



# Introduction to Pharmacology

# Derivation

## Pharmacology =>

- **Pharmakon** = Active Principle/Active Ingredient or equivalent to drug, medicine or poison &
- **Logia** = study.

## PHARMACOLOGY

means:

**"THE SCIENCE OF DRUGS"**

# Pharmacology



- Science that deal with the drugs
- Derived from Greek words
- Pharmacon – An active principle/ drug
- Logos – Discourse/ Study
- India & China – Oldest known Pharmacological writings
- Vedas – Earliest Indian records
- Rig Veda – 3000 B.C



# DEFINITION



## Pharmacology:

- Is the study of substances that interact with living systems through **chemical process**, especially by binding to **regulatory molecules** & activating or inhibiting normal body process.
- Includes, history, source, properties, compounding, biochemical and physiological effects, PK and PD, therapeutic and other uses, precautions, adverse effects, interactions and contra-indications of drugs.

# Pharmacology

- **Modern Medicine**

- Date (450 B.C) from Hippocrates, a Greek physician
- Concept – pathologic process, observation, analysis
- Deduction by medicine

- **Western Medicine**

- From Egypt, Assyria and Babylonia
- Papyri – First written account of medical experiences from Egypt (1900 B.C)

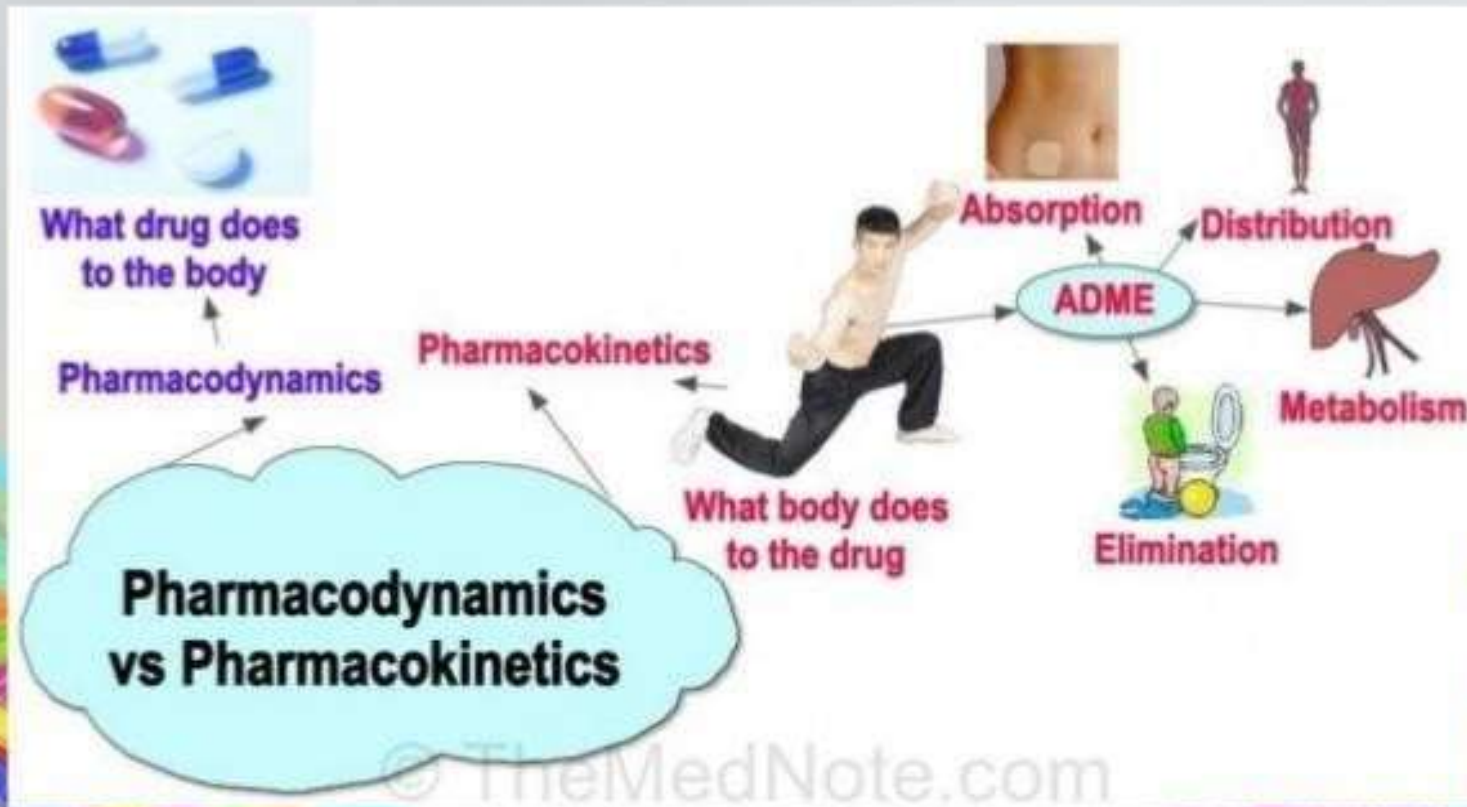
# Pharmacology

- Homeopathy (Similar suffering)
  - Concept introduced by Hanneman in 19<sup>th</sup> century
  - Like cures like & dilution potentiates the action of the drug
- Allopathy (other suffering)
  - Popularised by James Gregory (1753-1821)
  - Differs from Modern Scientific medicine
  - Wrongly applied

# Pharmacology



# Pharmacology

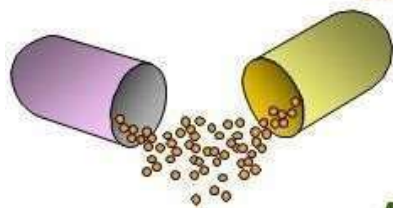




# Pharmacology

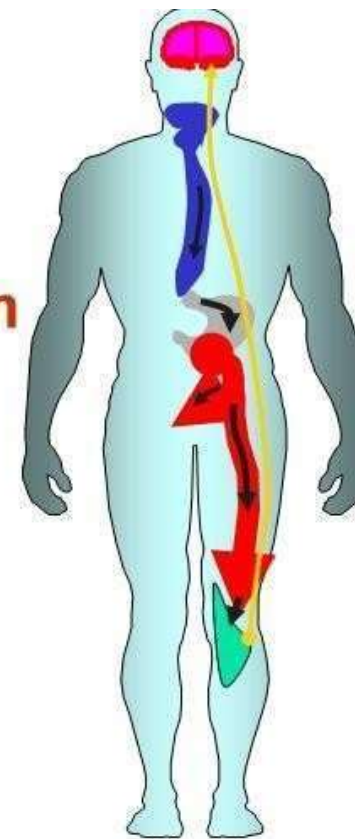
**Pharmacodynamics, PD**

**Drug Action and Mechanism**



**Absorption, Distribution,  
Metabolism, Excretion**

**Pharmacokinetics, PK**



# Drug

- Derived from French word drogue – a dry herb
- Drug is defined as any substance used for the purpose of diagnosis, prevention, relief/ cure of a disease in man/ animals

- According to WHO

A drug is any substance / product that is used or intended to be used to modify/ explore physiological systems/ pathological state for the benefit of the recipient

# Drug

- ✓ A French word 'Drogue' which means dry herb.
- ✓ Any substance that brings about a change in biologic function through its chemical action.
- ✓ Alters state in the body:  
=>can't create new function but alter existing function.
- ✓ Are poisons if they used irrationally.
- ✓ Poisons are drugs that have almost exclusively harmful effects. However, Paracelsus famously stated that "the dose makes the poison,"
- ✓ "Poisons in small doses are the best medicines; and useful medicines in too large doses are poisonous.
- ✓ *"Every drug is a medicine but every medicine is not a drug!!!"*

# Receptors

- ✓ Specialized target **macromolecules** present on the **cell surface** or **intracellularly**.
- ✓ The biological molecule plays a regulatory role.
- ✓ Drugs bind with receptors & initiate events leading to alterations in biochemical activity of a cell, and consequently, the function of an organ.
- ✓ Some times, the drug may act through **non-specific physicochemical mechanisms**.
  - Osmotic properties (bulk laxatives, saline purgatives, mannitol)
  - Adsorbents (kaolin, charcoal)

# History of Pharmacology

- ✓ Pre-historic people recognized beneficial & toxic effects of many plant & animal materials.
- ✓ Preceding the modern era, there were attempts to introduce rational methods into medicine.
  - But none were successful owing to the dominance of systems of thought [without experimentation & observation].
- ✓ Around end of 17<sup>th</sup> century, reliance on observation & experimentation began.
- ✓ About 60yrs ago, controlled clinical trial reintroduced; expansion of research efforts;
  - Drug action & receptor.
- ✓ Now, the molecular mechanism of action of many drugs is known.

# Allied topics of Pharmacology

- Pharmacognosy
- Pharmacy
- Clinical Pharmacy
- Pharmacokinetics
- Pharmacodynamics
- Pharmacotherapeutics
- Toxicology
- Chemotherapy
- Pharmacoepidemiology
- Pharmacoeconomics
- Pharmacovigilance
- Pharmacogenetics
- Pharmacogenomics

# Basic Areas of Pharmacology

- Pharmacokinetics (Biodisposition of drugs)
  - Pharmacodynamics
- ✓ **Pharmacokinetics**: deals with absorption, distribution, biotransformation & excretion of drugs.
  - ✓ **Pharmacodynamics**: study of biochemical & physiological effects of drugs & their **MOA**.
  - ✓ **Pharmacotherapeutics**: use of drugs in prevention & treatment of disease.
  - ✓ **Chemotherapy**: effect of drugs upon microorganisms, parasites and neoplastic cells living & multiplying in living organism.
  - ✓ **Toxicology**: branch of pharmacology which deals with the undesirable effects of chemicals on living systems.
  - ✓ **Pharmacogenomics**: relationship of individual's genetic makeup to his/her response to specific drugs.

## Pharmacopoeia

- Official code containing selected established list of drugs
- Descriptions, standards
- IP, BP, USP, Ph. Eur
- **Formulary**
  - Information about available drugs
  - Based on original and reputed drug information sources
  - WHO Model Formulary: Help countries to develop national formulary
  - The British National Formulary: BMA & RPS



# The Nature and Source of Drugs

- Mineral: Liquid paraffin, MgSo<sub>4</sub>, Mg trisilicate, Kaolin
- Animal: insulin, thyroid extract, heparin, Gn, sera
- Plant: Morphine, digoxin, quinine, atropine, reserpine
- Microorganism: Penicillins
- Synthetic: Analgesic, hypnotic, anticancer, antimicrobials
- Genetic engineering: Insulin, GH (rDNA)
- Hybridoma technique: Monoclonal Abs

# PLANT SOURCE



Source	Plant	Drug	Use
Leaf	Digitalis	Digoxin	CHF
Bark	Cinchona	Quinine	Malaria
Fruit	Opium	Morphine	Analgesic
Seed	Eserin	Anticholinestrerase	M.G

Contd.,

## ANIMAL SOURCE



- Obtained from animal

### Drug

Heparin

Insulin

Thyroxin

Vit. B<sub>12</sub>

Cod liver oil

Anti toxic sera

### Animal

Leech

Pork pancreas

Thyroid

Liver extract

Contd.,



# MINERAL SOURCE



- Use in pharmacotherapy

## Mineral

- Ferrous sulfate ( $\text{FeSO}_4$ )
- Magnesium sulfate ( $\text{MgSO}_4$ )
- Sodium bicarbonate ( $\text{NaHCO}_3$ )

## Use

- Anaemia
- Purgative
- Antacid



# Application of pharmacology

- ✓ To control speed of **onset**, **intensity** of the drug's **effect**, and **duration** of **action**. Hence decide on route of administration, the amount and frequency of each dose, and the dosing intervals.
- ✓ To identify the possible **side effect**, and **withdrawal symptoms** of drugs and take measures to manage.
- ✓ To avoid **adverse effects** from **drug interaction** and **contraindicated drugs**.
- ✓ To avoid **adverse effects** in **special populations** like geriatrics, paediatrics, pregnant and lactating mothers.
- ✓ To avoid treatment failure due to **tolerance & resistance**.
- ✓ To **control misuse** of drugs by the patient & health professionals.

