

SEMESTER –IV
BIOPHARMACEUTICS AND PHARMACODYNAMICS
THEORY

Programme: M.Sc.
Course Code: P20/CHE/DSE/404
Type of course: DSE – 8
No. of credits : 4

Max.Hours : 60
Hours / week: 4

COURSE OBJECTIVES:

- Introduction to Pharmacokinetics and importance of ADME studies of drugs. Routes of administration
- To discuss Pharmacodynamics of the drugs
- To explain Plasma Drug concentration vs Time profile, Definition and explanation of various terms: MEC, MSC, MTC, AU
- To describe mechanisms of drug interactions.

COURSE OUTCOMES:

CO1: Acquire the knowledge about the pharmacokinetics and importance of ADME studies of drugs and routes of administration

CO2: Describe Pharmacodynamics of the drugs

CO3: Explain Plasma Drug concentration vs Time profile, Definition and explanation of various terms: MEC, MSC, MTC, AUC

CO4: Explain mechanisms of drug interactions.

MODULE I - PHARMACOKINETICS:

(15 Hrs)

Introduction and importance of ADME studies of drugs. Routes of administration.

- i) **Absorption:** Definition, absorption of drugs across the membranes. Physico chemical factors affecting the drug absorption (emphasis on pH partition hypothesis and Drug Dissolution). Methods of determination of drug absorption. Bioavailability
- ii) **Distribution:** Apparent volume of drug distribution. Factors affecting distribution, plasma protein binding.
- iii) **Metabolism:** Sites of drug metabolism, metabolic rate constant, bioactivation and biotransformation of drugs (phase I and phase II reactions)
- iv) **Elimination:** Types of elimination and overall apparent elimination rate constant and half-life, concept of clearance.

MODULE II - PHARMACODYNAMIC:

(15 Hrs)

Introduction, targets for drug action, receptor concept. Pharmacological binding terms. Two-state receptor model, receptor families- structure and signal transduction mechanisms- channel linked proteins, gating mechanism, G-protein coupled receptors, G-protein and their role, Targets for G-proteins, Kinase linked receptors, receptors that regulate gene transcription. Theories of concentration -response relationship, dose-response curves.

MODULE III - PRINCIPLES OF THERAPEUTICS:

(15 Hrs)

Plasma Drug concentration vs Time profile, Definition and explanation of various terms: MEC, MSC, MTC, AUC(graph). Peak plasma concentration, time of peak concentration. Therapeutic range. Steady state concentration, onset of action, onset of time, duration of action, intensity of action. LD₅₀, ED₅₀. Therapeutic objective. Dosage regimen, Design of dosage regimes: Dose size, dosing frequency, drug accumulation during multiple dosing, time to reach steady-state during multiple dosing, average concentration and body content on multiple dosing to steady state, loading dose, maintenance dose, maintenance of drug within the therapeutic range, design of dosage regimen from plasma concentration. Kinetics of fixed dose, fixed time interval regimes. Modification to dosage regime: Dosing of drugs in obese patients, dosing of drugs in Neonates, infants & children, dosing of drugs in geriatrics (elderly), dosing of drugs in Hepatic disease, dosing of drugs in renal disease.

MODULE IV - DRUG INTERACTIONS:

(15 Hrs)

Introduction, classification, Mechanisms of drug interactions.– pharmacokinetic interactions(alteration of gastrointestinal absorption, complexation and adsorption, alteration of distribution, alteration of metabolism and alteration of excretion) & pharmacodynamic interactions (antagonistic effects, synergistic effects, alteration of electrolyte levels, interactions involving adrenergic system, alteration of receptor site interaction and antibiotic combinations). Influence of alcohol (Antibiotics, Anti coagulants, Anti histamines, Anti psychotic drugs, sedatives and Hypnotics), smoking(Theophylline, Diazepam, a Tri cyclic antidepressants), food (Bronchodilators, Diuretics, ACE Inhibitors, Anti coagulants, Tetracyclines) on drug action.

Reference books

1. Pharmacokinetics. By Shobha Rani
2. Elements of Pharmacology. By Gandhi, Desani & Goyal.
3. Goodman & Gilman's "The pharmacological basis of therapeutics. By Gilman & Rali.
4. Pharmacology. By Rang.
5. Biopharmaceutics and pharmacokinetics By Brahmanikar
6. Pharmacology By Lippincott
7. Modern Pharmacology with Clinical Applications. By R. Craig.
8. Comprehensive pharmacy review by Leon Shargel
9. Hospital and clinical pharmacy
10. Burger's medicinal chemistry and drug discovery. By Manfred E. Wolf.
11. Introduction to Medicinal chemistry. By Patrick.
12. Comprehensive medicinal chemistry. Vol 1-5 By Hanzsch.
13. Principles of medicinal chemistry. By William Foye
14. Biochemical approach to medicinal chemistry. By Thomas Nogrady.