ESHELMAN SCHOOL OF PHARMACY (GRAD)

Contact Information
Eshelman School of Pharmacy
http://pharmacy.unc.edu

ROBERT A. BLOUIN, Dean

The UNC Eshelman School of Pharmacy offers graduate curricula leading to the master of science in pharmaceutical sciences with a specialization in health-system pharmacy administration and the doctor of philosophy in pharmaceutical sciences with concentrations in one of four research areas: chemical biology and medicinal chemistry; molecular pharmaceutics; pharmacotherapy and experimental therapeutics; or pharmaceutical outcomes and policy.

Instruction emphasizes contemporary research methods, study design, and results and is delivered in the form of small group lectures/discussions, group activities and recitations, and seminars combined with intensive laboratory-based research. The excellent rapport that exists between schools, departments, institutes, and centers within the University facilitates interdisciplinary collaborative research by graduate students and faculty. The graduate degree programs also benefit from faculty affiliations with GlaxoSmithKline, Inc., the Research Triangle Institute, the Hamner Institutes for Health Sciences, Duke University, the Wake Forest University School of Medicine, and many other organizations in the Research Triangle Park area. The UNC Eshelman School of Pharmacy is housed in Beard Hall, Kerr Hall, Marsico Hall, and the Genetic Medicine Building, which are located on the health sciences campus together with the Schools of Dentistry, Medicine, and Nursing and the Gillings School of Global Public Health. The Health Sciences Library has an outstanding collection of books and journals as well as computer and support services. Library and laboratory resources residing in other University departments are also available for use by students and faculty.

Requirements for Admission to the Ph.D. Program

Applicants who have completed a standard collegiate curriculum in pharmacy, chemistry, biochemistry, biology, engineering, or in an allied field in the University, or in other universities or colleges having curricula acceptable to UNC–Chapel Hill’s Graduate School, are eligible for admission to the graduate program in pharmaceutical sciences. Applications for admission must be supported by scores on the Graduate Record Examination, letters of recommendation, official transcripts, and a statement of personal goals as they relate to graduate study at the UNC Eshelman School of Pharmacy.

The Graduate School online application (http://gradschool.unc.edu/admissions) is the standard means of applying for admission. Inquiries concerning admission to programs in the pharmaceutical sciences may be directed to the Office of Student Affairs, CB# 7566, 109 Beard Hall, Chapel Hill, NC 27599-7566.

Graduate Assistantships and Fellowships in the UNC Eshelman School of Pharmacy

Graduate teaching and research assistantships in the UNC Eshelman School of Pharmacy provide a stipend of $27,500 for 12 months’ service. All awards are made on a competitive basis with consideration given to the applicant’s academic record and Graduate Record Examination scores. Information concerning these assistantships, fellowships, and traineeships may be obtained by writing directly to the Office of Research and Graduate Education at the UNC Eshelman School of Pharmacy.

Chemical Biology and Medicinal Chemistry

Chemical biology and medicinal chemistry are multidisciplinary fields that integrate organic chemistry, biochemistry, molecular biology, structural biology, pharmacology, and physiology. The research in the division applies and extends the basic concepts of chemistry, biochemistry, and pharmacology to the investigation of biomedical problems. General areas of study include structure-activity relationships, drug-receptor interactions, synthetic drug design, and target discovery and validation. Specific focus areas include cancer chemotherapy, computer-aided drug design, enzymology, glycobiology, molecular modeling, natural products, neurochemistry, parasitology, and structural biology.

A Ph.D. is offered with a concentration in chemical biology and medicinal chemistry.

Molecular Pharmaceutics

Molecular pharmaceutics represents interdisciplinary specialties encompassing a range of scientific endeavors, including

1. The design, fabrication, evaluation, use of, and delivery strategies for dosage forms
2. Elucidation of the behavior of pharmacologic agents in biologic systems
3. Determination of the ability of pharmacologic agents to reach the relevant site of biologic effect
4. Determination of the time course of biologic activity

These areas of specialization represent critical steps in the development of new therapeutic agents, the evaluation of new and existing drugs, and the optimal clinical use of pharmacologic agents.

Students in the Division of Molecular Pharmaceutics are required to participate in a common core of entry-level graduate courses. This core provides a broad perspective of the pharmaceutical sciences as well as an appreciation for how different subdisciplines interact. Many dissertation projects are collaborative in nature and rely upon interactions with faculty in other divisions of the UNC Eshelman School of Pharmacy, as well as with colleagues in the UNC School of Medicine, the Department of Chemistry, or at pharmaceutical companies or institutions located in the Research Triangle Park area.

A Ph.D. is offered with a concentration in molecular pharmaceutics.

Pharmaceutical Outcomes and Policy

The Division of Pharmaceutical Outcomes and Policy offers a Ph.D. program in pharmaceutical sciences emphasizing an interdisciplinary approach to addressing issues relevant to medication use at the
patient, provider, community, and societal levels. Faculty research interests and course offerings reflect this interdisciplinary orientation. Students develop knowledge and skills that enable them to conduct high-quality research directed at improving the use and cost effectiveness of medications, technology, and services. Education and research in the division draws heavily upon expertise in numerous fields such as health services research, health policy, health communication, health behavior and behavior change, epidemiology, and psychometrics. Areas of faculty and student research include communication and decision making, comparative effectiveness of medications and pharmacy practice models, medication adherence and self-management, health disparities, health literacy, patient reported outcomes assessment, pharmaceutical policy analysis, and policy and ethical issues related to pharmacogenomics.

A Ph.D. is offered with a concentration in pharmaceutical outcomes and policy.

Pharmacotherapy and Experimental Therapeutics

The Division of Pharmacotherapy and Experimental Therapeutics offers a Ph.D. program in the pharmaceutical sciences with a focus on translational research, clinical pharmacology, and experimental therapeutics. The goal of the program is to develop clinician scientists who are prepared to generate, integrate, and disseminate new knowledge to optimize drug therapy and improve health outcomes for the benefit of patients and society. Graduate students engage in clinical experiences throughout the program that are designed to complement each student’s research interests while also facilitating their development as translational scientists. Areas of graduate coursework and research include drug metabolism and transport, pharmacokinetics/pharmacodynamics/pharmacometrics, pharmacogenomics, clinical research, drug development, experimental therapeutics, and mechanisms of drug toxicity. Therapeutic and research areas of particular strength include cardiovascular disease, infectious disease/HIV, oncology/hematology, hepatology/gastroenterology/transplant, and pulmonary disease.

A Ph.D. is offered with a concentration in pharmacotherapy and experimental therapeutics.

Master of Science in Pharmaceutical Sciences

The Division of Practice Advancement and Clinical Education (PACE) offers the master of science in pharmaceutical sciences with a specialization in health system pharmacy with a goal of preparing pharmacists for leadership positions in health care. To accomplish this goal, the program will provide students with the knowledge, skills, and experience necessary to assume a variety of roles and responsibilities. Our graduates will serve as vibrant, committed professionals with a focus on improving patients’ health, health care delivery, and the profession of pharmacy. This will occur through both didactic education and experiential opportunities in class and in the workplace.

Professors

Jeffery Aube, Synthetic Organic/Medicinal Chemistry, Neuroscience, Infectious Disease, Cytochrome P450 Biochemistry

J. Herbert Patterson (47), Individualized Pharmacotherapy of Heart Failure

Susan J. Blalock (115), Risk Communication, Behavior Change, and Psychosocial Aspects of Chronic Illness

Robert A. Blouin, Effects of Infectious Disease and Trauma on Altered Physiologic States (i.e., Aging and Obesity) and the Expression and Regulation of Drug Metabolizing Enzymes

Stephen Frye, Drug Design and Discovery, Chemical Biology of Chromatin Regulation

Leaf Huang (121), Gene Therapy, Targeted Gene/Drug Delivery in Tumor Microenvironment

Michael Jay (137), Pharmaceutical Formulation Development, Nuclear Sciences

Alexander Kabanov, Polymer-Based Drug, Gene, and Protein Delivery Systems and Novel Therapeutics for Cancer and Neurodegenerative and Neurodevelopmental Diseases

David Lawrence (133), Application of Chemical Tools to Biological Questions: Enzyme Sensors; Light-Activated Inhibitors, Sensors, and Signaling Proteins; Light-Induced Gene Expression; Chemical Genomics

Andrew Lee (111), Structural Biology, NMR Spectroscopy, Protein Dynamics, Biophysical Dissection of Proteins and Protein-Ligand Interactions

Kuo-Hsiung Lee (13), Medicinal Chemistry of Bioactive Natural Products and Synthetic Analogs including Antitumor, Anti-Aids, Antimalarial, Antihypertensive, Anti-Inflammatory, Anti-Arthritis, and Antiviral Agents; Anti fungal Antibiotics; Insect Antifeedants; Chinese Herbal Medicine

Jian Liu (108), Carbohydrate Biochemistry, Structural and Functional Relationships of Heparan Sulfate

Bryan Roth, GPCR Structure and Function

Betsy L. Sleath (91), Provider-Patient Communication about Medications, Child and Adolescent Health, Health Disparities, Improving Adherence to Medication Regimens

Alexander Tropsha (81), Molecular Modeling, Computer-Assisted Drug Design, Molecular Dynamics of Proteins, Protein Folding

Paul Watkins, Clinical Pharmacology, Drug-Induced Liver Injury

Xiao Xiao (126), Gene Therapy for Muscular Dystrophy and Other Genetic Diseases

Associate Professors

Wayne Pittman (30), Hypertension, Clinical Pharmacokinetics, Cardiology and Drug Administration

Kirsty Ainslie, Formulation of Vaccines and Drug Delivery Treatments for Immune Modulation to Treat and Prevent Infectious and Other Diseases

Elena Batrakova, Development of Active Targeted Delivery of Therapeutic Polypeptides to the Brain for Treatment of Parkinson’s Disease Using Inflammatory-Response Cells as Vehicles

Development of Exosome-Mediated Drug Delivery Systems for Treatment of Cancer

Joel Farley, (124), Pharmaceutical Policy, Pharmaceutical Outcomes Research, Comparative Effectiveness Research, Medication Adherence, Continuity of Care, Multiple Chronic Conditions

Federico Innocenti, Clinical Pharmacology—Oncology/Pharmacogenomics

Michael B. Jarstfer (112), Chemical Biology to Study Social Behavior and Telomere Biology

Craig R. Lee (128), Cardiovascular Biology, Genomics and Biomarkers, Eicosanoid Metabolism, Inflammation

Rihe Liu (113), Proteomics and Functional Genomics

Mary T. Roth-Mcclurg (125), Medication Management in Primary Care, Clinical Pharmacists and the Medical Home, Medication Management and Medical Home, the Quality of Medication Use and Drug Administration

Scott Singleton (116), Bio-Organic and Biophysical Chemical Investigations of the Mechanisms DNA Repair, Directed Evolution of
Novel Enzymes, Development of Alternate Strategies for Targeting Drug-Resistant Pathogenic Microorganisms
Philip C. Smith (85), Pharmacokinetics, Drug Metabolism, Quantitative Targeted Proteomics
Dennis M. Williams (92), Inhalation Therapy for Pulmonary Disease, Hypertension, Clinical Pharmacokinetics
Timothy J. Wiltshire, Preclinical and Clinical Pharmacogenetics, and Genomics
William C. Zamboni, Optimization of Chemotherapeutic Treatment of Cancer, Pharmacokinetics, Pharmacodynamics, Pharmacogenetics
Qisheng Zhang (130), Lipid Signaling and Small GTPases, Chemical Biology and Drug Discovery

**Assistant Professors**

Yanguang Cao, Pharmacokinetics, Pharmacodynamics, and Quantitative Pharmacology
Daniel James Crona, Pharmacokinetics and Pharmacodynamics of Therapeutic Treatments in Oncology
Stacy Bailey (81), Health Literacy, Health Disparities, Medication Understanding and Use
Albert Bowers, Drug Discovery, Natural Products and Synthetic Biology
Delesha Carpenter (88), Chronic Disease Self-Management, Medication Adherence, Patient-Provider Communication, Mhealth, Ehealth, Rural Health, Measurement, Asthma
Stacie Dusetzina (89), Pharmacoeconomics/Drug Utilization Research, Pharmaceutical and FDA Policies, Treatment of Multiple Chronic Conditions, Cancer Treatment, Mental Illness Treatment
Julie Dumond, Pharmacometrics, Clinical Pharmacokinetics
Gang Fang (84), Pharmacoeconomics, Medication Adherence, Evaluation of Treatment Utilization and Outcomes in Populations, Comparative Treatment Effects Research, Patient-Centered Outcomes, Health Disparities
Daniel Gonzalez, Pediatric Clinical Pharmacology
Nate Hathaway, Investigating the Regulation of the Mammalian Genome, Developing New Chemical-Mediated Tools to Examine Chromatin Structure and Function, and Drug Discovery
Shawn Hingtgen, Personalized Cell-Based Therapies for Cancer, Developing Novel Polymer Implant Strategies to Treat Surgically Resected Brain Cancer
Samuel K. Lai (129), Mucosal Immunity, Antibody Engineering, Antibody Response to Nanomaterials, Targeted Drug Delivery, Bacteriophage Engineering, Vaccines
Jacqui Mclaughlin, Practice Advancement via Bispecific Fusion Proteins, Clinical Education Computational Modeling
Christine Oramasionwu (87), HIV/AIDS Health Disparities and Health Outcomes, Medication Use in Minority, Underserved, and International Populations
Thomas Urban, Pharmacogenetics

**Research Professors**

Alison Axtman, Synthesis of Small Molecules That Selectively Modulate Proteins Implicated in Disease-Propagating Pathways
Dmitri Kireev, Computational Biophysics, Computer-Aided Drug Design, Drug Discovery Informatics
Feng Liu, Gene and Drug Delivery
Ken Pearce, Lead Discovery and Characterization, Assay Development, Biochemistry
Michael Wagner, Pharmacogenomics, Translational Pharmacology

**Research Associate Professors**

Elias P Rosen, Development Methods to Measure Intracellular Distribution of Therapeutics and Their Metabolites in Biological Matrices with Mass Spectrometry Imaging
Juan Li, Gene Therapy
Alexander Golbraikh, Chemical Biology and Medicinal Chemistry, Informatics
Chris Luft, Polymeric Particles for Drug Delivery
Chunping Qiao, Gene Therapy
Susan Morris-Natschke (102), Design, Synthesis, and Structural Optimization of Antiviral Phospholipids
Xiaodong Wang, Drug Discovery for Therapeutic Targets in Oncology
Tim Wilson, Chemical Biology

**Research Assistant Professors**

Rachel Julia Church, Drug Safety Science Center
Merrie W. Mosedale, Novel Animal and In Vitro Models for Understanding Adverse Drug Reactions in Humans
Eric Bachelder, Treatment of Autoimmune Diseases through Modulation of Immune Responses with Microparticles
Rahima Benhabbour, Organic/Polymer Chemistry and Drug Delivery
Ruth Everett, Metformin Intestinal Absorption, Transport Mechanisms and Anticancer Activities, Modulation of Tight Junctions for Enhanced Drug Delivery
Weigang Huang, Chemical Approaches to Explore the Phosphoinositides Related Cellular Process: 1) Development of Fluorogenic, Fluorescent, and Photoaffinity Labeling Probes; 2) Development of Small-Molecule Inhibitors for Phosphoinositides Metabolic Enzymes
Kevin Frankowski, Organic/Medicinal Chemistry, Therapeutic Areas of Interest: CNS Modulation and Cancer Treatment
Lindsey James, Chemical Biology of Chromatin Regulation, Chemical Probe Development for Epigenetic Regulatory Proteins
Devika Soundara Manickam, Protein and Gene Delivery to the CNS
Xin Ming, Targeted Delivery of Antisense and siRNA
Samanta Patterson, Chemical Biology of Chromatin Regulation
Melanie Priestman, Chemical Biology
Paul Sapienza, Biophysical Studies of Proteins and Macromolecular Interactions
Marina Sokolovsky-Papkov, Stimuli Actuated Theranostic Drug Delivery Systems
Ruhang Tang, Molecular Pharmaceutics
Qunzhao Wang, Biochemistry
Xiang Wang, Molecular Modeling
Zhuo Wang, Drug Metabolism and Pharmacokinetics
Kuo Yang, Pharmacometrics
Hao Zhu, Molecular Modeling

**Clinical Professors**

Alan Forrest, Pharmacokinetic and Pharmacodynamics Modeling
Robert E. Dupuis, Clinical Pharmacokinetics, Drug Metabolism of Immunosuppressant in Organ Transplant Recipients, Relationship between Drug Metabolism, Toxicity and Outcomes
J. Heyward Hull, Cardiovascular Pharmacology, Clinical Pharmacokinetics, Study Design and Analysis
Thomas Angelo, Practice Advancement and Clinical Education

**Clinical Associate Professors**

Amanda H. Corbett, Pharmacology of Antiretrovirals, Opportunistic Infection Therapies in Resource-Poor Countries
Wendy Cox, Practice Advancement and Clinical Education
Stephen F. Eckel, Practice Advancement and Clinical Education  
Adam M. Persky, Pharmacy Education, Pharmacokinetics and Pharmacodynamics of Dietary Supplements  
Jo Ellen Rodgers, Clinical and Translational Research in Heart Failure

**Clinical Assistant Professors**

Roy Hawke (118), Clinical Pharmacology of Natural Products and Their Mechanisms of Action and Disposition in Liver Disease  
Nicole Pinelli, Practice Advancement and Clinical Education  
David Steeb, Practice Advancement and Clinical Education  
Stephanie Kiser, Practice Advancement and Clinical Education

**Professor of the Practice**

Jerry Heneghan, Practice Advancement and Clinical Education

**Adjunct Professors**

Kirkwood Adams Jr., Heart Failure and Cardiovascular Disease  
Wayne Anderson  
Nancy Allbritton, Signaling in Single Cells, Microfabrication Systems for Cellular Analysis  
Daniel K. Benjamin Jr., Children’s Health  
William Brock  
M. Alan Brookhart, Epidemiology  
Patricia J. Bush, Asthma  
L. Scott Clark  
William Campbell, Pharmaceutical Policy  
Michael Crimmins, New Methodology and Synthesis of Natural Products  
Skip Cummings, Primary Care, Obesity and Diabetes  
Patricia Deverka, Senior Research Director, Center for Medical Technology Policy  
Joseph Desimone, Polymer Synthesis, Liquid and Supercritical CO2 Processing, Gene Therapy and Drug Delivery  
Robert Gomeni, Pharmakinetik, Clinical Development  
Eric C. Faulkner, Senior Director, RTI Health Solutions  
John Grabenstien, U.S. Pharmacopeia and Vaccination  
Klaus Hahn, Molecular Imaging Tools, Signaling Dynamics in Motility and Blood Cells  
Allison Harrill, Research Investigator, the Hamner Institutes for Health  
Alan Higgins, Vice President, Viamet Pharmaceuticals  
Clark D. Jeffries, Chemical Biology and Medicinal Chemistry  
Robert Konrad  
Lawrence Lesko, Clinical Pharmacology and Drug Development  
Matthew Maciejewski, Pharmacoconomics  
Elaine Mardis, Characterization of Cancer Genomes, Genome Sequencing Technologies  
Howard Mcleod, Pharmacoconomics and Individualized Therapy  
Gerald Miwa, Drug Metabolism and Drug Development  
Alison Motsinger, Associate Professor, NC State Department of Statistics  
Michael Murphy, Pharmaceutical Research in Molecular Genotyping  
Kouroos Owzar, Professor of Biostatistics and Bioinformatics, Duke University School of Medicine  
Jai Patel, Levine Cancer Institute  
Nita Patel, Senior Vice President, Operations, Artisan Pharma Inc.  
Gary Pollack, Pharmacokinetics, Pharmacodynamics  
Joseph Polli, Dmpk and Drug Transporters, GlaxoSmithKline  
John Robert Powell, Clinical Pharmacology and Drug Development  
D.K. Theo Raynor, Medication Risk Communication  
Jack Reynolds, Toxicity and Drug Development  
Bryan Roth, GPCR Structure  
Virginia Schmith, GlaxoSmithKline  
Cosette Serabjit-Singh, Pharmaceutical Scientist  
Til Sturmer  
Russell Thomas, Director, Center for Genomic Biology, Epidemiologic Methods and Bioinformatics Clinical Epidemiology  
Robert Voyksner, Mass Spectrometry  
Amelia Warner  
Morris Weinberger, Health Policy and Clinical Trials  
Macej Zamek-Gliszczyski, Senior Research Scientist, Eli Lilly  
Daryl C. Zeldin, Respiratory Biology, Exposure Assessment and Prevention of Asthma, Eicosanoid Metabolism  
Zhao Zhiang

**Adjunct Associate Professors**

John Edgar French, Pharmacy  
Amelia Margaret Wall, Pharmacy  
Elizabeth Andrews, Drug Safety and Compliance  
Andrea K. Biddle, Health Economics and Public Policy Analysis  
David M. Cocchieto, Clinical Pharmacology, Antiviral/Antibacterial Regulatory Affairs  
Gregory Daniel, Pharmaceutical Economics, Comparative Effectiveness, and Pharmaceutical, Biologic, and Vaccine Safety  
Rowell Daniels, Practice Advancement and Clinical Education  
Paul A. Dayton, Biomedical Engineering and Ultrasound  
Patricia Deverka, Medical Technology Policy, Ethical Issues  
Nikolay Dokholyan, Computation/Experimental Biophysics and Structural Biology  
Marisa Domino, Health Economics  
Sean Ekins, Collaborative Drug Discovery  
Eric Faulkner, Personalized Medicine Development  
Felix Frueh, Pharmacogenomics and Clinical Pharmacology  
Alex Z. Fu, Cost Effectiveness and Pharmacoconomics  
John Grabenstien, Pharmacy  
Sandra Greene, Health Care Policy  
Alon Higgins, Preclinical Drug Development  
William Janzen, Drug Discovery, High Throughput Screening, and Automation and Process Improvement  
Clark D. Jefferies, Developing Assays for Small Rnas in Human Cell Lines and Tissue Samples and Developing Software to Interpret Small RNA Signatures as Diagnostics or Theranostics  
Nancy Allen Lapointe, Translational Research of Antiarrythmic Drug Therapy  
Michael Murphy, Molecular Genetics  
Kyoko Nakagawa-Goto, Discovery and Development of Drug Candidates through Total Syntheses and Synthetic Modifications of Bioactive Natural Products Focused on Antitumor and Anti-HIV Agents  
David Nichols, Study of Hallucinogens (Psychedelics) and Discovery of Novel D1 Dopamine Receptor Full Agonists  
William T. Sawyer, Drug Development  
Susan Sutherland, Epidemiology Research, Statistical Computing, Data Management, Study Design  
Dan Weiner, Pharmacometrics, Pharmaceutical Biostatistics  
Lan Xie, Chemical Biology and Medicinal Chemistry  
Weifan Zheng, Chemical Biology and Medicinal Chemistry  
Issam Zineh, Pharmacoconomics and Clinical Pharmacology  
Zhiyang Zhao, Pharmacokinetics and Drug Metabolism  
Mark Zylka, Molecules and Mechanisms for Pain and Autism, Angelman Syndrome Therapies

**Adjunct Assistant Professors**

Justin Lee Geurink, Experimental Education  
Hisham Aljahedy, Pharmacoepidemiology and Drug Safety
Christopher Blanchette, Epidemiology, Pharmaceutical Health Services Research, Healthcare Economics
Peter Bonate, Pharmacokinetics Modeling Simulation
Alan Boyd, Neurocognitive Software Development
John Byrd
Jack W. Campbell
Michael Cohen-Wolkowiz
Austin Combest, Clinical Scientist, Global Product Development, PPD
Mike Decoske, Practice Advancement, Pharmacy Law and Clinical Education Ethics
Lynn Dressler, Pharmacogenomics
Stephanie Earnshaw, Quality Management, Linear and Integer Programming and Network Optimization
Eric Faulkner, Personalized Medicine Development
Mona Fiuza, Heart Failure Drug Development and Pharmacogenomics
Giulia Ghibellini, Pharmacokinetics, Clinical Pharmacology
Alicia Gilsenan, Pharmacoepidemiology and Therapeutic Risk Management
Allison Harrill, Toxicology, Drug-Induced Liver Injury
Charles Lee, Provider-Patient Communication
Martin Marciniak, Health Outcomes, Oncology, Neuroscience and Cardiovascular
Phil Mendys, Cardiovascular Drug Development and Preventive Cardiology
Steven R. Moore, Health Policy and Planning
Alison A. Motsinger, Pharmacogenetics, Bioinformatics
Adam Orsborn, Practice Advancement and Clinical Education
Nita Patel, Preclinical Drug Development
Erick Peters, Psychiatric and Cancer Pharmacogenomics
Cosette Serabjit-Singh, Computational Approaches to Predicting ADME Parameters/Pharmacogenetics
Katharine Sheldon, Practice Advancement and Clinical Education
Richard Stanford, Health Outcomes Strategy and Research
Andrine Swenson, Development and Application of Epidemiological Methods
Russell Thomas, Genomic Biology and Bioinformatics
Andrew Z. Wang, Radiation Oncology, Nanomedicine
David Wei
Adam Wolfe, Practice Advancement and Clinical Education
Keele Wurst
Macej Zamek-Gliszczynski, Preclinical Drug Development

Distinguished Professors
Angela Kashuba (114), Clinical Pharmacology of Antiretroviral Agents in HIV Treatment, Prediction of Drug-Drug and Drug-Cytokine Interactions and Adverse Effects, Role of Sex and Ethnicity in Drug Disposition
Kim L.R. Brouwer (62), Hepatobiliary Drug Disposition, Drug Transport, Prediction of Drug Interactions and Hepatotoxicity, Clinical Pharmacokinetics and Quantitative Systems Pharmacology
Dhiren R. Thakker (87), Mechanisms of Drug Transport, Pro-Drug Strategies for Enhanced and Targeted Drug Delivery, Disposition of Macromolecules (e.g., Genes)

Professors Emeriti
William Campbell
George H. Cocolas
Dale Christensen
Anthony Hickey
Khalid S. Ishaq
Rudolph Juliano
Tom S. Miya

G. Joseph Norwood
Subjects in this school include Chemical Biology and Medicinal Chemistry (CBMC) (p. 5), Medicinal Chemistry (MEDC) (p. 5), Molecular Pharmaceutics (MOPH) (p. 6), Pharmacy Practice and Experiential Education (DPPE) (p. 7), Practice Advancement and Clinical Education (PACE) (p. 7), Pharmaceutical Outcomes and Policy (DPOP) (p. 8), Pharmaceutical Sciences (PHRS) (p. 9), and Pharmaceutical Sciences (Interdisciplinary) (PHCY) (p. 8).

Chemical Biology and Medicinal Chemistry (CBMC)
Graduate-level Courses
CBMC 804A. Biochemical Foundations of Chemical Biology. 3 Credits.
Permission of instructor for students lacking the prerequisites. This course is designed to emphasize the elements of biochemistry, bioorganic chemistry, and molecular biology required for the design and synthesis of biologically-active compounds.
Requisites: Prerequisites, CHEM 466, BIOC 505 or 601, and PHCO 643.
CBMC 804B. Biochemical Foundations of Chemical Biology Journal Club. 1 Credit.
Permission of the instructor for students lacking the co-requisite. This is a seminar based course that will run in concert with 804A. Students will present journal articles and interact with seminar speakers.
Requisites: Co-requisite, CBMC 804A;
Repeat rules: May be repeated for credit. 2 total credits. 2 total completions.

CBMC 805. Molecular Modeling. 3 Credits.
Introduction to computer-assisted molecular design, techniques, and theory with an emphasis on the practical use of molecular mechanics and quantum mechanics programs.
Requisites: Prerequisites, MATH 231, 232, and CHEM 481.
Same as: BIOC 805.

CBMC 807. Foundations of Chemical Biology I: Organic and Medicinal Chemistry. 3 Credits.
The elements of organic chemistry required for the design and synthesis of chemical probes and biologically active compounds.
Requisites: Prerequisite, CHEM 262.

CBMC 833. Molecular Target-Based Drug Discovery. 3 Credits.
An integrated introduction to molecular target-based drug discovery including bioactive natural products, neuropharmacology, chemical biology, and recent advances and techniques in drug discovery.
Requisites: Prerequisite, CBMC 804.

Medicinal Chemistry (MEDC)
Graduate-level Courses
MEDC 806. Macromolecular Modeling. 3 Credits.
Introduction to modeling and simulation techniques for biological macromolecules. Two lecture and three to four laboratory hours per week.
Requisites: Prerequisites, MATH 231, 232, and CHEM 430.
Same as: BIOC 806.

MEDC 821. Chemistry of Natural Products. 3 Credits.
An introduction to the isolation, structure determination, biosynthesis, and synthesis of bioactive natural products; emphasis on aspects relating to medicinal chemistry. Three hours a week.
Requisites: Prerequisite, CHEM 466; Permission of the instructor for students lacking the prerequisite.
MOPH 822. Selected Topics in Natural Products. 2 Credits.
Discussions of important recent developments in the chemistry of natural products of biomedical significance.
Requisites: Prerequisites, CHEM 466 and 468.

MOPH 836. Selected Topics in Synthetic Medicinal Chemistry. 2 Credits.
Discussions from current literature on the strategy and techniques involved in the synthesis of drug molecules. Two lecture hours a week.
Requisites: Prerequisite, CHEM 460.

MOPH 842. Therapeutic Proteins. 3 Credits.
This course covers applications of modern information theory and information technologies to biomolecular systems. The core of this course is an overview and practical applications of methods and techniques for the analysis of nucleic acid and protein sequences, sequence-structure, and sequence-function correlations.

MOPH 899. Seminar. 1 Credit.
Seminar consists of presentations on current research topics by the division’s graduate students, faculty, and invited speakers from industry, government, and other academic departments and institutions. Only four credits of MOPH 899 may count toward requirement for the Ph.D. degree (two credits for M.S.).
Repeat rules: May be repeated for credit.

MOPH 900. Introduction to Research in Medicinal Chemistry. 1-3 Credits.
One conference and three or more laboratory hours a week.
Requisites: Prerequisites, CHEM 261 and 262; Permission of the instructor.

MOPH 991. Research in Medicinal Chemistry. 1-9 Credits.
One conference and nine laboratory hours a week per course.

MOPH 993. Master’s Research and Thesis. 3 Credits.
After didactic course work is complete, master’s students register for three credits of MOPH 993 during the fall and spring semesters.
Repeat rules: May be repeated for credit.

MOPH 994. Doctoral Research and Dissertation. 3 Credits.
Students register for dissertation credits after successfully completing all didactic course work. A minimum of six credit hours are required for graduation.
Repeat rules: May be repeated for credit.

Molecular Pharmaceutics (MOPH)
Graduate-level Courses

MOPH 738. Nanomedicine. 3 Credits.
Offers an introduction to the interdisciplinary field of nanomedicine for students with physical, chemical, or biological sciences background. It will emphasize emerging nanotechnologies and biomedical application.

MOPH 801. Radiopharmacy 1 - The Physics and Chemistry of Molecular Imaging. 3 Credits.
Basic principles of radiation physics, instrumentation, radiation safety, and radiation biology.
Requisites: Prerequisite, PHCY 512; Permission of the instructor for students lacking the prerequisite.

MOPH 802. Radiopharmacy 2 - The Drugs of Nuclear Medicine. 3 Credits.
Chemical principles underlying the preparation, regulatory control, and use of radioactive drugs in nuclear medicine.
Requisites: Prerequisite, MOPH 801; Permission of the instructor for students lacking the prerequisite.

MOPH 810. Drug Metabolism. 3 Credits.
Permission of the instructor. Introduction to the use of concepts, chemistry, enzymology, and techniques in drug metabolism for the design and development of safe and effective therapeutic agents.

MOPH 840. Introduction to Research. 1-3 Credits.
Permission of the instructor. Students participate in research projects designed to introduce them to research opportunities in the pharmaceutical sciences.

MOPH 850. Pharmaceutical Analysis. 1 Credit.
Permission of the instructor. Introduction to quantitative instrumental analysis in pharmaceutics. One lecture hour a week.

MOPH 862. Advanced Physical Pharmacy. 3 Credits.
Discuss industrial approaches to pharmaceutical formulation development.

MOPH 864. Advances in Drug Delivery. 3 Credits.
Requisites: Prerequisites, PHCY 410 and 411; permission of the instructor for students lacking the prerequisites.

MOPH 865. Trends in Molecular Pharmaceutics Research. 3 Credits.
An interactive course in which students actively participate by critical evaluation and discussion of current literature in the field of drug delivery.
Requisites: Prerequisite, MOPH 864.

MOPH 868. Advances in Drug Delivery and Nanomedicine. 6 Credits.
Discuss basic physicochemical and transport properties of the drug with emphasis in macromolecular drugs and nano drug carriers.
Requisites: Prerequisite, CHEM 430.

MOPH 890. Special Topics in Advanced Pharmaceutics. 1-12 Credits.
Permission of the instructor. A lecture and/or laboratory course designed to present new concepts and innovations in the area of drug delivery and disposition.

MOPH 899. Seminar. 1 Credit.
Seminar consists of presentations on current research topics by the division’s graduate students, faculty, and invited speakers from industry, government, and other academic departments and institutions. Only four credits of MOPH 899 may count toward requirement for the Ph.D. degree (two credits for M.S.).
Repeat rules: May be repeated for credit.

MOPH 900. Introduction to Research in MOPH. 2-3 Credits.
This course provides students the opportunity to work with a faculty mentor on a research project.
Repeat rules: May be repeated for credit.

MOPH 991. Research. 1-12 Credits.
Graduate course consisting of laboratory-based research, conferences with the major professor, and library investigations relating to research. One conference and nine laboratory hours a week per course.

MOPH 993. Master’s Research and Thesis. 3 Credits.
After didactic course work is complete, master’s students register for three credits of MOPH 993 during the fall and spring semesters.
Repeat rules: May be repeated for credit.

MOPH 994. Doctoral Research and Dissertation. 3 Credits.
Students register for dissertation credits after successfully completing all didactic course work. A minimum of six credit hours are required for graduation.
Repeat rules: May be repeated for credit.
Pharmacy Practice and Experiential Education (DPPE)

Graduate-level Courses

DPPE 801. Perspectives in Public Health. 3 Credits.
Examines the scope and implications of current public health concerns at the community, state and national level. Includes practical approaches to the integration of public health activities into the community.

DPPE 807. Pharmaceutical Approaches to ID Therapy. 2 Credits.
Same course as DPET 807. Instructor moved to different division in Eshelman School of Pharmacy.

DPPE 810. Institutional Pharmacy. 3 Credits.
Same course as DPET 801. Instructor moved to different division in Eshelman School of Pharmacy.

DPPE 899. Seminar in DPPE. 1 Credit.
Seminar in DPPE.

DPPE 991. Research in DPPE. 1-9 Credits.
DPPE research is aimed at helping students develop necessary research skills, while exposing students to relevant issues, processes, investigations, and unanswered questions in pharmacy practice.

Practice Advancement and Clinical Education (PACE)

Advanced Undergraduate and Graduate-level Courses

PACE 607I. Inter-Professional Team Work and Communication: Keys to Patient Safety. 3 Credits.
This inter-professional course focuses on understanding roles, teamwork, and communication to improve patient safety within the health care environment. National standards and initiatives will be foundational to the course.

Requisites: Prerequisite, completion of first year in Doctor of Pharmacy program.
Grading status: Letter grade.

Graduate-level Courses

PACE 700. Community Outreach and Service Learning. 0 Credits.
This course provides service learning opportunities to apply pharmacy practice within the context of interprofessional care for vulnerable populations through participation with local clinic programs. Enrollment is required for participation in any aspect of clinic programs. Enrollment is restricted to Pharmacy students.
Repeat rules: May be repeated for credit. 0 total credits. 16 total completions.

PACE 800. Geriatric Pharmacy Practice. 3 Credits.
This course is designed to provide opportunities to enhance knowledge and skills in geriatric pharmacotherapy and other health disciplines involved in the care of seniors. This course will challenge students to identify and resolve health and medication use problems they may encounter while caring for older patients.
Requisites: Prerequisite, PHCY 446.

PACE 803. Ambulatory Care. 3 Credits.
Provides comprehensive immunization education, discusses strategies to develop, implement, and maintain pharmacy-based immunization services, and provides opportunities to practice administration of subcutaneous and intramuscular injections.
Requisites: Prerequisites, PHCY 442, 443, 444, 445, and 446.

PACE 804. Teaching and Learning Concepts of Pharmacy Practice. 3 Credits.
This course introduces pharmacy students to teaching and learning theories and concepts that may be used during future teaching opportunities and assist in the development of lifelong learning techniques.
Requisites: Prerequisites, PHCY 401 and 402.

PACE 806. Medication Therapy Management. 2 Credits.
This course examines the expanded role of pharmacists in the community setting with the focus on integrating their pharmacotherapy knowledge into the Medication Therapy Management role.
Requisites: Prerequisites, PHCY 442, 443, 444, 445, and 446.

PACE 807. Veterinary Pharmacotherapy. 3 Credits.
PY3 PharmD students. An introductory course providing students with the knowledge and skills required to provide effective pharmaceutical care and compounds to non-human patients.

PACE 808. Critical Care. 3 Credits.
The course is designed to develop knowledge in common acute diseases encountered in the ICU by utilizing patient cases. Classes will focus on choice and rationale for therapy, dosing guidelines, and monitoring parameters. Two visits to the ICUs at UNC-CH are required.

PACE 811. Contemporary and Applied Communications in Healthcare. 3 Credits.
This course is designed to prepare students to develop and enhance their health communication skills across a broader range of constituents. Students envisioning health careers requiring high levels of communication across disciplines and with key stakeholders and those preparing for careers in leadership, management, entrepreneurship, and academia would gain tremendously.

PACE 812. Pediatric Pharmacotherapy. 3 Credits.
A comprehensive overview of developmental pharmacology and pharmaceutical management of various disease states in pediatric patients. Emphasis will be placed on nutrition management and pharmacokinetic recommendations for pediatric patients.

PACE 813. Introduction to Clinical Toxicology. 2 Credits.
This course will provide the student with an overview of the clinical manifestations, assessment, and treatment of poisonings with common drug, chemical, and biological agents.
Requisites: Prerequisite, PHCY 442.

PACE 814. Disaster Preparedness and Emergency Care. 2 Credits.
Prerequisite: PY3 PharmD students. Students will learn about different types of disasters and related health care issues.

PACE 815. Evaluation Research and Project Design. 3 Credits.
This course provides formal instruction on critical components of evaluation research, study design, and data analyses that a Master in Pharmaceutical Sciences with a specialization in health system pharmacy administration graduate will need in the workplace.

PACE 820. Health-System Pharmacy Leadership. 2 Credits.
Graduate student status in the MS in Pharmaceutical Sciences (Health-System Pharmacy Administration subplan) program required. This course focuses on principles of leadership and strategies used by leaders, with an emphasis in health-system pharmacy. Active learning strategies are used to examine and model leadership principles.
PACE 821. Rural Pharmacy Health 1: Introduction to Rural Pharmacy Practice. 1 Credit.
This seminar course is the first in a four-semester course sequence intended to facilitate skill development in rural pharmacy practice as part of the Rural Pharmacy Health Certificate Program. Enrollment is reserved for Rural Pharmacy Health Scholars only.

PACE 822. Rural Pharmacy Health 2: Cultural Competence and Physical Assessment in Rural Pharmacy Health. 1 Credit.
This seminar course is the second in a four-semester course sequence intended to facilitate skill development in rural pharmacy practice as part of the Rural Pharmacy Health Certificate Program. Enrollment is reserved for Rural Pharmacy Health Scholars only.
Requisites: Prerequisite, PACE 821.

PACE 823. Rural Pharmacy Health 3: Interprofessional Practice. 1 Credit.
This seminar course is the third in a four-semester course sequence intended to facilitate skill development in rural pharmacy practice as part of the Rural Pharmacy Health Certificate Program. Enrollment is reserved for Rural Pharmacy Health Scholars only.
Requisites: Prerequisite, PACE 821, PACE 822.

PACE 824. Rural Pharmacy Health 4: Population Health Management. 1 Credit.
This seminar course is the fourth in a four-semester course sequence intended to facilitate skill development in rural pharmacy practice as part of the Rural Pharmacy Health Certificate Program. Enrollment is reserved for Rural Pharmacy Health Scholars only.
Requisites: Prerequisite, PACE 821, PACE 822, PACE 823.

PACE 825. Foundational Practices of a Successful Health-System Department of Pharmacy. 4 Credits.
MS in Pharmaceutical Sciences students with a specialization in Health-System Pharmacy Administration. This course will focus on the Foundational Practices of a Successful Health-System Department of Pharmacy. Topics covered include medication safety, pharmacy informatics, and human resources management.

PACE 830. The Leadership Challenge. 2 Credits.
Introducing students to the principles of leadership and strategies used by leaders, regardless of position or pharmacy practice setting, and helps prepare student pharmacists to meet the leadership challenge. Active learning strategies are used to examine and model leadership principles. Instructors will lead discussions on various topics pertaining to leadership.

PACE 831. Applied Case Studies in Self Care Therapeutics. 3 Credits.
This course emphasizes evaluating literature to determine the best practices for patients seeking self care. It utilizes a team-based learning approach to engage students in a higher level of active learning as it relates to community pharmacy practice.
Requisites: Prerequisite, PHCY 452.

PACE 832. Financial Management of Health-system Pharmacy. 3 Credits.
MS in Pharmaceutical Sciences students only. This course provides an overview of the current financial environment in the health care industry and is intended to familiarize students with general accounting principles and financial management skills required to lead and manage pharmacy services in a health care organization.

PACE 833. Overview of Health Systems. 3 Credits.
MS in Pharmaceutical Sciences students with a specialization in Health-System Pharmacy Administration. This course is designed to expose participants to real world issues facing health system pharmacy leaders and to teach participants to work through concepts, processes, and challenges that are and will be faced.

PACE 860. Advanced Hospital Pharmacy Operations. 3 Credits.
This course is intended to build on the basic principles of pharmacy operations learned through coursework and experience as professional students as well as work experience.

PACE 896. Independent Study in PACE. 1-8 Credits.
Independent Study in the Division of Practice Advancement and Clinical Education.
Repeat rules: May be repeated for credit.

Pharmaceutical Outcomes and Policy (DPOP)

Graduate-level Courses

DPOP 801. Economics and Behavior of the International Pharmaceutical Industry. 3 Credits.
This course focuses on the empirical investigation of the economic and health impact of major pharmaceutical policies, regulations, market conditions, prescription drug use, and pharmaceutical care.

DPOP 803. Social and Behavioral Aspects of Pharmaceutical Use. 3 Credits.
This course will draw upon medical sociology and health psychology to familiarize students with core theories, research, measures, and design issues relevant to conducting social/behavioral research in pharmaceutical use.

DPOP 804. Introduction to Healthcare Database Research. 3 Credits.
Course will provide foundational knowledge for using administrative health care claims and other relational data for health services research. Students will learn to: manage large databases in SAS, identify key variables in administrative data, and design and implement a study protocol.
Same as: HPM 804.

DPOP 805. Patient-Reported Outcomes: Theory, Methods, and Applications. 3 Credits.
Course examines theoretical and methodological issues related to the assessment of patient reported outcomes, including health-related quality-of-life, in pharmaceutical research. Current and potential applications are highlighted.

DPOP 806. Pharmaceutical Policy. 3 Credits.
Course examines policies that influence pharmacy. Structured methods of policy analysis are examined and used to assess theoretic and analytic applications for evaluating pharmaceutical policy.

DPOP 870. Pharmaceutical Outcomes Research. 3 Credits.
Required preparation, introductory statistics and research methods coursework. Permission of the instructor for students lacking the required preparation. This is an intermediate-to-advanced-level applied and contemporary research methods class for students to build methodological and analytical knowledge to conduct high quality studies in evaluating pharmaceutical treatment utilization and outcomes.

DPOP 872. Proposal Writing in DPOP. 3 Credits.
How to write research proposals, including dissertation grants.

DPOP 899. Seminar. 1 Credit.
Forum for scholarly discussion of policy issues, research ideas and methods, campus and industry research resources, and the presentation of ongoing research. In addition to presentations by DPOP faculty and students, seminar will include presentations from invited researchers from industry, managed care, foundations, health care organizations, clinicians, and other departments.
DPOP 900. Introduction to Research in DPOP. 2-3 Credits.
This course offers students the opportunity to work with a faculty mentor on a research project.
Repeat rules: May be repeated for credit.

DPOP 901. Selected Topics in Pharmaceutical Outcomes and Policy. 1-3 Credits.
A reading and/or special projects course for both undergraduate and graduate students interested in pursuing additional work in the administrative and social sciences as they pertain to pharmacy practice. One to three hours a week.

DPOP 902. Methods in Pharmaceutical Outcomes Research. 3 Credits.
Includes formulating a research question, stating aims and hypothesis. Students are introduced to formulating a research strategy to write the background of the protocol, developing a research methodology, addressing measurement issues, selecting an appropriate design, and performing statistical analysis and power calculations. Three lecture hours a week.

DPOP 991. Research in Pharmaceutical Outcomes and Policy. 1-6 Credits.
Consists of laboratory work, conferences with the major professor, and library investigations relating to research.

DPOP 993. Master's Research and Thesis. 3 Credits.
A minimum of six hours of thesis must be taken in order to complete the requirements for the master's degree.
Repeat rules: May be repeated for credit.

DPOP 994. Doctoral Research and Dissertation. 3 Credits.
There is no limit to the number of dissertation hours that can be taken; however, no more than six hours may be applied to the minimum of 45 hours needed to satisfy graduation requirements.
Repeat rules: May be repeated for credit.

Pharmaceutical Sciences (PHRS)

Graduate-level Courses

This is a required course for first year pharmaceutical sciences graduate students. Students participate on cross-discipline teams to discuss topics in three foundational areas essential to their development as pharmaceutical scientists: research ethics which meets RCR training requirements; leading research articles within five areas of pharmaceutical sciences; and professional development.

PHRS 899. Seminar in Pharmaceutical Sciences. 1 Credit.
This course is required for all Pharmaceutical Sciences graduate students by their second semester. Class format consists of seminar presentations by students and/or faculty or invited speakers. Students are expected to actively engage in seminar activities and discussions.
Repeat rules: May be repeated for credit.

PHRS 990. Practicum in Pharmaceutical Sciences. 1-9 Credits.
Enrollment in this variable credit course requires a signed agreement between the Chair of the student's academic division and a representative of the institutional sponsor providing the research practicum. Teaching/learning methods consist of a pharmaceutical sciences-based research training experience at the participating institution involving independent work and written and oral reports.
Repeat rules: May be repeated for credit.

PHRS 991. Research in Pharmaceutical Sciences. 1-9 Credits.
This is a variable credit course required for all Pharmaceutical Sciences graduate students by their second semester. Teaching/learning methods consist of a pharmaceutical sciences-based mentored research training experience involving independent work and research reports that must be filed at the end of the semester.
Repeat rules: May be repeated for credit.

PHRS 992. Master's (Non-Thesis). 3 Credits.
Students register for thesis substitute credits after successfully passing their comprehensive written examinations. A minimum of 3 credit hours of thesis substitute research and writing is required for Pharmaceutical Sciences graduate students.
Requisites: Prerequisite, PHRS 991 or equivalent.
Repeat rules: May be repeated for credit.

PHRS 993. Master's Research and Thesis. 3 Credits.
Students register for thesis credits after successfully passing their comprehensive written examination. A minimum of 3 credit hours of thesis research and writing is required for Pharmaceutical Sciences graduate students.
Requisites: Prerequisite, PHRS 991 or equivalent.
Repeat rules: May be repeated for credit.

PHRS 994. Doctoral Research and Dissertation. 3 Credits.
Students register for dissertation credits after successfully passing their qualifying preliminary and oral examinations. A minimum of 6 credit hours of dissertation research and writing is required for Pharmaceutical Sciences graduate students.
Requisites: Prerequisite, PHRS 991 or equivalent.
Repeat rules: May be repeated for credit.