

University of Jordan-Faculty of Pharmacy
Department of Biopharmaceutics and Clinical Pharmacy

Semester: First
Course Title: Pharmacokinetics
Course Code: 1203475
Prerequisite (s): Biopharmaceutics (1203471)
Level: 4th year

| Coordinator | Office Number | Office Hours | E - mail |
|------------------------|---------------|----------------------------------|--------------------------|
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Course description

This course provides you with a basic intuitive understanding of the pharmacokinetic principles, terminology, models, equations and factors affecting drug absorption, distribution, metabolism and excretion and its importance in drug therapeutic or toxic effects. Emphasis will be placed upon the prediction of plasma levels of drugs under varying conditions applying different pharmacokinetic parameters. Solved examples obtained from literature and problem sets with answers are used to illustrate the application of pharmacokinetic principles and equations, making them realistic for clinical practice.

Course Objectives :

- 1) Mathematical background for modeling of the concentration time relationships for the different routes of administration.
- 2) Designing dosing regimens by relating plasma concentration of drugs to their pharmacological and toxicological action,
- 3) Individualization of therapy for patients.
- 4) Designing therapeutic drug monitoring plans for drugs with narrow therapeutic index or high toxicity.

Learning Outcomes :

A) Knowledge and understanding

- A1) Understanding mathematics of the time course of Absorption, Distribution, Metabolism, and Excretion (ADME) of drugs in the body.
- A2) Individualization of therapy and therapeutic drug monitoring for each patient.

B) Intellectual skills (cognitive and analytical)

- B1) Utilization of mathematics of the time course of Absorption, Distribution,

Metabolism, and Excretion (ADME) of drugs in the body for dosage optimization.

B2) Developing dosing regimens for the individualization of therapy for the patient

C) Subject specific skills

C1) Fitting concentration time profiles and estimating pharmacokinetic parameters.

C3) Designing dosing regimens in case of renal and hepatic dysfunction.

D) Transferable Skills

D1) Communicating the dosage adjustment with physicians.

D2) Suggesting therapeutic monitoring plans for physicians.

Teaching Methods :

1) Lectures

2) Case studies

Exams :

Midterm exam 40%

Quizzes and assignments 10%

Final exam 50%

Course contents

1. Introduction

2. The one-compartment open model with an intravenous bolus dose.

Plasma data; elimination rate constant, AUC, elimination half-life, volume of distribution and clearance

Urinary data; excretion rate constant and half-life, elimination rate constant

3. The one-compartment open model with an intravenous infusion. Continuous infusion, Infusion with a bolus dose, post infusion

4. The one-compartment open model with absorption and elimination; Absorption rate constant, calculation of F, method of residuals, flip-flop kinetics

5. The one-compartment open model with multiple dosing kinetics; Multiple dosing IV and oral, multiple dosing factor, accumulation factor, loading dose, and average concentration.

6. Designing dosing regimens

7. Dosage adjustment in renal failure. (Aminoglycosides)

8. The two-compartment open model with intravenous administration.

9. Non-linear pharmacokinetics

Michaelis-Menten kinetics, methods to obtain V_{max} and K_m (Phenytoin).

10. Pharmacodynamics

Linear models, E-max and time dependent response.

11. Therapeutic Drug Monitoring.

12. Bioequivalence revisited.

Textbooks and resources

- 1) Applied biopharmaceutics and pharmacokinetics, Shargel and Yu, 6th edition, 2012, McGraw-Hill Medical, **ISBN-13: 978-0071603935**
- 2) Basic pharmacokinetics, Sunil Jambhekar, Philip J. Breen, 2nd edition, 2012. Pharmaceutical Press. **ISBN-13: 978-0853699804**
- 3) Basic pharmacokinetics, Mohsen A. Hedaya, 2nd edition, 2012. CRC Press. **ISBN-13: 978-1-4398-5073-2**
- 4) Handbook of Basic Pharmacokinetics, Wolfgang A. Ritschel, Gregory L. Kearns, 7th edition, 2009, American Pharmacists Association. **ISBN-13: 9781582121260**
- 5) Clinical Pharmacokinetics and Pharmacodynamics, Rowland and Tozer, 4rd edition, 2011, Wolters Kluwer Health/Lippincott William & Wilkins. **ISBN-13: 9780781750097**
- 6) A First Course in Pharmacokinetics and Biopharmaceutics
<http://www.boomer.org/c/p1/>

Important regulations:-

Attendance: Mandatory.

First warning – with 4 absences

Last warning – with 5 absences

Failing in the subject – with 6 absences

No side talks

No use of mobile phones

Do not enter after the instructor

Cheating policy

The participation, the commitment of cheating will lead to applying all following penalties together

- 1) Failing the subject he/she cheated at
- 2) Failing the other subjects taken in the same course
- 3) Not allowed to register for the next semester. The summer semester is not considered as a semester

