

PHA 621
PRINCIPLES OF DRUG ACTION
FALL 2017

A. General Information

1) Meeting Times and Place

Tuesday/Friday 2:00-3:15 PM, MS303 Medical Sciences

2) Credit Hours: 3.

3) Director: Robert Hadley, Ph.D.

Email: rhadley@uky.edu, Phone: 257-6556, Office: MS371 Medical Sciences
Scheduled Office Hours: Tuesday & Friday (after class until 4:00 PM).

4) Co-Director: Hollie Swanson, Ph.D.

Email: hswan@email.uky.edu, Phone: 323-1463, Office: MN322 Medical Sciences

5) Course Assistant: Veronique Thibault

Email: vthibau@uky.edu, Phone: 323-6124, Office: MS372 Medical Sciences

6) Contact Information for Additional Teaching Faculty

Michael Piascik, Ph.D.

Email: mtp@uky.edu, Phone: 323-5107, Office: MS320 Medical Sciences

Rina Plattner, Ph.D.

Email: Rina.Plattner@uky.edu, 323-4778, Phone: Office: 209 Combs

Todd Porter, Ph.D.

Email: tporter@uky.edu, Phone: 257-1137, Office: 381 Todd Bldg.

Sean Thatcher, Ph.D.

Email: SeanThatcher@uky.edu Phone: 218-4001, Office: 593 Wethington

Olivier Thibault, Ph.D.

Email: othibau@uky.edu, Phone: 323-4863, Office: MS313 Medical Sciences

B. Course Description

1. Brief Description & Prerequisites as seen in the UK Bulletin

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. Prerequisites: Consent of instructor.

2. Detailed Description

Pharmacology is the study of the effects of drugs on biologic systems. A **drug** is a chemical that has the ability to interact with and cause a change in a biologic system. Drugs are used in diverse situations such as the topical application of drugs to treat acne, the therapy of hypertension, the systemic use of drugs to treat cancer or in support of organ transplantation. Toxic substances and environmental pollutants are also considered drugs. Therefore,

understanding how these agents affect physiologic systems is also highly relevant. PHA 621 is an advanced course designed to provide graduate students with the fundamental principles that regulate drug action. The course will cover the factors governing drug **absorption, distribution, metabolism and excretion** and how these processes ultimately determine the action of drugs. We will discuss the interaction of drugs with pharmacologic **receptors** and the coupling of these receptors to intracellular signaling cascades. We will also discuss the factors that govern the **toxic action** of drugs. The student can then use the pharmacokinetic and pharmacodynamic concepts presented in this course to gain a better understanding of the therapeutic action of drugs that are discussed in PHA 622. This information is intended to be integrated with other disciplines, including anatomy, biochemistry, physiology, psychology and molecular biology. We will use the Blackboard website as a means to effectively communicate.

C. Student Learning Outcomes

After completing this course, students are expected to be able to:

- 1) Discuss properties that govern the absorption, distribution, metabolism and excretion of drugs.
- 2) Discuss how pharmacokinetic parameters determine the overall response to drugs.
- 3) Discuss how alterations in pharmacokinetic and pharmacodynamic parameters can result in a toxic response to drugs.
- 4) Discuss the various receptor families at which drugs can interact to produce physiologic effects.
- 5) Define and discuss the concepts of affinity and efficacy as they relate to the action of drugs.
- 6) Describe signaling pathways utilized by the different receptor families to produce changes in cellular activity.
- 7) Discuss the key factors that govern the toxic actions of drugs.
- 8) Prepare and present to the class a presentation on a receptor or cell signaling system at which drugs act to alter physiologic regulation.

D. Course Materials

1) Canvas.

Most course materials, including reading assignments and powerpoint presentations, will be posted on the course's UK Canvas site.

2) Textbook.

It will not be necessary to purchase a textbook for the course. Two online textbooks will be used, and are available for free through the UK Medical Library. To obtain access off campus you will be asked to login to EZProxy and either use the links given below or else go to the Library Catalog search page (<http://libraries.uky.edu/>).

Basic and Clinical Pharmacology 13E edition (Betram Katzung)

<http://accessmedicine.mhmedical.com.ezproxy.uky.edu/book.aspx?bookid=1193>

Goodman & Gilman's *Pharmacological Basis of Therapeutics*, 12th edition (Editor, Laurence L. Brunton; Associate editors, Bruce A. Chabner, Björn C. Knollmann)

<http://accessmedicine.mhmedical.com.ezproxy.uky.edu/book.aspx?bookid=1613>

E. Course Assignments and Activities

1) Overview

We will use several different pedagogies in PHA 621, including reading assignments, traditional didactic presentations by the instructor, and student-led class room presentations.

2) Instructor-led Lectures and Class Discussions

Reading material and powerpoint presentations will be posted on the Canvas website before class. Student comprehension will be assessed both by in-class written questions and by two written exams (see Section F-Course Grading).

3) Student Presentations (Sept 22-26)

Dr. Piascik will assign students to working groups, where you will be expected to create and present a mini-presentation on either receptor systems or pharmacodynamics to the class. The presentation will draw on information presented to the class by Dr. Piascik in lectures and discussion from Aug 29 to Sept 12. Additional instructions will be provided by Dr. Piascik at the beginning of the course.

4) Student Presentations (Nov 17-Dec 8)

At the end of the course, you will be expected to make an individual presentation regarding a receptor or signaling system. The assignment is to create a presentation on a physiologically important receptor or signaling system and the actions of drugs on this system. Here are the guidelines for this presentation:

a) You are to choose a receptor or cell signaling system. This selection should be made by Oct. 17. The topic must be approved in consultation with one of the course directors. Your presentation should feature the interaction of drugs with your system of interest, either how drugs are used as tools to study your system or how the system can be targeted by drugs to produce a therapeutic benefit.

b) Presentation materials should be of high-quality with clearly legible text, figures and graphs. Whenever possible you should use original, self-generated figures. When you use the work of

others, this must be clearly indicated on the slide. Over reliance on using the work of others is discouraged.

c) There will be one to two presentations scheduled per session. You should plan to talk for approximately 25 minutes to allow sufficient time for class discussion. Students are expected to actively participate in the discussion of other student's presentations.

d) The necessary components of the presentation are described below in Section F.6.

F. Course Grading

1) Grading Scale

The following grading scale will be used to determine the final class grade.

- A = 90-100%
- B = 80-89.9%
- C = 70-79.9%
- E (Fail) = <70%
- I = Incomplete

2) Grading Components (Percentage of Final Grade)

Component	Percentage of Final Grade
In-Class Discussion of Reading Assignments (Sept 1-8)	10%
Student Presentations (Sept 22-26)	12.5%
Written Exam 1 (Oct 17)	22.5%
Student Presentations (Nov 17-Dec 8)	25%
Written Exam 2 (Dec 12)	30%

3) In-Class Discussion of Reading Assignments (Sept 1-8)

Dr. Piascik will give a reading assignment at the start of the course. The class will not meet on August 29 to provide time to carry out this assignment. The readings will be discussed in three class sessions (Sept 1-8), during which students will be asked questions on the assignment. Students' written answers will be graded by Dr. Piascik.

4) Student Presentations (Sept 22-26)

This assessment will cover Dr. Piascik's material presented from Aug 29 to Sept 26. Dr. Piascik will provide a grade based on the student-led presentations on G-protein coupled receptors and constitutively active receptors/inverse agonists. Dr. Piascik will provide specific instructions for presentation preparation and the grading rubric at the beginning of the course.

5) Written Exam 1 (Oct 17)

This will be a take-home, open book exam consisting of short-answer and essay questions. The questions will cover the topics presented in class from Sept 15 (Hadley) to Oct 13 (Swanson). Note that Dr Piascik's material and student presentations will not be covered on the exam.

6) Student Presentations (Nov 17-Dec 8)

These individual student presentations will be graded by Drs. Hadley and Swanson as described below.

Presentation Item	Contribution to Presentation Grade
Audiovisual material	15% -- quality, originality, clarity, appropriate mix of original material and material from other sources, appropriate citation of the work of others.
Oral Presentation	15%-- quality of presentation, ability to answer questions, appropriate length.
Scientific Background	10%-- appropriate coverage and discussion of background material.
Role of the receptor or signaling system in normal physiology and disease	20%-- appropriate discussion of the physiologic relevance of the system being described
Drugs as therapeutic tools	20%-- appropriate discussion of drugs that are used as therapeutic tools to modify the activity of the system being presented. Include current therapeutic needs and/or short comings of current therapies.
Summary and future directions	10%-- appropriate summary of the presentation and discussion of future directions for the system.
Discussion	10%--you are expected to contribute to the discussion during other student's presentations, and provide a short written appraisal of the presentation.

7) Written Exam 2 (Dec 12)

This will be a take-home, open book exam consisting of short-answer and essay questions. The questions will cover the topics presented in class from Oct 20 (Swanson) to Nov 14 (Piascik). Student presentations will not be covered on the exam.

G. Course Policies

1. Attendance Policy

Regular class attendance is critical to success in this course. Tardiness is an inconvenience to classmates and instructors. Classroom discussion is an essential component of the grade for this course. Therefore, students are expected to arrive on time and participate in all course related activities. Three unexcused absences will be allowed during the semester before a letter grade reduction is employed.

2. *Excused Absences*

Students need to notify the professor of absences prior to class when possible. *Senate Rules 5.2.4.2* defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit “reasonable cause for nonattendance” by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Two weeks prior to the absence is reasonable, but should not be given any later. Information regarding major religious holidays may be obtained through the Ombud (859-257-3737, http://www.uky.edu/Ombud/ForStudents_ExcusedAbsences.php).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy.

Per *Senate Rule 5.2.4.2*, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

3. *Classroom Behavior*

Behavior that detracts from the educational environment will not be tolerated. Professional behavior is expected. This is defined as: treating the instructors and your fellow students in a respectful and courteous manner. Instructors and students alike are entitled to professional respect from one another regardless of the similarity or divergence of viewpoint and irrespective of age or experience. Disruptive students will be asked to leave the classroom and may receive a penalty to their final grade in the course

4. *Academic Integrity (Plagiarism)*

Per University policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the University may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense

against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Senate Rules 6.3.1 (see <http://www.uky.edu/Faculty/Senate/> for the current set of *Senate Rules*) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording, or content from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work (including, but not limited to a published article, a book, a website, computer code, or a paper from a friend) without clear attribution. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work, which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content, and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so generally and freely circulated as to be a part of the public domain.

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

5. Accommodations due to disability

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at drc@uky.edu. Their web address is <http://www.uky.edu/DisabilityResourceCenter>.