

# DEFINITION OF PHARMACOLOGY; DRUGS; CLASSIFICATION AND NAMING

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# CONTENTS

- **DEFINATION AND DIVISIONS**
- **DRUG SOURCES**
- **DRUG CLASSIFICATION**
- **DRUG NAMES**
- **DOSE FORMS OF DRUGS**

# DEFINITION AND DIVISIONS

- **PHARMACOLOGY** : It is the science that deals with interaction of drugs with living systems.

**Drugs** : These are chemical substances that shows biological activity (treatment or sometimes diagnosis).

- **Divisions of Pharmacology:**

## **1. Pharmacodynamics :**

**(What the drug does to the body)**

- This deals with the action of drugs on living tissues , namely the type or quality of action, its quantitative aspect , as well as the mechanism of action .

- Adverse effects and safety of drugs on body tissues or systems are also included
- The main organ or tissue on which the drug acts , and for which it is used therapeutically, is called the **target organ or tissue** of drug action

## 2. Pharmacokinetics :

(What the body does to drug)

- This includes administration and absorption of drugs, their distribution inside body, and their elimination by metabolism or excretion

# OTHER TOPICS LINKED WITH PHARMACOLOGY

- 1. Pharmacotherapeutics:** It is concerned with the proper use of drugs in treatment of disease in man
- 2. Clinical Pharmacology:** This includes :-
  - A. Drug pharmacology
  - B. Clinical evaluation of drugs in treating disease in man. This is done by :
    - a. Clinical trials
    - b. Surveillance studies
- 3. Chemotherapy :** It is used to imply the use of drugs to inhibit growth or kill either :
  - a. Microbes (i.e. anti-microbial agents)
  - b. Cancer cells ( Cyto-toxic anti-cancer drugs)

**4. Pharmacy :** It is the science and profession that is concerned with the preparation, storage, dispensing, and proper utilization of drug products

**5. Toxicology :** It is the science that deals with the harmful effects of chemicals (including drugs) .

# DRUG SOURCES

These may be either :-

## **I. Synthetic sources :** common at present

- these drugs are prepared by the labs or factories of the pharmaceutical industry. Nowadays, computers greatly assist in discovery of new drugs

## **II. Semi-synthetic drugs :**

- these are obtained from natural sources, but are modified by pharmaceutical industry in order to improve their physical or chemical properties or pharmacological activity.

**III. Natural sources :** These are **less used now** . They may be either :

**1. Organic :**

**A. Plants :** Any part of the plant (stem, leaves, flowers, seeds, roots) may be used to extract active ingredients for drugs; same plant may contain more than one active principle. All of this is dealt with in **PHARMACOGNOSY**

Examples of drugs from plants are : alkaloids, steroids, some vitamins, tannins, volatile oils, gums

**Note :**

**Alkaloids** are small organic molecules containing nitrogen . e.g. atropine, morphine, caffeine, theophylline, quinine

**B. Animals :** these may include either proteins , oils, enzymes from exocrine glands, hormones, vaccines and anti-sera, and some vitamins

**C. Microbes :** like fungi, and sometimes bacteria which are sources of antibiotics

## **2. Non-Organic sources :**

- metals : Platinum, Zinc
- non-metals : Sodium chloride , magnesium sulfate

## Rational drug design:

- This implies the ability to predict the chemical structure of drug molecule on basis of 3-dimensional structure of its receptor, employing at present suitable computer programs. Only few drugs in clinical use at present were developed in this rational way.
- Most drugs were in the past developed through random testing of chemicals , or modified molecules of known drugs that are known to have some pharmacological effect.

**However, as more becomes known about detailed structure of receptors, rational drug design with the aid of computers would become more feasible**

# DRUG CLASSIFICATION

**There is no fixed rule;** classification is usually done according to their :

**1. Therapeutic use :** e.g. anti-hypertensive drugs ; anti-microbial drugs ; anaesthetics; hypoglycemic drugs; anticoagulants;

**2. Type of pharmacological action :**

**This should be precise.** e.g. local or general anaesthetics; vasodilators; anticoagulants **OR** **according to molecular or cellular site of action in target cells** e.g. enzyme inhibitors, receptor blockers , ion channel blockers, inhibitors of transporters, antimicrobials acting on cell wall, DNA, or ribosomes

**3. Physiological systems on which they act :** Drugs acting on cardio-vascular system; drugs acting on GIT or CNS or respiratory system

**4. Chemical nature or Source :**

Common chemical groups or structures can be used to classify drugs that have similarity in their pharmacological profile e.g. benzodiazepines, steroids.

For drugs derived from nature, both the plant species or genus and drug chemistry are included e.g. belladonna alkaloids from *atropa belladonna* , digitalis glycosides from *Digitalis* leaves .

# DRUG NAMES

## 1. Chemical name :

- Because of its complexity , the chemical structure is not usually used to name drugs.
- However, sometimes a shorthand name based on a simple chemical structure is employed e.g. **acetylsalicylic acid (aspirin)** , **acetaminophen (parectamol)**



## 2. Generic (non-proprietary) name :

- This is a unique name that is given by official pharmaceutical bodies;
- It is present in **pharmacopeas (BP or USP)** .
- It is the approved scientific name, and must be used in scientific publications as well as in prescriptions esp. in hospitals .
- Its use makes it easier for pharmacist to choose from many available brands of same drug.
- **Only few drugs show more than one generic name :**  
Noradrenaline & adrenaline in UK but are named Nor-epinephrine and epinephrine, respectively, in USA & WHO; salbutamol in UK while albuterol in USA
- **Generic names of drugs in a classified group may have common endings** e.g. – **olol** for beta-adrenoceptor blockers; **-caine** for local anaesthetic drugs. These endings may give a hint about the drug pharmacotherapeutic action

### 3. Commercial or trade or brand or proprietary name:

- This name is given by the specific pharmaceutical company synthesizing and marketing the drug.
- Examples: Diclofenac Na (Voltaren, Inflanban, Diclogesic)
- A single drug can have many brand names (this may be confusing) due to its manufacture and marketing by many pharmaceutical companies.



# DOSE FORMS OF DRUGS

- It is the physical form of drug product that is suitable for administration to man. It contains specified dose or amount of drug in a specified quantity or unit of the formulation.
  
- **Types of drug dose forms:**
  1. Oral
  2. Inhalational
  3. Parenteral
  4. Topical
  5. Suppository

**1. Oral dose forms:** It includes the following

- A. Pill: Tablets and capsules
- B. Liquid: Syrup or suspension
- C. Powder
- D. Herbal plants: seeds, leaves etc..
- E. Pastes



**2. Inhalational:**

- A. Aerosol
- B. Inhaler
- C. Vaporizer (Solutions)



**3. Parenteral:**

- |                         |                       |
|-------------------------|-----------------------|
| A. Intradermal (ID)     | B. Intramuscular (IM) |
| C. Intraperitoneal (IP) | D. Intravenous (IV)   |
| E. Subcutaneous (SC)    | F. Intrathecal (IT)   |

#### **4. Topical:**

- A. Cream, gel, ointment, lotion
- B. Eye drops ( ophthalmic)
- C. Ear drops (otic)
- D. Skin patch (transdermal)

#### **5. Suppository:**

- A. Vaginal
- B. Rectal

THANKS