PHARMACOLOGY & THERAPEUTICS
COURSE INTRODUCTION

I. INTRODUCTION

Overview

(i) The word Pharmacology is originally derived from the Greek: *pharmakon* –meaning drug and *logos*—meaning knowledge.

(ii) Pharmacology can be defined as “the study of the effects of drugs on the function of living organisms”. In a broader sense, Pharmacology deals with the actions, mechanism of action, clinical uses, adverse effects and the fate of drugs in the body.

(iii) Drugs are defined as chemical substances, other than nutrients or essential dietary ingredients, that when *administered* to a living organism result in a distinct biological outcome.

(iv) Drugs maybe purified chemicals, synthetic organic chemicals, substances purified from either plant or animal products or recombinant proteins generated by genetic engineering.

(v) In order for a drug to be effective it has to be administered by an appropriate route (i.e. oral, intravenous or intramuscular etc) capable of achieving a sufficiently high enough concentration within its target tissue(s) in a chemical form that allows it to interact with its biological target to achieve its desired effect.

(vi) The factors that determine the ability of a drug to reach its target tissue and achieve its desired therapeutic effect are determined by its inherent *Pharmacokinetic* and *Pharmacodynamic* properties.

(vii) While drugs are intended to have a selective beneficial action, there is always the risk that a drug may have unanticipated, undesirable, and in some cases, harmful, side effects.

(viii) The effective use of drugs in the clinical practice of medicine requires a thorough understanding of both the basic concepts of pharmacology and the specific pharmacology of any specific prescribed drug.
II. Pharmacology and Therapeutics: Course Goals and Objectives

At the end of the course the student will be able to:

**MEDICAL KNOWLEDGE**

1. Describe the basic scientific concepts and principles that serve as the foundational underpinnings of the pharmacological sciences including pharmacokinetics; pharmacodynamics; drug metabolism; and drug-drug interactions; and explain how these fundamental pharmacological properties can influence route of administration, drug action; drug efficacy and potency; drug levels in the body; potential for drug interactions; drug toxicity; and the appropriate choice of drug for pharmacotherapy in a given patient.

2. Explain how to use drug-specific and patient-specific pharmacokinetic parameters to calculate the physiochemical properties that influence rates of drug disposition and clearance in the body, and how these parameters can be used to monitor, design and modify appropriate dosing regimens of drugs in specific patient populations.

3. Describe the process by which new drugs are discovered, developed, tested and finally approved by the Federal Drug Administration for use in the clinic.

4. Discuss the fundamental principles of pharmacogenomics including how specific patient characteristics and genetics can affect the clinical response to particular classes of drugs, and how pharmacogenomics approaches can be used to influence the drug discovery process and the choice of drugs in the treatment of specific diseases.

5. List the major drugs and drug classes currently used in medical practice.

6. Describe the specific pharmacology of the major drugs and drug classes currently used in medical practice including their indications, contraindications, clinical use, mechanisms of action, physiological effects, pharmacokinetic properties, major adverse effects and clinically significant drug interactions; and apply this knowledge together with both disease-specific and patient-specific factors to select the most appropriate medication(s) for the effective pharmacotherapy of a given disease or condition in a specific patient.

7. Demonstrate an understanding of the molecular, cellular and physiological mechanisms underlying normal cell/organ function; the pathophysiological changes that occur in the etiology of the most common disease states, the clinical presentations associated with these diseases and describe how targeting these mechanisms with the appropriate choice of drug(s) can act to effectively treat, cure, or mitigate the underlying disease causes and/or symptoms.
8. Discuss the overriding theoretical considerations and principles that underlie the successful pharmacotherapy of the major diseases and conditions including recognition and use of widely used, national organization-approved treatment algorithms.

9. Recognize the currently accepted diagnostic criteria required to specific diagnose disease and initiate drug therapy and the anticipated therapeutic goals likely to be achieved by therapeutic intervention for the most commonly encountered pathophysiological state(s) and/or disease mechanism(s), as well as any clinical testing requirements for monitoring drug effectiveness and potential toxicity.

10. Explain the physiological, pharmacological, and psychological effects of acute and chronic exposure of individuals to drugs of abuse, and describe the consequences of sudden withdrawal of such a drug from a drug-dependent individual.

11. Describe the effective use of non-pharmacological therapeutic interventions in the treatment of specific diseases, conditions and symptoms.

12. Discuss the basic principles of toxicology; the mechanisms by which excess exposure to certain drugs, toxins, chemicals, heavy metals and poisons can lead to adverse toxicological effects; and the basic principles of clinically managing the poisoned patient.

13. Evaluate the relative pros and cons in the use of dietary supplements and herbal medications in the treatment of certain specific conditions, and compare and contrast the major differences in the laws and regulations governing the approval, safety, efficacy and marketing of these agents compared to conventional FDA-approved drugs.

INTERPERSONAL AND COMMUNICATION SKILLS

14. Demonstrate the ability to effectively communicate and work collaboratively together with peers in the small group setting to successfully address problems of pharmacological significance.

PROFESSIONALISM, MORAL REASONING, AND ETHICAL JUDGEMENT

15. Demonstrate professionalism by behaving in a professional and courteous manner when engaged in course activities or interacting with course faculty and staff, and by being punctual in attendance at required course activities such as small groups, team-based learning exercises and exams.
III. ORGANIZATION OF THE COURSE.

A. Syllabus

The Pharmacology & Therapeutics course is year-long and is divided into two semesters.

Semester III (Part 1); August 5th – December 15th, 2014
Semester IV (Part 2); January 6th – April 30th, 2015

You will receive an individual grade for each semester.

Semester III:
There are five major areas of emphasis in Semester III:

(i) Basic Principles – in this series of lectures you will be introduced to the fundamental concepts of Pharmacology including pharmacokinetics, pharmacodynamics, pharmacogenomics, drug metabolism, and drug interactions.

(ii) Autonomic Pharmacology/Anesthesia/Pain medications - this section of the course will introduce you to the pharmacology of the autonomic nervous system. You will also be introduced to the pharmacology of anesthetics and analgesics.

(iii) Antimicrobial agents – this section of the semester will provide an introduction to the pharmacology and clinical use of antibiotic drugs used in the treatment of infectious diseases.

(iv) Cardiovascular Pharmacology – in this series of lectures you will be introduced to the major drug classes that are used to treat diseases of the cardiovascular system. These drug classes include those involved in the regulation of blood coagulation, as well as drugs used to control hyperlipidemia, hypertension, angina, cardiac arrhythmias and congestive heart failure.

(v) Miscellaneous Pharmacology Topics - this final section will deal with a number of topics including, pharmacotherapy of anemia, immunomodulation therapy, treatment of allergies and pharmacotherapy of mycobacterial and fungal infections

There will be a total of FIVE exams in Semester III on the following dates:

August 18th; September 2nd; September 19th; October 27th; December 15th.
Pharmacology & Therapeutics
August 4th, 2014

Note: The Pharm course will not have questions on the MHD exam scheduled for November 17th

Semester IV
There are four major areas of emphasis in Semester IV:

(i) Psychopharmacology – the first series of lectures in the semester will provide an introduction to the pharmacology of drugs used in the treatment of common psychiatric illnesses, including the antidepressants, mood stabilizers, anxiolytics, and anti-psychotics. There will also be lectures on sedative hypnotic drugs and drugs used to treat drug abuse.

(ii) The endocrine system – this section of the course will discuss the pharmacology of drugs used to treat disorders of the endocrine system. Topics included are hypothalamic and pituitary hormones; estrogens, progesterones and androgens; Adrenocorticosteroids; drugs used to treat thyroid disorders; drugs to treat osteoporosis, and drugs to treat diabetes.

(iii) Chemotherapy – the final section of the semester will focus on the pharmacology of drugs used in chemotherapy and the treatment of cancer. Other topics will include drugs to treat HIV and other viral infections, the principles of clinical toxicology, and the pharmacology of common botanical medications and alternative medicine supplements.

(iv) Other topics - Other lecture topics that will be introduced throughout the semester include drugs to treat drugs to treat Rheumatoid Arthritis; drugs used in the management of GI disorders; and Herbal Medications and Drug Supplements.

There will be FOUR exams in Semester IV on the following dates:

January 23rd; March 6th; April 6th; April 28th.

B. Integration with other courses
The Pharmacology and Therapeutics course will run concurrently with Mechanisms of Human Disease. You will find that the lecture topics in these have been integrated so that related topics are coordinated and will be taught in a contemporaneous fashion. This will ensure that you will first hear about the underlying scientific basis of a disease process, its associated pathologies, and symptoms, prior to being introduced to the Pharmacology of the drugs used to treat that specific disease process. The topic areas are further integrated in small group sessions within both the Mechanisms and Pharmacology courses that aim to dovetail knowledge gained from both courses into addressing specific clinical
scenarios. It is hoped that by integrating the course material in this way, it will aid the overall educational experience and will greatly facilitate the learning process.

C. Lectures
All Pharmacology lectures will be 50 min in duration and will be presented in SSOM Rm. 390. A PDF printout of the powerpoint presentation of each lecture will be made available for download shortly before each lecture. As always, appropriate and professional behavior in the lecture hall is expected. Distracting classmates and/or faculty with conversation is unprofessional and is not acceptable.

D. Learning objectives and Handouts
A handout that can be used as a study guide for each lecture topic will accompany each lecture and will be posted on the web, where it can be accessed through the calendar for each specific date.

These handouts will include:
   a) A list of suggested reading assignments.
   b) A list of key concepts and learning objectives for each lecture topic.
   c) A list of the important drugs that will be covered during the lecture.
   d) A detailed overview of the material that will be covered in the lecture.
   e) Charts illustrating key Pharmacological features of each drug covered in the lecture, and/or a brief review of key points made in the lecture.

E. Small Group Case Studies
In addition to lectures the course also includes a variety of small group case studies. These small group case analyses will typically last 90 min and will take place in assigned locations within the sit-down-labs of SSOM. They will use various clinical case vignettes to illustrate important pharmacological concepts and will attempt to facilitate learning of critical pharmacological information covered in the related lectures. In the first semester the small group cases will be focused on basic pharmacological concepts such as pharmacokinetics, pharmacodynamics drug dosing, drug metabolism, and drug interactions. In the second semester there will be four small group cases that will each focus on the pathophysiology and drug management of an individual psychiatric condition (e.g. bipolar disorder, schizophrenia, depression and drug abuse). The case vignettes and associated study questions will be made available online. Individual small group assignments, room numbers, and the names of the group
facilitators will be posted, both on the web and outside Rm. 320. Note that in many cases, Pharmacological topics and the use of drugs in the treatment of specific diseases will be discussed in small group cases delivered within the Mechanisms of Human Disease course.

In addition to the small group cases there will also be two pharmacology demonstrations that will use clinical simulators and standardized patients to illustrate important aspects in the use of autonomic and cardiovascular drugs. These demonstrations will take place at the assigned times in SSOM Rm. 390. You will be expected to have reviewed the cases prior to the class and to come to these sessions ready to fully participate in the discussions.

In line with current school policy attendance at Small Groups is Mandatory- there will be sign up sheets for each separate small group session. Failure to attend and participate in small groups will result in an evaluation of NOT MEETING EXPECTATIONS in your Professional competency component of the course. If, for whatever reason you find that you have a legitimate reason for being unable to attend a particular small group session you should seek advance permission from the Course Director.

F. **Tips on learning/understanding the Pharmacology of specific drugs**
As indicated above, the first section of semester III will introduce you to the basic scientific principles of Pharmacology. By its very nature this section of the course is very conceptual and deals with very basic fundamental aspects of Pharmacology. However, the remainder of the course will quickly become very specific and is organized in a stepwise fashion to introduce you to the different classes of currently available drugs that are used to treat specific diseases and clinical conditions. This will expose you to a very large amount of information. In order to facilitate your learning and understanding of this material it is helpful to consider the following specific pieces of information for each drug or class of drugs that is covered.

For each drug/drug class you should know the following:

a) **INDICATIONS*** - under what circumstances is the drug used.

b) **DRUG ACTION*** - what clinical effect does the drug have.

c) **MECHANISM OF ACTION*** - how does the drug work at the biochemical level.
d) ADVERSE EFFECTS*** - are there clinically relevant side effects of the drug.

e) CONTRAINDICATIONS*** - are there circumstances in which the drug should not be administered to certain patient populations e.g. the elderly, those with renal insufficiency, pregnant women etc.

f) PHARMACOKINETICS - are there any factors such as absorption, metabolism, excretion or half-life that might affect the drug action.

g) DRUG INTERACTIONS - are there any interactions with other potentially concomitantly administered drugs that might affect the clinical efficacy, bioavailability or toxicity of either drug.

***- indicates most relevant HIGH YIELD information that is essential to master in order to perform well on the USMLE Step 1 exam.

This information will be discussed for each drug and/or drug class discussed throughout the course. In many cases, the information will be summarized in the charts that will accompany your lecture handouts. By learning this information for each drug/drug class, you will gain a greater appreciation for both the uses and limitations of these drugs in the effective treatment of specific patient populations. Knowing, understanding and being able to apply this information will also be critical for performing well in examinations both in the Pharmacology course and in the USLME-step 1 exam.

IV. EXAM FORMAT & GRADING POLICY.

A. There will be a total of NINE exams throughout the year that contain Pharmacology and Therapeutics questions. All exams will be computerized and will be administered in the Sit-Down Labs.

B. The dates of the exams are:
   Semester III- August 18th; September 2nd; September 19th; October 27th; December 15th.
Note: The Pharm course will not have questions on the MHD exam scheduled for November 17th

Semester IV- January 23rd; March 6th; April 6th; April 28th.

C. The total number of questions containing Pharmacology material will vary from exam to exam and will depend on the total number of Pharmacology lectures given during that period of the course.

D. The exams are NOT cumulative. Each exam will consist of three questions per lecture and one questions per small group session that were delivered during the corresponding section of the course. All questions will all be multi choice format in the style of the United States Medical Licensing Exam (USMLE-Step 1). Total time allowed for each exam will vary depending on the number of exam question- the average time allotted to answer each question will be 1 min 20 sec.

E. Your final semester grade will be based on the total percent correct of your answers from all of the questions answered in each exam throughout the entire semester.

The final grade for each semester will be compiled as follows:

**Honors**: a score greater than 90%.

**High Pass**: a score greater than 80% and less than 90%.

**Pass**: a score greater than 70% and less than 80%.

**Fail**: a score less than 70%.

Note: Scores within 0.5 percentage points of a grade cut off will be rounded up to the higher grade

G. In order to pass the entire course you will need to score AT LEAST a PASS or better in BOTH Semester III AND Semester IV.

V. PREPARATION FOR EXAMINATIONS.

A. As part of the handouts for each lecture you should also receive a chart(s) illustrating the major features of the drugs discussed during that lecture (i.e. indications, mechanism of action, adverse effects, contraindications, drug interactions). Alternatively, some lectures may supply you with a list of key review points for the lecture. In either case, these materials should be invaluable resources in your preparations for each exam.
B. USMLE type questions with explanations can be found at the end of each chapter in Katzung and Trevor’s *Examination and Board Review* (9th Edition).

C. An online student Resource Center accompanies the 12th edition of Katzung “*Basic & Clinical Pharmacology*”. This includes chapter questions and answers with detailed rationales.

D. The following represent Pharmacology-related exam questions that are available online:
   
   
   URL [http://www.medtrng.com/pharmacology_quizzes.htm](http://www.medtrng.com/pharmacology_quizzes.htm)
   
   
   URL [http://tulane.edu/som/departments/pharmacology/medpharm/quizzes.cfm](http://tulane.edu/som/departments/pharmacology/medpharm/quizzes.cfm)

VI. MISSED EXAM POLICY.

If circumstances arise that may prevent you from taking a scheduled examination (e.g. serious illness) you should immediately contact BOTH the course directors AND the Associate Dean of Student Affairs, so that a timely adjudication can be made. Students who are forced to miss exams for legitimate reasons, as ascertained by the Associate Dean of Student Affairs, will be given the opportunity to take a make-up exam on an individual basis.

VII. REMEDIATION POLICY

Students who receive a failing grade for either Semester III or Semester IV will be required to take a Remediation exam. The course director will notify those students that failed a semester after the last exam of that semester. Remediation Exams are administered with the assistance of the Associate Dean of Student Affairs in May/June at the end of the entire course. The purpose of the remediation exam is for the student to demonstrate competence of the material presented in the course. The composition of the exam will be decided by the course director and will consist of representative questions reflecting material that was presented throughout the semester. **Students must earn at least a 75% score to pass the remediation exam.** The course director will notify the student of the remediation exam grade.

VIII. PROFESSIONALISM.

Personal responsibility and professionalism are two key areas in the development of a physician. Professionalism is actually a separate category on the required evaluations for the American College of Graduate Medical Education. It is expected that professionalism will be extended in all aspects of your conduct in this course. This includes appropriate and professional interactions with the
course directors, lecturers, educational specialists and other students. Any serious lack in professional conduct will be reported to the Dean.

It is further expected that all students will maintain personal integrity and honesty during the examination process. Once an exam has started there should be no verbal or non-verbal communication with other students. If a problem arises this should be brought to the attention of the examination proctor. Lecture handouts, textbooks, telephones, personal computer devices and any written material should not be taken into the exam room. Neither should these materials be accessed during authorized bathroom breaks. Any student that attempts to gain an unfair advantage over other students in an examination by attempting to gain access to pharmacology resource material by any of these unauthorized means will be guilty of academic misconduct and will be promptly reported to the Dean.

IX. TEXTBOOKS

Recommended:
EITHER


- Available in the Inkling Format for iPad
- Also available through Access Medicine

This is a textbook that is used by many Pharmacology courses at other Medical Schools around the country- it is the companion textbook to the Board Review book listed below. It offers an in-depth detailed discussion of each topic and can be used as a primary resource textbook. It contains excellent summary charts of points at the end of each chapter.

OR


This Board Review book has previously been recommended by past students of the course. It offers a user-friendly brief synopsis of most pharmacological topics with plenty of diagrams, figures and tables. It also includes a list of practice exam questions complete with annotated answers at the end of each section. However, you should be aware that this book provides only a brief review of each topic, not a comprehensive in-depth coverage.
X. ADDITIONAL TEXTBOOKS AND E-RESOURCES

A. Textbooks.


   *This voluminous textbook provides a very comprehensive and in depth discussion of all areas of modern clinical pharmacology. It is considered as the “gold standard” of Pharmacology textbooks. However, it would probably be overkill for the course for all but the most interested students.*

   - available in the Inkling format for iPad
   - also available through Access Medicine


   *This is a condensed readily portable paperback version of the main Goodman & Gilman Reference textbook highlighted above. Highly recommended for those students that want a comprehensive user-friendly Pharmacology resource that can easily be carried in either a pocket or backpack.*


   *6th Edition expected September 22nd 2014*

   *A “user friendly” textbook that provides a basic outline of each topic. Provides just about the right amount of detail for easy review of any given topic. Includes many excellent tables, charts and illustrations for easy review of the material.*

B. Review Books


   *An excellent review book that provides essential facts and information for each of the major drug classes in a succinct user-friendly format- includes many excellent charts and figures. Highly recommended as a board review study aid to complement the lecture handouts provided in the course.*
   An excellent resource for exam preparation. Essentially Pharm flash cards in a book format. Provides numerous active recall questions on each of the key topics that allows the student to gauge their study progress.

C. E-Resources

1. ACPMedicine (Scientific American Medicine)

   This Online Textbook is available through the library e-books collection. It contains a series of excellent up-to-date chapters on a variety of disease process, detailing the underlying biology and pathology of each disease. Most importantly, each chapter ends with a discussion of the available therapeutic approaches to treat each disease, as well as a succinct review of the most important pharmacological aspects of each of the highlighted medications.

2. Up-to-Date
   URL http://www.utdol.com/application/search.asp

   This website is available through computers on campus and can be accessed via the library web site (under quick links). It provides access to an extensive searchable and clickable database of excellent articles and monographs on specific disease conditions and the medications used to treat them. Provides excellent discussion on all aspects of specific medications including indications, mechanism of action, side effects and drug interactions. An excellent resource of current up-to-date pharmacological information that is widely used on the clinical floors.

3. Medical Pharmacology- Online Pharmacology content & Practice questions

   This is a privately run web site that provides concise review notes on a comprehensive list of Pharmacological topics and specific medications. In addition, it offers the chance to take a number of different online practice exams for each topic. Although I cannot attest to the complete accuracy of the material, it seems that this site would be a good resource for exam preparation.

4. The Knowledge Objectives in Medical Pharmacology.
   URL http://www.aspet.org/AMSPC/Knowledge_Objectives/default.asp
This is the official list of important medications that every US medical student should be familiar with as defined by the Association for Medical School Pharmacology.

X. KEY CONTACTS

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REMEMBER TO CHECK YOUR E-MAIL ON A REGULAR BASIS. UPDATES AND CHANGES WILL BE ONLY POSTED THROUGH E-MAIL. ALSO CHECK THE WEEKLY COURSE SCHEDULE FOR ANY CHANGES.
# PHARMACOLOGY & THERAPEUTICS FACULTY

## SEMESTER III & IV 2014-2015

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