

INTRODUCTION TO PHARMACOLOGY

Dept. of Pharmacology, GMC
Amritsar

1

Pharmacology is a branch of medicine which deals with drugs.

Pharmacology – drugs
Pharmacology – studies

Samuel Dale, 1693 – 1st book of Pharmacology

Oswald Schmiedberg (1838-1921)

– Father of Modern Pharmacology.

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2

Pharmacokinetics

Kinetics means movement.

- Absorption.
- Distribution.
- Biotransformation.
- Excretion.

It is **what the body does to the drug**.

- Time course of drug conc; Order of reaction; Plasma half-life & steady state conc; Therapeutic drug monitoring.
- Drug dosage & dosing schedules.

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3

Pharmacodynamics

- Dynamics means power
- Pharmacodynamics can be defined as the study of the biochemical & physiological effects of drugs & their mechanism of action.
- It is **what the drug does to the body**.
- Qualitative aspects:

Receptors, Enzymes, Selectivity.

Quantitative aspects: Dose response, Potency, Therapeutic efficacy, Tolerance.

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4

Definitions

- Clinical Pharmacology deals with the study of drug effects in humans beings, i.e. healthy volunteers and patients.
- Experimental Pharmacology deals with the study of drug effects in laboratory animals.
In vitro – Isolated tissue.
In vivo – Intact organism.

Definitions

- Pharmacotherapeutics is the use of drugs in the prevention & treatment of diseases.
- Toxicology deals with adverse reactions of drugs & their treatment.
- Pharmacy is the collection, compounding and dispensing of drugs.

Drug

- A drug is a chemical substance that affects processes in living organism & used for treatment, prophylaxis (prevention) or diagnosis of the disease.
- WHO defines a drug is a chemical substance or biological product that is used or intended to be used to modify or explore physiological systems or pathological states for the benefit of the recipient.
- Drug is called medicine when used in proper dosage form for safe administration. All medicines are drugs but all drugs are not medicines.

Essential Drug Concept

- WHO 1977
- Essential drugs are those drugs which satisfy health care needs of the majority of the population, be available at all times in adequate amounts, in appropriate dosage forms and at reasonable cost.

Orphan Drugs

- When a drug is not developed into a usable medicine because the costs will not be recovered by the developer then it is known as orphan drug & the disease is an orphan disease.
- Orphan drugs are those which are used for treatment, prevention or diagnosis of rare diseases like Kala-Azar, Cancers, Viral diseases, Heavy metal Poisoning.

Pharmacopoeia

- An official book published by authorized body in a country containing description of commonly used drugs with their sources, properties, uses, doses, purity and potency. It is revised every five years. Drugs contained in pharmacopoeia are official drugs.
- I.P. – Indian pharmacopoeia.
B.P. – British pharmacopoeia.
U.S.P. – United states pharmacopoeia.

Sources of Drugs

- Natural – Plants, microorganisms, animals, minerals.
- Synthetic.
- Semi-synthetic.
- Biosynthetic.
- Gene based therapy (Gene therapy).

Natural Drugs

- **Plants**
e.g. Morphine from Poppy capsules.
Atropine from belladonna leaves.
Quinine from Cinchona bark.
Castor oil from castor seeds.
- **Animals**
e.g. Insulin from Pig or Ox pancreas.
Thyroxine from Pig or Ox thyroi gland.
Heparin from Pig or Ox liver.
Cod Liver Oil from Cod fish Liver.

Natural Drugs

- **Microorganisms**

- e.g. Penicillin from *Penicillium notatum*.
- Streptomycin from *Streptomyces griseus*.
- Bacitracin from *Bacillus subtilis*.
- Diastase from *Aspergillus oryzae*.

- **Minerals**

- e.g. Calcium, Magnesium, Aluminium, Sodium, Potassium & Iron salts
- Liquid paraffin from petroleum.

Synthetic Drugs

They are prepared by chemical synthesis in pharmaceutical laboratories.

- ✓ Sulphonamides
- ✓ Salicylates
- ✓ Barbiturates
- ✓ Benzodiazepines.

Semi-Synthetic Drugs

- These are prepared by chemical modification of natural drugs in labs.

- ✓ Ampicillin from Penicillin-G.
- ✓ Dihydroergotamine from Ergotamine.
- ✓ Dehydroemetine from Emetine.

Bio-Synthetic Drugs

These are prepared by cloning of human DNA into bacteria like E.Coli.

- CLONING means production of identical subjects like parent.
- TECHNIQUE is called Recombinant DNA technology or Genetic Engineering.
 - ✓ Human Insulins
 - ✓ Human Growth Hormones (Somatrem, Somatropin)
 - ✓ Human Interferons, alpha & beta.
 - ✓ Tissue plasminogen activator (Alteplase)
 - ✓ Human BCG vaccine.
 - ✓ Human Hepatitis-B Vaccine

Gene Therapy

It is the introduction of functional genetic material DNA into target cells to replace or supplement defective genes. It imparts new function to cells.

- ✓ Cancers, Gauchers ds.
- ✓ Alzheimers ds., Sickle Cell Anaemia
- ✓ Parkinsons ds., Dwarfism.
- ✓ Diabetes mellitus, multiple Sclerosis.
- ✓ Hypertension.
- ✓ Viral infections.
- ✓ Cystic fibrosis.
- ✓ Muscular dystrophy.