

Branches & Scope of Pharmacology

(Lecture-5 : Dated 07.10.2020)



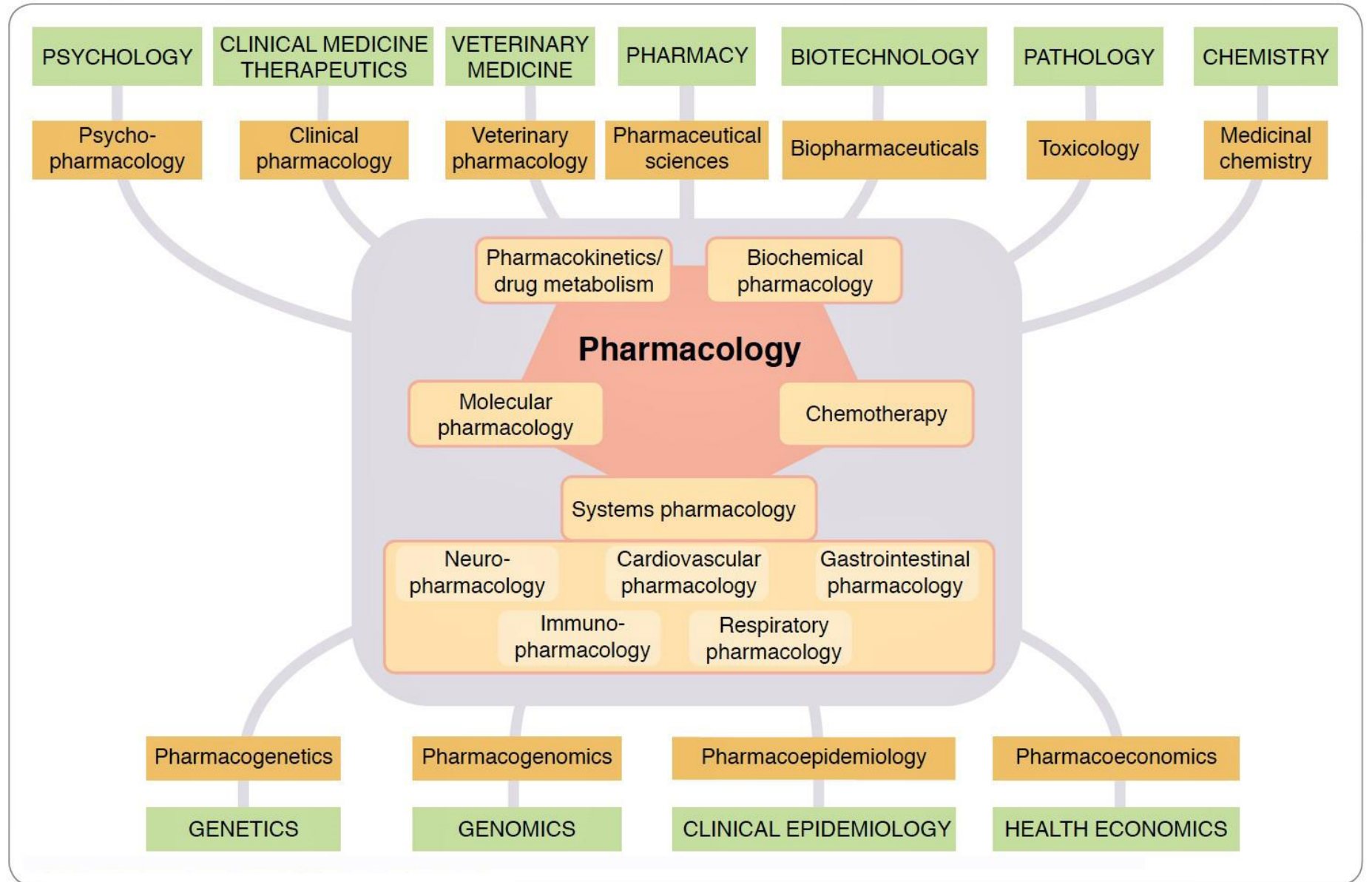
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Pharmacology today with its various sub-disciplines



Source:
Rang & Dale's
Pharmacology,
Elsevier

Important Sub-disciplines/ Branches of Pharmacology

Pharmacokinetics

- It deals with study of Absorption, Distribution, Metabolism and Excretion (ADME) of drugs.
- In other words, it means "What the body does to the drug?"

Pharmacodynamics

- It deals with study of **Biochemical and Physiological effects** of drugs and their **Mechanism of action.**
- In other words, it means **“What the drug does to the body?”**

Chemotherapy

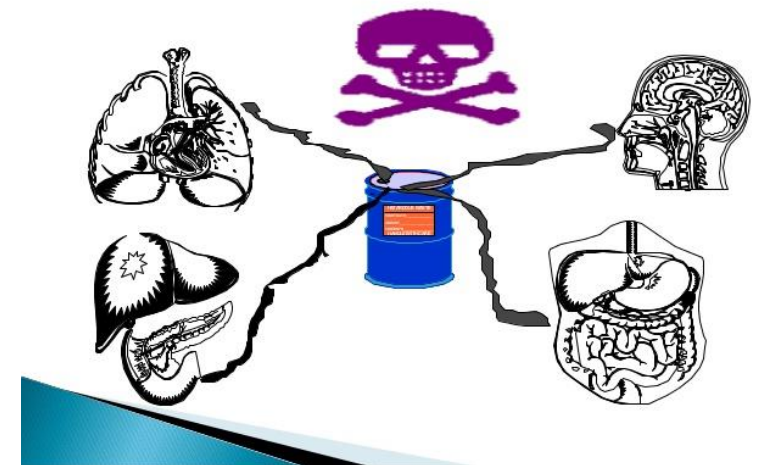
- It deals with study of drugs which selectively inhibit or destroy specific agents of diseases such as bacteria, viruses, fungi and parasites.



Toxicology

- It deals with study of **adverse effects of drugs or chemicals** on living systems.

THE STUDY OF POISONS



Clinical Pharmacology

- It deals with study of drugs in man and animals as pertaining to or founded on **clinical observations** on living systems.



Experimental Pharmacology

- It deals with study of action of drugs in animals/ animal tissues under laboratory conditions.



Medicinal Chemistry

- It deals with study of **designing and synthesis of new drugs**.
- It is largely based on the **Structure Activity Relationship** data of existing drugs belonging to **one generic group**.



Pharmacognosy

- It deals with study of **sources and identification of drugs.**
- Study of drugs derived from plant and animal sources (their sources, identification, constituents and detection of substituents or adulterants).



Pharmacy

- It deals with study of **collection, compounding and dispensing of drugs** so as to make them fit for administration to patients.



Pharmacoeconomics

- It deals with study of **cost effectiveness** of drug treatments.



Pharmacoepidemiology

- It deals with study of drugs effects at the population level.
- It is concerned with the variability of drug effects between individuals in a population, and between populations.



Pharmacogenetics

- The study of **genetic influences on responses to drugs**, initially focused on familial idiosyncratic drug reactions, where affected individuals show an abnormal - usually adverse - response to a class of drug.



Pharmacogenomics

- It now covers broader genetically based variations in drug response, where the genetic basis is more complex, the aim being to use **genetic information to guide the choice of drug therapy** on an individual basis - so-called **personalised medicine**.

Pharmacovigilance

- The science and activities relating to the **detection, assessment, understanding and prevention of adverse effects or any other possible drug related problems.**



Scope of Pharmacology

Scope

An Area in which something

- **Acts**
- **Operates**
- **Has Power OR Control**

Present

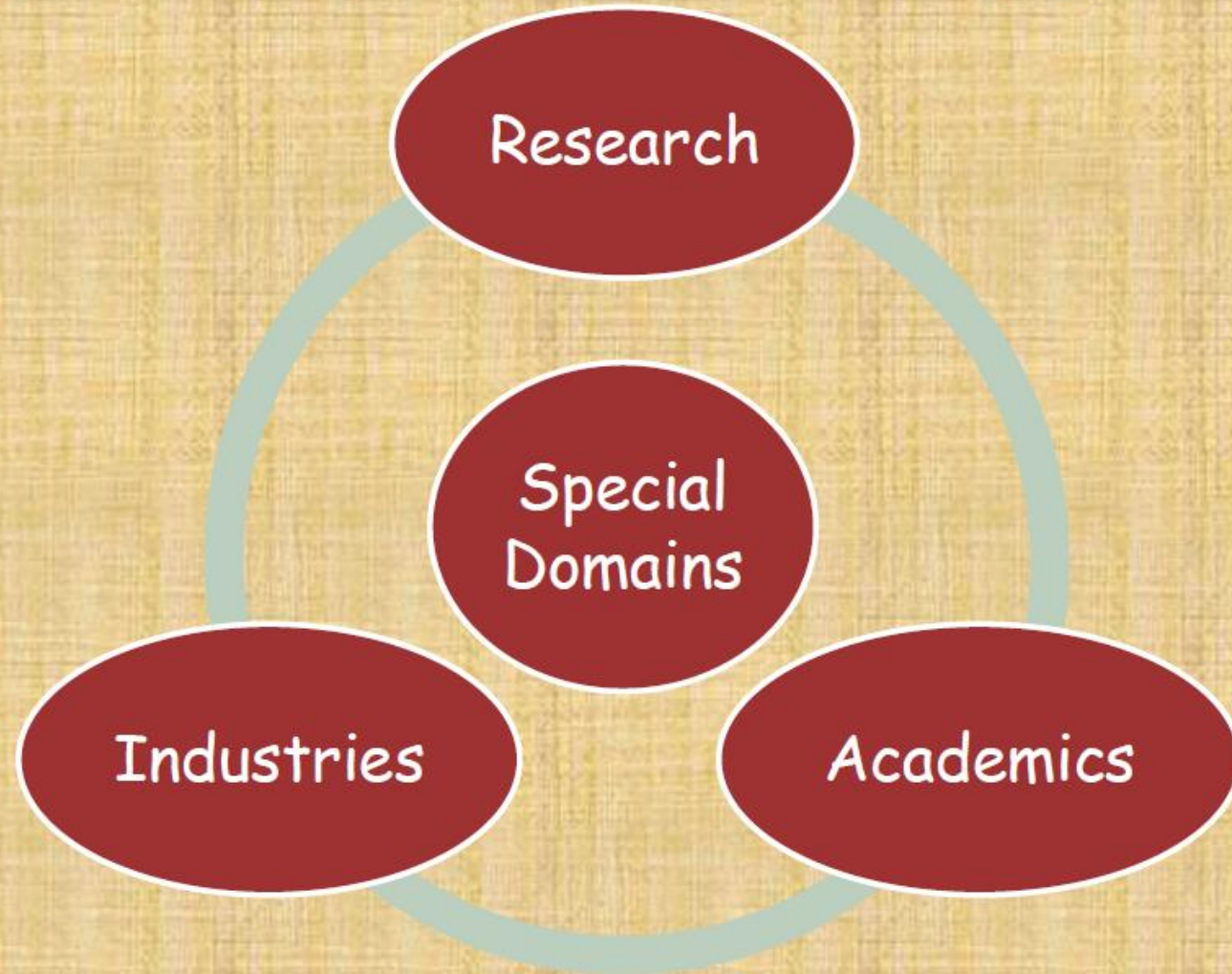
- **Academics**
- **Research**
- **Industries**
- **Special Domain Areas**

Future

- **Proteomics**
- **Pharmacogenomics**
- **Bioinformatics**
- **Nanomedicine**
- **Neutraceuticals**

Present

Universe of Pharmacology



Research

- Stages of drug development

Drug discovery phase

Preclinical phase

Clinical trial phase

Drug discovery phase

1. Random screening

2. Serendipity (Happy observation ,by chance)

3. Rational drug designing

4. Designing of a prodrug or active metabolite as a drug



Preclinical/Experimental phase

- AIM- To satisfy all requirements that are needed before a compound is considered fit to be tested in human
- Require 1.5-2 yrs
- Out of 10,000 compounds screened only 10 qualify for preclinical evaluation



- Deals with effect of various pharmacological agents on different animal species
- Aims:
 - Find out the therapeutic agent suitable for human use
 - Study of toxicity of the drugs
 - Study the mechanism and site of action of drugs

Done by -

1) In Vitro Study- Receptor characterization
Enzyme inhibition
Cytokine activity

2) In Vivo Study- Animal experiments



Clinical trial phase

Systematic study of new drug in human subjects

Phase 1-Healthy volunteers

(25-100) , Open label

Determines- safe dose

- pharmacokinetics
- any predictable toxicity

Phase 2-patient with target disease

Determine -efficacy

-definitive end point

A)Early phase 2- (200 patients)

Single blind

B) Late phase 2- (200-400 patients)
Double blind

Phase 3- (1000-5000+)
Large scale multicentre double blind
To further establish safety and efficacy

These 3 phases take 5-6 yrs

-New drug application for licensing

Phase 4- post licensing phase
No fixed duration
Periodic safety update report (PSUR) is to be submitted

Reverse Pharmacology

- Reverse pharmacology is the science of integrating documented clinical/experimental hits, **into leads by transdisciplinary exploratory studies** and further developing these into drug candidates by experimental and clinical research."
- Examples :
 - Rauwolfia alkaloids in hypertension
 - Psoralens in vitiligo

Concept of reverse pharmacology

- It relates routine 'Lab to clinic' progress of discovery to 'Clinic to lab'.
- Conventional molecule → mice → man
- Reverse pharmacology man → mice → molecule
- In the process, safety remains most important starting point and efficacy becomes matter of validation.

Academics

- Under Graduate Education
- Post Graduate Education

Clinical Pharmacology

- **Basic science of pharmacology:** application of pharmacological principles and methods in the real world.
- **Frontiers of Clinical Pharmacology:-**
 - Clinical trials Bioavailability / Bioequivalence studies
 - Prescription audit
 - Antibiotic stewardship
 - Drug use survey
 - Rational use of medicines
 - Therapeutic drug monitoring (TDM) service.

Industries

- **Research: New Drug Development**
- Medical/ Veterinary advisor
- Medical marketing
- Product management
- Contract research organization
- Training

Future

- Proteomics
- Pharmacogenomics
- Bioinformatics
- Nanomedicine
- Neutraceuticals



Thank You