of Philosophy

Master of Science Degree

Course Requirements

For the M.S. in Toxicology, students must take a minimum of 15 credit hours of academic course work and must take a minimum of 15 credit hours of independent research toward a scientific publication.

Thesis

Required.

Final Examination

Not applicable.

Doctor of Philosophy Degree

Course Requirements

All Toxicology Ph.D. students will be required to take 28 hours of coursework (of that 6 hours will be rotations); the remaining 62 hours will be research and seminar, for a total of 90 hours. Other requirements for completing the Ph.D. program are (1) publishing two first-author papers, or submitting a statement from the student's research committee indicating that these will be forthcoming; and (2) achieving two of the following: (a) submitting a grant application, (b) co-authoring a third paper, and (c) presenting two abstracts at regional, national, or international meetings.

Minor

Students generally minor in pharmacology or pathology. Students should consult the Graduate Student Advisor 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.

The following courses are taught by Pharmacology & Toxicology faculty:

GRAD G743 Fundamentals of Electrical Signaling and Ion Channel Biology (1 cr.) Experimental basis for cellular and molecular concepts of electrical excitability and membrane transport through ion channels. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide current "facts" to memorize.

GRAD G747 Principles of Pharmacology (1 cr.) This course is intended for incoming basic science doctoral graduate students in the School of Medicine Pharmacology & Toxicology programs or other interested graduate students. This course covers the basics of drug-receptor interactions, drug metabolism, pharmacogenetics, and pharmacokinetics. This course will include PowerPoint presentations and student presentations.

GRAD G748 Principles of Toxicology 1 (1 cr.) This course will present the fundamental concepts of toxicology necessary to understand the effects of chemicals on human health. Cellular and molecular mechanisms involved in toxic responses elicited by pharmaceutical and environmental agents, activation and detoxification of drugs and chemicals, and the principles of carcinogenesis and mutagenesis will be presented.

GRAD G754 Principles of Toxicology 2 (1 cr.) Xenobiotic-induced target organ toxicity will be discussed with respect to the biological and/or chemical factors that influence toxicity at a tissue site, the modes of action for producing damage, and the methodology used to measure injury. This course is designed to provide a foundation for understanding the complex interactions between toxicants and biological systems from a basic science approach.

GRAD G755 Principles of Toxicology 3 (1 cr.) The effects associated with specific classes of chemicals, including chemical agents that either demonstrate a great chance for injury and/or pose significant potential for human exposure will be presented. The chemical classes covered will include selective metals, solvents and alcohols, pesticides, plastics, and gases.

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.)