

Phar 312(4), Bio-pharmaceutics and Clinical Pharmacokinetics

Pre-requisite: Physiology and Pharmacology I

Course objectives:

This course aims to equip the student with the theoretical, practical and mathematical backgrounds that describe drug availability and kinetics in the body.

Course description:

Part I of the course deals with Biopharmaceutics and covers mechanisms of drug absorption, effect of pH on drug absorption and the pH partition principle, role of dosage forms in the absorption of drugs, bioavailability and bioequivalence, factors affecting bioavailability, and evaluation of the bioavailability of a drug. Part II of the course is on Pharmacokinetics and it covers kinetic analysis of data, basic models for drug absorption and disposition, absorption, distribution and elimination, disposition and absorption kinetics, (intravenous dose, constant rate intravenous infusion extra vascular dose), and dosage regimens.

Teaching/learning methods:

- lecture (42 hrs)
- Demonstrations, tutorials (18hrs: 3 hrs x 6 weeks): exercises in computing pharmacokinetic parameters and data presentation

Assessment:

- written exams: 90% (30%: class tests, 60%: final exam)
- assignments: 10%

Course outline:

Part I: Biopharmaceutics

1. Biological Introduction (2 hrs)
Physiology of: membrane, skin, GIT, and renal, circulatory system
2. Mechanisms of Drug Absorption (4 hrs)
Diffusion, simple non-ionic, ionic electrochemical and facilitated diffusion, active transport, pinocytosis and exocytosis
3. Effect of pH on Drug Absorption and the pH Partition Principle (1 hr)
4. Role of Dosage Forms in the Absorption of Drugs
- 4.1 Absorption of drugs from solutions (3 hrs)
Effects of gastrointestinal pH, GIT motility, rate determining steps
- 4.2 Absorption of drugs from solid dosage forms (3 hrs)
Steps involved, dissolution and the Noyes-Whitney equation;
in vitro in vivo correlation of drug absorption
5. Principles of the Bioavailability of Drugs

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| 5.1 | Bioavailability and bioequivalence (including generic bioequivalence) | (2 hrs) |
| 5.2 | Factors affecting bioavailability | (2 hrs) |
| 5.3 | Evaluation of the bioavailability of a drug | (2 hrs) |

Part II: Pharmacokinetics

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| 6. | Kinetic Analysis of Data: order and rate constants | (1 hr) |
| 7. | Concepts in Pharmacokinetics | |
| 7.1 | Basic models for drug absorption and disposition | (2 hrs) |
| 7.2 | Absorption | (1 hr) |
| 7.3 | Distribution (rate and extent of distribution) | (2 hrs) |
| 7.4 | Elimination (renal clearance and elimination, biotransformation and biliary excretion) | (2 hrs) |
| 8. | Disposition and Absorption Kinetics | |
| 8.1 | Intravenous dose
Concept of bolus, disposition viewed from plasma only, disposition, viewed from plasma and urine, disposition viewed from urine only, estimation of pharmacokinetic parameters, dependence of elimination kinetics on clearance and distribution | (3 hrs) |
| 8.2 | Constant rate intravenous infusion
Drug level-time relationships, assessment of pharmacokinetic parameters | (2 hrs) |
| 8.3 | Extravascular dose
Kinetics of absorption, body level-time relationships | (2 hrs) |
| 9. | Dosage Regimens | |
| 9.1 | Empirical and kinetic approaches to drug therapy | (1 hr) |
| 9.2 | Therapeutic dosage regimen | (1 hr) |
| 9.3 | Relationships between initial and maintenance doses | (1 hr) |
| 9.4 | Maintenance of drug levels in the therapeutic range | (1 hr) |
| 9.5 | Practical aspects of multiple dose administration | (1 hr) |
| 9.6 | Use of plasma concentration to design dosage regimens | (1 hr) |
| 9.7 | Prolonged release | (1 hr) |
| 9.8 | Assessment of pharmacokinetic parameters | (1 hr) |

Books recommended;

- Notari, R. E. Biopharmaceutics and Clinical Pharmacokinetics, 4th ed. Marcel Dekker, Inc., New York, 1987.
- Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics, 3rd ed. Lea & Febiger, Philadelphia, 1984.
- Rowland, M. and Tozer, T. N. Clinical Pharmacokinetics, Lea & Febiger, Philadelphia, 1980.
- Shargel, L. and Yu, A. B. C. Applied Biopharmaceutics and Pharmacokinetics 2nd ed. Appleton-Century-Crofts, Connecticut, 1985.
- Curry, S. H. Drug Disposition and Pharmacokinetics, 3rd ed. Blackwell Scientific Publications, Oxford, 1980.

