

Pharmacology

College of Medicine

Graduate study in Pharmacology is designed to prepare candidates for research careers in academics, industry or government laboratories and agencies. The Ph.D. program in Pharmacology trains students in the fundamental principles of basic molecular and biochemical science, while also providing training in the principles of drug-receptor interactions, of experimental therapeutics and of drug discovery. Modern pharmacology also emphasizes new directions in gene therapy and pharmacogenetics. Students learn the conceptual and technical basis of research while performing mentored and, subsequently, independent research projects in laboratories equipped with state of the art technology and instrumentation.

Students will have the opportunity to join nationally recognized faculty research programs in investigating topics such as: Cardiovascular Disease and Obesity; Molecular Biology of Carcinogenesis and Metastasis; and Neurobiology of Aging and Neurodegenerative Disease, with emphases on memory, hormones, stress, and Type II Diabetes.

Admission Requirements

Admission to the graduate program is competitive and is based upon academic background, professional recommendations, performance on the Graduate Record Examination (GRE), experience, and when possible, personal interviews. It is recommended that students have completed undergraduate courses in organic chemistry, calculus, physics, and biological sciences. The program of study is tailored to the individual background and career goals of the student and can often include interdepartmental study and research. Students are expected to participate in journal clubs and research seminars; to interact with visiting scholars; and to present the results of their research at local and national meetings. Financial aid is available for qualified students.

Admission to the Ph.D. program in Pharmacology is through the Integrated Biomedical Sciences (IBS) program. Information about the admissions process is available at <http://www.mc.uky.edu/ibs>. For information about the Ph.D. program in Pharmacology, please contact the Director of Graduate Studies, Department of Molecular and Biomedical Pharmacology, University of Kentucky College of Medicine, Lexington, KY 40536-0298. Information may also be obtained from www.mc.uky.edu/pharmacology/.

Course Descriptions

PHA 200 PHARMACOLOGY: DRUGS AND HUMAN HEALTH. (3)

This course will give students the needed background to understand how drugs impact human health and guide their appropriate use. Lectures will focus on how drugs function, how they impact our lives, and how new targets for drugs are discovered. This course will provide a history of drug development, design, and drug discovery, and examine the uses and actions of commonly prescribed and over-the-counter drugs. This course will also cover drugs of abuse and those used in sports and performance enhancement. Students will learn about when drugs should be used, conditions under which their use is prudent, and how to obtain accurate information regarding use, benefits and risks of new drugs. This class will give students valuable scientific insights into drug actions and provide a basis for lifelong learning to better protect and inform health care choices. Prereq: One semester of College Biology.

#PHA 421G PHARMACOLOGY: PRINCIPLES OF DRUG ACTION. (3)

PHA 421G is a 3 credit course designed to first introduce students to the basic principles of modern pharmacology, and then have them apply those principles to current issues of both drug therapy of human

disease and drug abuse. The goal of this course is to prepare students with the knowledge base to explore career options in medicine, pharmacy, dentistry, or graduate school. Prereq: 3 credits are required from either BIO 148 or BIO 152, 4 credits from either PGY 206+207 or BIO 350 and PHA 200 or consent of the Course Director.

PHA 422G PHARMACOLOGY OF TREATING HUMAN DISEASE. (3)

This course will provide students with a fundamental understanding of the actions of drugs most commonly used in the treatment of the major human diseases, drugs of abuse, and those used in sports to enhance performance. This course is geared toward the pre-professional and others interested in a career in health care and research. Prereq: BIO 350 and BIO 315.

#PHA 423G EXPLORING THE DARK SIDE OF MEDICINE. (3)

This course will provide students with a fundamental understanding of the adverse effects of drugs and other substances that may be harmful to human health as well as the approaches that are used to ensure drug safety. This course is geared toward the pre-professional student and others interested in a career in health care and research. Prereq: PHA 421G or consent of the Course Director.

#PHA 424G PHARMACOLOGY OF HUMAN ENDOCRINOLOGY AND REPRODUCTION. (3)

PHA 424G is a 3-credit course designed to give students a fundamental understanding of the drugs that control the human endocrine system and reproduction and the mechanism by which they exert their actions. The goal of this course is to prepare students with the knowledge base that will allow them to explore career options in medicine, pharmacy, dentistry, graduate school and pharmaceutical sciences.

#PHA 425G NEUROPHARMACOLOGY: TREATING DISORDERS OF THE BRAIN. (3)

PHA 425G is a 3-credit course designed to give students a fundamental understanding of the drugs that exert neuronal control in the human and the mechanism by which they exert their actions. The goal of this course is to prepare students with the knowledge base that will allow them to explore career options in medicine, pharmacy, dentistry, graduate school and pharmaceutical sciences. Prereq: PHA 421G or consent of instructor.

PHA 612 QUANTITATIVE PHARMACODYNAMICS: PHARMACOKINETICS. (3)

Quantitative treatment of dynamics of drug absorption, distribution, metabolism and excretion, including development of both mathematical models and model-independent approaches for describing these processes. Prereq: MA 114 and consent of instructor. (Same as PHS 612.)

PHA 616 BIOLOGY AND THERAPY OF CANCER. (3)

Biology of cancer will be discussed at the molecular, cellular and organismic level. Emphasis will be placed on cellular signaling, apoptosis and cell cycle unique to cancer cells, which affects tumor cell behavior and its interactions with the host immune system. The biology of hematopoietic cells will also be included. Clinicians active in treatment and research of various types of cancer will be invited to participate in the lectures. Prereq: BCH 501, 502, BIO 685. (Same as MED/MI 616.)

PHA 617 PHYSIOLOGICAL GENOMICS. (2)

RNA-seq, ChIP-seq and microarray techniques are powerful tools for global analyses of transcriptomes and gene expression. They are widely used in biological and medical research. Lectures on fundamental concepts, experimental design, and the impact of understanding gene expression patterns are combined with computer labs where students analyze RNA-seq, ChIP-seq and microarray data. Prereq: IBS 603 or an equivalent course in Cell Biology or Molecular Biology. (Same as PGY 617.)

PHA 621 PRINCIPLES OF DRUG ACTION. (3)

The objective of this course is to familiarize graduate students with the principles and mechanisms of

drug action in biochemical and physiological systems. Students will discuss the quantitative approaches to assessing drug responses, metabolism and toxicity. Prereq: Consent of instructor.

PHA 622 MOLECULAR DRUG TARGETS AND THERAPEUTICS. (1-4)

PHA 622 is an advanced course designed to provide graduate students with state of the art information regarding drugs, drug action and targets for drug action. Emphasis will be placed on drugs that interact with the cardiovascular system (section 001), the central nervous system (section 002), chemotherapeutic agents (section 003), and other important drug classes such as nonsteroidal anti-inflammatory agents, steroid hormones, antidiabetic agents and toxicology (section 004). Each section is designed to be a separate one hour course. Students may take any combination of sections from one to all four sections. For each agent, emphasis will be placed on the cellular mechanisms of action, the receptors or cellular targets at which they act, therapeutic issues and potential toxicities. This information is intended to be integrated with other disciplines, including anatomy, biochemistry, physiology, psychology and molecular biology. Prereq: IBS 601-609 and PHA 621.

PHA 623 PROFESSIONAL DEVELOPMENT FOR SCIENTISTS IN TRAINING. (3)

The purpose of this course is to introduce graduate students to useful topics in their quest to attain and retain a tenure track researcher position (or equivalent) at some point in their scientific future. These subjects are not always taught by mentors or through a traditional curriculum, but they are of utmost importance in a successful career. A breadth of issues will be presented that many principal investigators would say they wished they learned in graduate school and should give students the resources to become competitive scientific professionals. (Same as NS 623.)

PHA 630 SPECIAL TOPICS IN PHARMACOLOGY. (1-3)

Detailed examination of current, significant topics in pharmacology such as: contemporary neuroscience methodology, molecular and cellular pharmacodynamics, transmembrane signaling. Course is designed to offer flexibility to students in different tracks, different emphasis in a given year and to utilize the special research interests in resident and visiting investigators. May be repeated to a maximum of six credits. Prereq: Consent of course director.

PHA 658 ADVANCED NEUROPHARMACOLOGY. (2)

A study of the general theories of the mode of action of drugs upon nervous tissue and a review of the effects of analgesics, sedatives, hypnotics, anesthetics, tranquilizers, psychotomimetics, analeptics, antidepressants, anti-convulsants and drugs affecting motor dyskinesias upon neurones, synapses and functional components of the central nervous system. Prereq: PHA 522, IBS 601-606, or consent of instructor.

PHA 670 CHEMICAL CARCINOGENESIS. (3)

Lectures and discussion of the chemical and biochemical reactions of chemical carcinogens and their metabolites. Prereq: CHE 232; PHR 400; or BCH 501, 502. (Same as TOX 670.)

PHA 710 AGING OF THE NERVOUS SYSTEM. (3)

This course will examine the alterations in the brain that occur with aging and in neurodegenerative disorders such as Alzheimer's disease. The emphasis will be on human aging although the relevance of animal models to studies of human aging will be a recurrent theme. The course will examine aging at several levels, including molecular, cellular, organismic, and behavioral. A strong background in the basic sciences is encouraged. (Same as ANA/GRN/PGY 710.)

PHA 748 MASTER'S THESIS RESEARCH. (0)

Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

PHA 749 DISSERTATION RESEARCH. (0)

Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

PHA 815 FIRST-YEAR ELECTIVE, PHARMACOLOGY. (1-3)

With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Pharmacology. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

PHA 822 DENTAL PHARMACOLOGY AND THERAPEUTICS. (4)

This course will provide students with a fundamental understanding of the pharmacology and therapeutic uses of drugs commonly used by their patients and in their practice. Prereq: OBI 812 and OBI 814. (Same as OBI 826.)

PHA 824 MECHANISMS OF DISEASE AND TREATMENT/PHARMACOLOGY. (7)

This course introduces the principal actions of substances which are used as drugs for treatment of diseases and suffering in humans. It will cover the general principles of drug action, how drugs alter the function of normal and pathologic tissues and organisms and how they influence the disease process. Drugs used in the treatment of disease processes will be integrated with discussion of those diseases in PAT 823. Lecture, 20 hours per week. Prereq: Admission to second year of medical curriculum.

PHA 825 SECOND-YEAR ELECTIVE, PHARMACOLOGY. (1-4)

With the advice and approval of his or her faculty adviser, the second-year student may choose approved electives offered by the Department of Pharmacology. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the second-year curriculum. Pass-fail only. Prereq: Admission to secondyear medical curriculum and approval of adviser.

PHA 850-899 FOURTH-YEAR ELECTIVE FOR MEDICAL STUDENTS. (1-6)

With the advice and approval of the faculty adviser and the Student Progress and Promotions Committee, the fourth-year student may choose approved electives offered by the various departments in the College of Medicine. The intent is to provide the student an opportunity to develop his fund of knowledge and clinical competence. Prereq: Admission to the fourth year, College of Medicine and/or permission of the Student Progress and Promotions Committee.