

# Neuroscience and Pharmacology

## Chair

- Edwin "Ted" G. Abel

**Faculty:** <https://medicine.uiowa.edu/neuroscience-and-pharmacology/people>

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The Department of Neuroscience and Pharmacology provides professional training for health science students and participates with other departments in educational and research activities such as the Medical Scientist Training Program, the Physician Scientist Training Pathway, the Molecular Medicine Program, the Neuroscience Program, the Holden Comprehensive Cancer Center, the Abboud Cardiovascular Research Center, the UI Fraternal Order of Eagles Diabetes Research Center, and the Iowa Neuroscience Institute.

The department was a pioneer in offering pharmacology to undergraduate students with little or no science background. Currently, undergraduates can enroll in PCOL:2220 Drug Use and Abuse. This course emphasizes the mechanisms of drug action and give students a background for rational decisions concerning use of drugs.

Department of Neuroscience and Pharmacology graduate study includes both didactic and research experience. Students interested in doctoral studies should apply under the umbrella program in Biomedical Science (pharmacology subprogram). Qualified students may pursue the combined MD/PhD in the university's Medical Scientist Training Program.

Pre- and postdoctoral students pursue research training in all areas of neuroscience and pharmacology in the department in preparation for career opportunities in academia, government, and industry.

## Programs

## Graduate Programs of Study

### Majors

- Master of Science in Pharmacology
- Doctor of Philosophy in Pharmacology

Students interested in doctoral studies in pharmacology should apply under the umbrella program in Biomedical Science (select pharmacology subprogram). Direct applications to the MS and PhD in pharmacology are not currently being considered.

## Courses

## Neuroscience and Pharmacology Courses

### PCOL:2220 Drug Use and Abuse 3 s.h.

Effects of common drugs on the body and how they occur; consumer education in easy-to-understand language; basic principles of pharmacology and toxicology; drugs that work on specific systems including antibiotics, oral contraceptives, sedatives, stimulants, hallucinogens, narcotics, steroids, diabetes drugs, and cancer drugs; for students with little to no science background. Offered spring semesters. GE: Natural Sciences without Lab.

### PCOL:3101 Pharmacology I: A Drug's Fantastic Journey 3 s.h.

Introduction to basic pharmacological principles by following a drug's journey from its site of administration to its site of elimination; common mechanisms by which drugs affect the body and mechanisms underlying drug actions on two primary body systems—nervous and cardiovascular; structured learning environment bolstered by highly interactive application sessions where students apply course material via collaborative work on problem sets/activities; for students interested in medicine, pharmacy, research, and industry. Offered fall semesters. Prerequisites: (CBE:3205 or BIOL:1411) and CHEM:1110. Recommendations: additional higher-level biology and chemistry courses helpful.

### PCOL:3102 Pharmacology II: Mechanisms of Drug Action 3 s.h.

Expansion of basic pharmacological concepts and further exploration of how they are applied to define a drug's actions on the body; students continue their exploration of the body by discussing various disorders including neuropsychiatric and immune disorders, cancer, diabetes, and microbial infections in conjunction with current treatments; structured learning environment bolstered by highly interactive discussion sessions where students learn to apply course material via collaborative work on problem sets/activities; for students interested in medicine, pharmacy, research, and industry. Offered spring semesters. Prerequisites: PCOL:3101. Recommendations: additional higher-level courses in biology and chemistry helpful.

### PCOL:4130 Drug Mechanisms and Actions 3 s.h.

Pharmacology of major drugs in use today; basic principles underlying drug action and disposition; physiology, biochemistry, and pathophysiology of specific organ systems; how various drugs impact these systems and how they treat disorders of each system; major adverse effects of drugs and how those occur; differences among drugs within each drug group. Offered spring semesters. Requirements: undergraduate biochemistry and physiology courses.

### PCOL:4199 Undergraduate Research in Neuroscience and Pharmacology arr.

Experimental research under faculty supervision in department laboratories.

**PCOL:5130 Fundamentals of Pharmacology 3 s.h.**

Basic pharmacological principles underlying drug absorption, distribution, and metabolism; how these processes determine drug dosing; drug receptor interactions and their quantitation; impact of genetic variation on the actions and metabolism of drugs; mechanisms of neurotransmission focusing on synthesis, release, actions, and degradation; central nervous system (CNS) pathways for major neurotransmitters; disease states involving various abnormal neurotransmitter function. Offered spring semesters.

**PCOL:5135 Principles of Pharmacology 1 s.h.**

Basic pharmacological principles underlying drug absorption, drug distribution throughout the body, drug metabolism, and drug elimination; how these processes determine drug dosing and the means by which dosing parameters are characterized; drug receptor interactions and their quantitation. Offered spring semesters.

**PCOL:5136 Pharmacogenetics and Pharmacogenomics 1 s.h.**

Impact of genetic variation on the actions and metabolism of drugs; database search techniques to identify variants. Offered spring semesters. Recommendations: PCOL:5135, and undergraduate or graduate biochemistry and/or genetics.

**PCOL:5137 Neurotransmitters 1 s.h.**

Mechanisms of neurotransmission focusing on mechanisms of synthesis, regulation of release, mechanisms of action, means of degradation, and CNS pathways for major neurotransmitters; disease states involving various neurotransmitter systems. Offered spring semesters.

**PCOL:5204 Basic Biostatistics and Experimental Design 1 s.h.**

Overview of theory of experimental design and data analysis in biological sciences; types of analyses available for common types of data generated in biomedical sciences; review of statistical methods used in published studies; cursory coverage of mathematical computations involved in various analytical tests. Offered fall semesters.

**PCOL:6015 Topics in Pharmacology and Neuroscience 1 s.h.**

Recent advances in pharmacology, neuropharmacology, developmental neurobiology, neuroendocrinology, and related neurosciences.

**PCOL:6080 Pharmacology Seminar 1 s.h.****PCOL:6090 Graduate Research in Pharmacology arr.****PCOL:6099 Special Topics in Pharmacology arr.****PCOL:6203 Pharmacology for Graduate Students 5 s.h.**

Pharmacology of all major drugs in use today; discussion of basic principles underlying drug actions and disposition; physiology, biochemistry, and pathophysiology of specific organ systems; how various drugs impact these systems; how drugs are used to treat disorders of each system; major adverse effects of drugs and how those occur; differences among drugs within each drug group. Offered fall semesters. Prerequisites: BMED:5207 and MPB:5153.

**PCOL:6204 Pharmacology for Health Sciences: Nurse Anesthetist 5 s.h.**

Pharmacology of all major drugs in use today; discussion of basic principles underlying drug actions and disposition; physiology, biochemistry, and pathophysiology of specific organ systems; how various drugs impact these systems; how drugs are used to treat disorders of each system; major adverse effects of drugs and how those occur; differences among drugs within each drug group. Offered fall semesters. Prerequisites: MPB:5200 and NURS:6000. Requirements: enrollment in Anesthesia Nursing Program.

**PCOL:6207 Ion Channel Pharmacology 1 s.h.**

Heuristic, semiquantitative approach to concepts in ion channel physiology and pharmacology; up-to-date physical principles, classification, and structure/function relationships for major voltage-gated ion channels that facilitate application of abstract concepts to physiological, pharmacological, and general biological problems. Offered spring semesters.

**PCOL:6210 Receptors and Cell Signaling 3 s.h.**

Mechanisms of signaling by growth factors, cytokines and related molecules; principles of ion channel physiology and pharmacology; structure-function relationships of small molecular weight and heteromeric G proteins; G protein-coupled receptors; genomic and nongenomic actions of intracellular receptors; basis for actions of novel new ligands on intracellular receptors. Offered spring semesters.

**PCOL:6225 Growth Factor Receptor Signaling 1 s.h.**

Mechanisms of signaling by growth factors; cytokines and related molecules that regulate cell proliferation, development, differentiation, and survival; emphasis on molecular mechanisms of signaling and relevance of these signaling processes to various human diseases. Offered fall semesters.

**PCOL:6250 Advanced Problem Solving in Pharmacological Sciences 1 s.h.**

Discussion of methodologies, strategies, and approaches commonly used to solve pharmacological sciences problems; use of interpersonal problem-solving skills to develop experimental study plans for solving contemporary scientific problems in pharmacology. Offered fall and spring semesters.