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

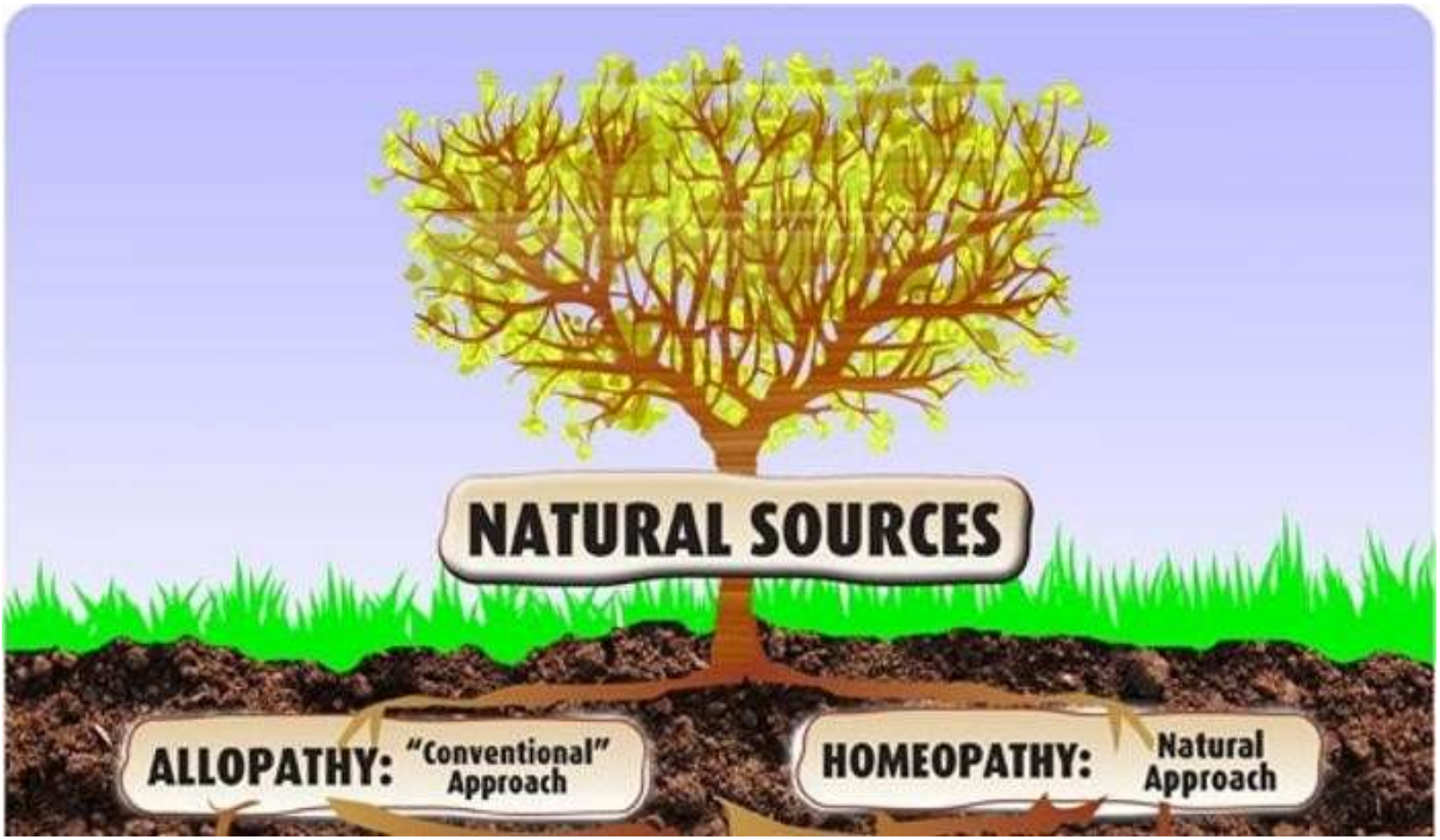
- **Western Medicine**
  - From Egypt, Assyria and Babylonia
  - Papyri – First written account of medical experiences from Egypt (1900 B.C)

Pharmacology

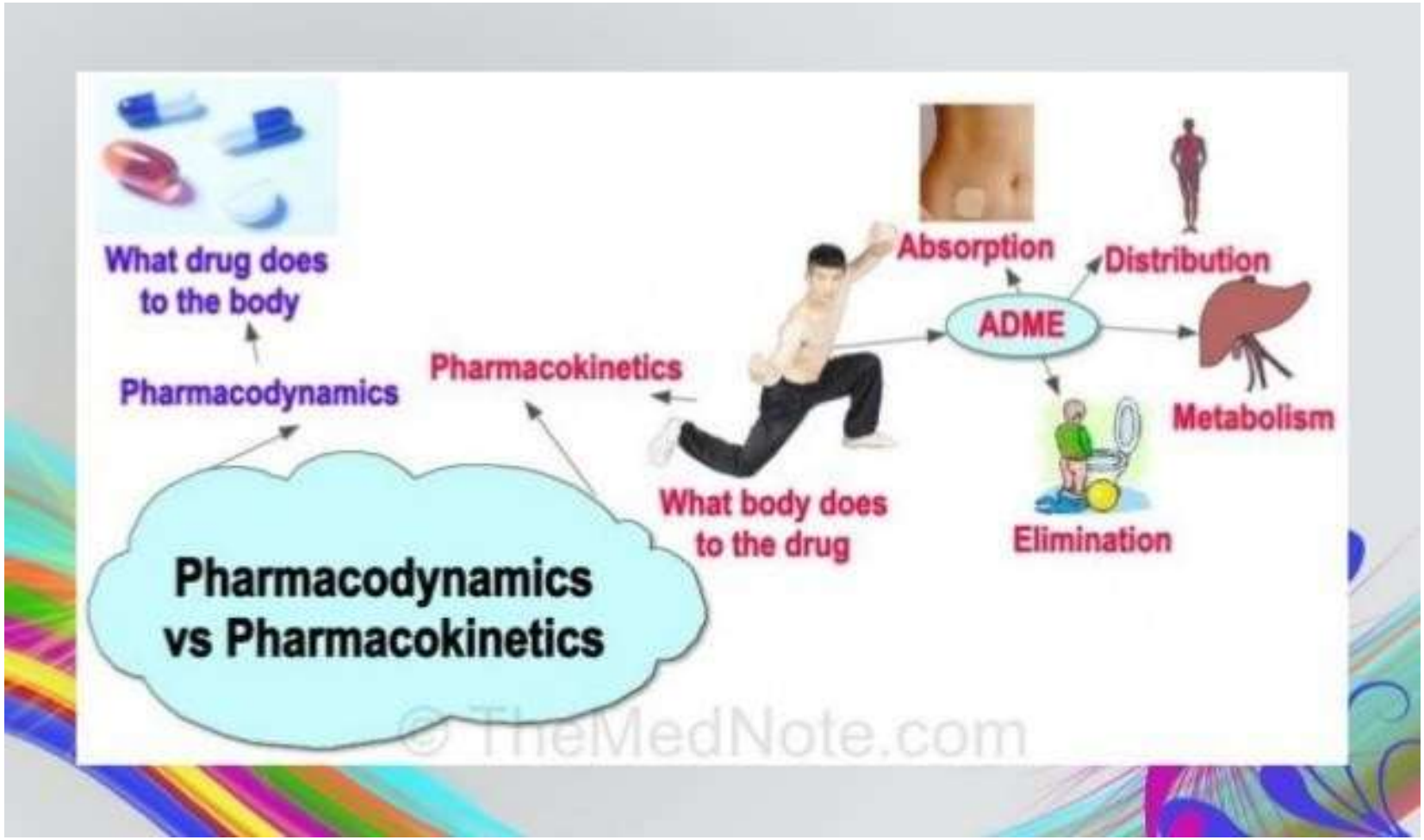
- Homeopathy (Similar suffering)
  - Concept introduced by Hanneman in 19th century
  - Like cures like & dilution potentiates the action of the drug

- Allopathy (other suffering)
  - Popularised by James Gregory (1753-1821)
  - Differs from Modern Scientific medicine
  - Wrongly applied

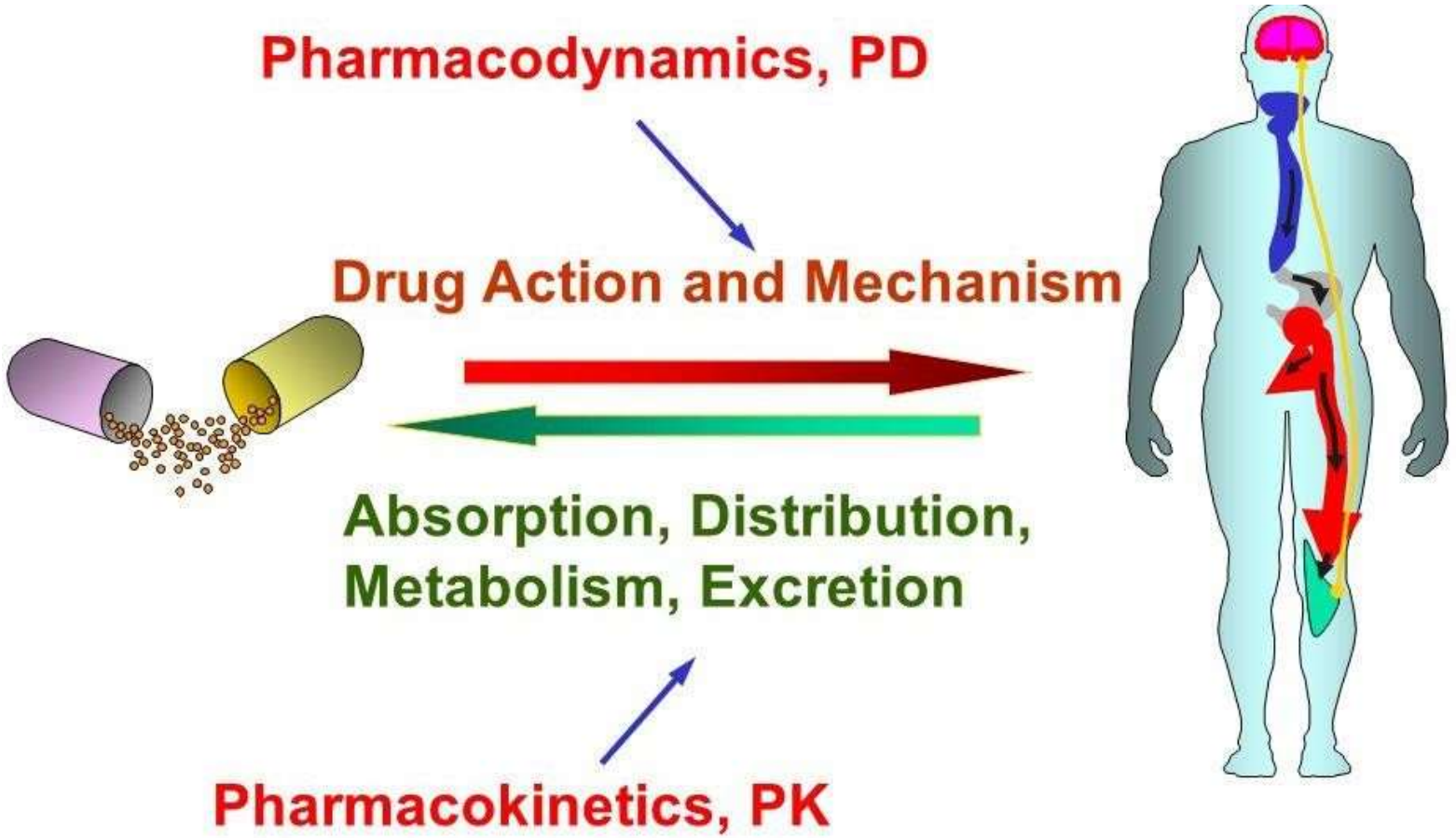
Pharmacology



Pharmacology



Pharmacology



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

- ✓ Prehistoric 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 17th 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**
  - Offical code containing selected established list of drugs
  - Descriptions, sandards
  - 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, $MgSo_4$, 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	Anticholinestrase	M.G

Contd.,

ANIMAL SOURCE

- Obtained from animal

Drug	Animal
Heparin	Leech
Insulin	Pork pancreas
Thyroxin	Thyroid
Vit. B_{12}	Liver extract
Cod liver oil	
Anti toxic sera	

Contd.,

MINERAL SOURCE

- Use in pharmacotherapy

Mineral	Use
• Ferrous sulfate($FeSo_4$)	Anaemia
• Magnesium sulfate($MgSo_4$)	Purgative
• Sodium bicarbonate ($NaHco_3$)	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.