

USC School of Pharmacy

RXRS 302: Pharmacology and Drug Development

Instructors:

Isaac Asante, PhD
School of Pharmacy
University of Southern California
Office: HSC campus PSC 306B
asante@usc.edu
(323) 442-1357
Office hours: 3 hours per week

Stan Louie, PhD
Associate Professor, Department of Pharmacy
University of Southern California
Office: HSC Campus PSC 208B
slouie@usc.edu
(323) 442-3646
Office hours: 3 hours per week

Daryl L. Davies, PhD
Professor, Department of Clinical Pharmacy
University of Southern California
Office: HSC campus PSC 506
ddavies@usc.edu
(323) 442-1427
Office hours: 3 hours per week

Course Weight: 4 units

Days/Time/Location: Tuesday; 2:00-4:50pm at VPD 106

Catalogue description: Introductory course in pharmacology/drug development- Drug/Receptor interactions, pharmacodynamics, pharmacokinetics, toxicology, therapeutic interventions, biotransformation, pharmacogenomics, FDA, regulatory requirements and challenges, intellectual property, global challenges of drug development.

Introduction

Pharmacology is the study of substances that interact with living systems through chemical processes, especially by binding to regulatory molecules and activating or inhibiting normal body processes. These substances may be chemicals administered to achieve a beneficial therapeutic effect on some process within the patient or for their toxic effects on regulatory processes in parasites infecting the patient. "Introduction to Pharmacology and Drug Development," will provide students with an introduction to the

nature of drugs and drug development including: principles of drug receptors; how drugs interact with the body (PD); and potentially damage the body (toxicology); how the body alters the effects of the drug (PK); drug biotransformation; important drug interactions and their mechanisms of action and pharmacogenomics. The student will also learn about the regulatory challenges associated with the discovery and development of a new drug. The student will be introduced to the use of different types of pharmaceutical interventions, from the use of patented to generic to over-the counter drugs, the current approaches to dietary supplement and alternative medicines. Selected cases studies and emerging “hot” topics will be discussed. This course should have broad appeal to many science and non-science undergraduates including students interested in drug discovery research, chemistry, biology, pharmacology, biochemistry, toxicology, formulations, pharmaceutical industry, FDA, business analysts, entrepreneurs and venture capitalist interested in understanding the pharmaceuticals industry.

Chapters from the core textbook will be supplemented with a variety of source materials including online resources and articles from scientific journals.

Upon successful completion of this course, the student should be able to demonstrate a working knowledge regarding:

- The nature of drugs and drug development
- The role and importance of different pharmacokinetic parameters (absorption, distribution, metabolism and elimination; ADME) that affect drug dosing in a patient.
- The basic terminology used in characterizing a drug (e.g. potency, EC₅₀, IC₅₀, MTD, efficacy, selectivity, etc....).
- Different drug-receptor interactions and the basic principles of pharmacodynamics (PD)
- The basic principles in the use of drugs to prevent and treat diseases (pharmacotherapy).
- The importance of pharmacogenomics.
- Why particular drugs are prescribed and how their effects are monitored (clinical pharmacology)
- The importance of good laboratory practices (GLP), good manufacturing practices (GMP) and good clinical practices (GCP).
- The processes involved in the discovery and development of new therapeutic agents.

Evaluation and Grading:

Evaluation will be based on two midterm examinations, a final examination and course quizzes.

Class/Group participation:	40 pts (20%)
4 quizzes @ 10 pts each:	40 pts (20%)
2 midterm exams @ 35 pts each:	70 pts (35%)
1 final exam (partially cumulative):	<u>50 pts</u> (25%)
Total:	200 pts (100%)

Attendance at all classes is expected. Participation will include asking and answering questions and being actively involved in the discussion as well as group assignments. It is expected that the students read the assigned papers prior to the lecture, prepare for group presentations and be prepared to discuss background, current understanding, treatments, and gaps in knowledge for the topic in each lecture.

There will be 4 quizzes over the course of the semester that will be primarily based on questions pulled from the text book and lecture notes. The midterms (35 points each) will include multiple choice questions T/F questions fill-in the blank questions and possibly short answers.

The final exam (50 points) will consists of multiple choice and T/F questions. The final exam will be cumulative but will majorly emphasize material covered after the 2nd midterm.

There are no make-up exams. If exceptional circumstances prevent you from attending an exam, your reason for missing it must be accompanied by a written statement from a third party (e.g. a note from a medical doctor).

Notes, books, calculators, electronic dictionaries, regular dictionaries, cell phones or any other aids are not allowed during exams.

Students will be asked to complete an anonymous critical evaluation of the course at its completion.

Course Readings

Required Readings

The text is mandatory for this course as it will greatly improve your grasp on the course content. There is a supplemental online student companion website for this course that can be accessed once the textbook is purchased. The chapters identified for your assigned reading in the in the text will support your learning process throughout the semester. Of note, **this textbook is available at USC Norris Medical Library: Upper Level QV 4 H675p 2016**

Textbook:

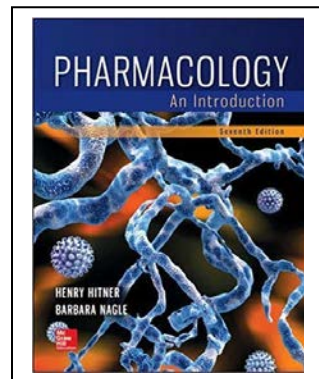
Pharmacology: An Introduction, 7e

Henry Hitner, PhD and Barbara T Nagle, PhD

ISBN-13: 978-0073513812

ISBN-10: 9780073513812

Available on Amazon.com for \$73.00



Other topical materials including but not limited to the syllabus, supplemental reading assignments and additional handouts will be posted on <http://blackboard.usc.edu/>. Students will also be encouraged to use the online discussions sessions (via Blackboard) as an additional learning tool.

Course Outline

This course will be in the format of a directed seminar/lecture under the guidance of the instructor for the specific session. During each weekly session, the instructor will engage the students with questions and draw comments or interpretations primarily based on the assigned reading. Students are expected to ask questions and participate in an interactive fashion. Because this is an area of rapid change in policies, the readings may vary from one term to the next. Additional readings for each section that may be of added use are listed in the table below.

Course schedule is as follows:

Date	Time	Subject	Lecturer
Tue, Jan 8 th	2-4:50 PM	Introduction- Basic principles of pharmacology.	Asante
		Drug, Dosage forms and Routes of Drug Administration	
		Pharmacokinetics (PK)	
		1. Absorption, Distribution, Metabolism and Elimination of Drugs	
		2. PK Calculations	
		Assigned and supplement reading: Chapter 2: Pharmacokinetics and Factors of Individual Variation Basics on Pharmacokinetics/pharmacodynamics: https://www.youtube.com/watch?v=NKV5iaUVBUI Very brief overview of PD and PK: Utube: https://www.youtube.com/watch?v=tobx537kFal	
Tue, Jan 22 nd Quiz 1	2-4:50 PM	Pharmacokinetics (PK)	Asante
		1. Absorption, Distribution, Metabolism and Elimination of Drugs	
		2. PK Calculations	
		Principles of Pharmacodynamics (PD)	
		General PD terminologies, Receptor types, Drug- Receptor Interactions	
		Assigned and supplement reading: Chapter 2: Pharmacokinetics and Factors of Individual Variation https://www.youtube.com/watch?v=NKV5iaUVBUI	
Tue, Jan 29 th Quiz 2	2-4:50 PM	Pharmacodynamics (Part II)	Asante
		1. PD Interactions and Calculations	
		2. Drugs for Special Populations	
		3. Adverse Drug Effects	
		4. Intracellular receptors	
		Assigned and supplement reading: Basics on Pharmacokinetics/pharmacodynamics: https://www.youtube.com/watch?v=NKV5iaUVBUI Very brief overview of PD and PK: Utube: https://www.youtube.com/watch?v=tobx537kFal	
Tue, Feb 5 th	2-4:50 PM	Factors impacting on Drug Levels	Asante

		1. Genetics 2. Age effect 3. Sex 4. Drug-drug interaction 5. Diet and environment Assigned and supplement reading: Chapter 2 & 3	
Tue, Feb 12 th	2-4:50 PM	Midterm I	
Tue, Feb 12 th	2-4:50 PM	Drug Discovery and Development 1. Drug discovery process 2. Screening 3. ADME evaluation 4. Drug synthesis and formulation 5. Toxicology Evaluation Assigned and supplement reading: To be posted on Blackboard	Asante
Tue, Feb 19 th	2-4:50 PM	President's Day Holiday	
Tue, Feb 26 th	2-4:50 PM	Autonomic Pharmacology 1. Cholinergic drugs; anticholinergic drugs; adrenergic drugs; adrenergic blocking drugs. 2. Anti- Cholinergic & Neuromuscular Blocking 3. Clinical perspectives. Adverse effects of anticholinergic drugs or ABCDs A. Agitation B. Blurred vision C. Constipation and confusion D. Drug mouth Histamine; serotonin; vasoactive peptides; drugs used in asthma Assigned and supplement reading: Chapters 5- 9 https://www.youtube.com/watch?v=r-gJaMoMon0 https://www.youtube.com/watch?v=cp_CZpCBVpk	Eshaghian
Tue, Mar 5 th Quiz 3	2-4:50 PM	Vitamins, Minerals and Pain Drugs 1. Nutrition and Therapy 2. Pain and Analgesics Assigned and supplement reading: Chapters 19, 20 & 28	Asante
Tue, Mar 12 th	2-4:50 PM	Spring Recess	
Tue, Mar 19 th	2-4:50 PM	Midterm II	
Tue, Mar 26 th	2-4:50 PM	Cardiovascular Drugs Antihypertensive agents	Forrester

		Assigned and supplement reading: Chapters 21- 26 https://www.youtube.com/watch?v=1SsYduKxE0Q	
Tue, Apr 2 nd	2-4:50 PM	Respiratory Drugs	Asante
		1. Mechanism of constriction	
		2. Pharmacology of bronchial dilators	
		Assigned and supplement reading: Chapters 31- 32 https://www.youtube.com/watch?v=NNfx27io8-k	
Tue, Apr 9 th Quiz 4	2-4:50 PM	Infectious Disease Drugs	Louie
		1. Antibacterial	
		2. Antimycobacterial drugs	
		3. Antiviral drugs	
		Assigned and supplement reading:	
		Chapters 41-42 https://www.youtube.com/watch?v=rhFZ-yPfy2U	
Tue, Apr 16 th	2-4:50 PM	Cancer Chemotherapy	Louie
		1. Cytotoxic chemotherapy	
		2. Antimitotic agents	
		Assigned and supplement reading: Chapter 45	
Tue Apr 23 rd	2-4:50 PM	Pharmacology of the Gastrointestinal Tract	Asante
		1. Pharmacology of Peptic Ulcer Disease	
		2. Emetics and anti-emetics	
		3. Pharmacology of Diarrhea and Constipation	
		Assigned and supplement reading: Chapters 33-34	
Tue May 7 th	2-4:00 PM	Final Examination	

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa
Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.
emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour