NATS 3035 MOLECULAR PHARMACOKINETICS

Credit Points 10

Legacy Code 300912

Coordinator Gang Zheng (https://directory.westernsydney.edu.au/search/name/Gang Zheng/)

Description Molecular Pharmacokinetics builds on the fundamental chemical kinetic principles learnt in Physical Chemistry and extends them to the study of absorption, distribution, metabolism, and elimination of pharmaceutical drugs in human body. Upon completing this unit, students will gain a firm understanding of why the pharmacokinetic behaviour of a drug can be fully described by two key pharmacokinetic parameters (i.e. clearance and volume of distribution) and why the absorption rate of a drug can be predicted by examining its chemical structural features alone. Students will also gain the capability of designing dosage regimens for simplified pharmacokinetic scenarios and extracting important kinetic information from plasma drug concentration versus time data obtained experimentally.

School Science

Discipline Pharmacology

Student Contribution Band HECS Band 2 10cp

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 3 subject

Pre-requisite(s) CHEM 2010

Equivalent Subjects LGYA 6080 - Molecular Pharmacokinetics

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Describe mathematically the kinetic and mechanistic aspects of availability and removal of drugs in the body, including under conditions of continuous and periodic dosage.
2. Explain and compare the main forms of metabolic, oxidative and hydrolytic degradation experienced in vivo by the members of each of the major types of drug class.
3. Relate the chemical structure of members of a given major type of drug class to their relative stability to chemical oxidative, hydrolytic and enzymatic degradation in vitro, and to their ease of phase partitioning.
4. Describe the transport and the environment experienced in vivo of members of the major types of drug class relevant to their site of action.
5. Demonstrate appropriate advanced laboratory skills, for collection of kinetics and physicochemical data of the bioavailability, degradation and removal of drug molecules.

Subject Content

1. Kinetics of the bioavailability, degradation and removal of drug molecules.
2. Principles of pharmacokinetics of the transport of drugs across membranes of cells and tissues within the body.
3. Theory of physicochemical factors affecting the bioavailability of drugs in the body: pH, pKa, permeability, plasma protein binding, dissolution, molecular size and shape, hydrogen bonding, Log P, viscosity, conductivity, mobility, and hydrophibicity.
4. Principles of pharmacokinetics and mechanism of metabolism (oxidation, hydrolysis and conjugation), enzymatic degradation and stability within the body of members of the major types of drug: linear and nonlinear elimination, enzymatic, Michaelis-Menten and atypical kinetics.
5. Theory of in vitro adsorption of drugs onto proteins: free drug, receptors, agonists and messengers, Langmuir plots.
6. Time course concentration of the drugs in the body: from dose to time-course concentration of the drug in the plasma, area under the curve, renal clearance, elimination rates.

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task
Practical	1200 words for each report	40	N	Individual
Quiz x5 (Online)	15 min each	15	N	Individual
End of Session Quiz (Online)	45 min	10	N	Individual
Final Exam (Online)	2 hours	35	N	Individual

Prescribed Texts

- Hedaya, MA 2012, Basic Pharmacokinetics, 2nd ed., CRC Press, London. ISBN 9781439850732