

Part I

General Pharmacology

1. Definitions and Sources of Drugs	2
2. Routes of Drug Administration	4
3. Pharmacokinetics	8
4. Pharmacodynamics	17
5. Drug Interactions	37
6. Adverse Drug Reactions and Its Monitoring and Pharmacovigilance	41
7. Occupational and Environmental Pesticides, Food Adulterants, and Insect Repellents	45
8. Management of Common Poisonings, Insecticides, and Common Stings and Bites	51
9. New Drug Approval Process and Clinical Trials	63
10. Pharmacogenomics and Pharmacoeconomics	66
11. Dietary Supplements and Nutraceuticals	76
12. Drug Regulations, Acts, and Other Legal Aspects	79
13. Prescription Writing	82
14. Basic Aspects of Geriatric and Pediatric Pharmacology	87
15. National Health Programme	91



Chapter 1

Definitions and Sources of Drugs

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Learning Objectives

- Common terms.
- Drug nomenclature.

Pharmacology (PH1.1)

Pharmacology is a science that deals with the effects of drugs on the living system. Widely, it encompasses all aspects of knowledge about drugs; however, medical pharmacology, which is relevant, is defined as the science of substances used to prevent, diagnose, and treat disease.

The World Health Organization (WHO) defines drug as any substance or product that is used or intended to be used, in order to modify or explore the physiological system or pathological states for the benefit of a recipient.

The two main divisions of pharmacology are as follows:

- **Pharmacokinetics:** It is the movement of drug within the body, which includes the processes of absorption (A) distribution (D), metabolism (M), and excretion (E). It also means "what body does to the drug."
- **Pharmacodynamics:** It is the study of drugs, their mechanism of action, pharmacological actions, and their adverse effects. It also means "what drug does to body."

Common Terms

Pharmacy: It is the science that deals with preparation, preservation, standardization, compounding, dispensing, and proper utilization of drugs.

Therapeutics: It is concerned with the treatment of diseases.

Toxicology: It is the study of poisons, their actions, detection, prevention, and treatment of poisoning.

Chemotherapy: It deals with treatment of infectious diseases/cancer.

Clinical pharmacology: It is the study of drug in man, both healthy volunteers and patients. It includes evaluation of pharmacokinetics and pharmacodynamics data, safety, efficacy, and adverse effects of a drug by comparative clinical trials.

Essential drugs: These are those drugs that satisfy the health care needs of majority of the population. They should be available at all times in adequate amounts and in appropriate dosage forms (WHO).

Orphan drug: The drugs used for diagnosis, treatment, or prevention of rare diseases.

Drug Nomenclature (PH1.9)

Chemical name: It describes the chemical composition of a drug, for example, acetylsalicylic acid. They are not suitable for use in prescribing.

Nonproprietary/generic name: It is the name assigned by a scientific authority, for example, the United States Adopted Name (USAN) Council and the British Approved Name (BAN). It is the same all over world, for example, aspirin.

Proprietary name (brand name): It is the name assigned by the manufacturer and is the property/trademark of the manufacturer, for example, Disprin. Often brand name is memorable, appealing, and indicative of drug use, for example, Asmanil (generic name Salbutamol), indicating its use in asthma. However, a drug may have different brand names; also, the same manufacturer can assign the same drug different brand names in different countries.

Sources of Drugs

There are various sources of drugs.

Natural

Drugs can be obtained from plants, animals, microorganisms, and recombinant deoxyribonucleic acid (DNA) technology.

- **Plants:** Plant products are being used in treatment since centuries. Based on their chemical composition, they can be divided into following categories:
 - **Alkaloids:** These are alkaline nitrogenous bases, having potent activity, for example, morphine, atropine, and quinine.
 - **Glycosides:** These are compounds with heterocyclic nonsugar moiety linked to a sugar moiety through ether linkage, for example, digoxin and digitoxin.
 - **Oils:** These are viscous liquids insoluble in water, for example, castor oil is a purgative, clove oil is used as an analgesic in dental pain, and Nilgiri oil is used as a counterirritant.
- **Animals:** These are mainly organ extracts, for example, insulin and thyroxine.
- **Minerals:** Some minerals are used as medicinal substances, for example, ferrous sulfate and magnesium sulfate.
- **Microorganisms:** Most antibiotics are obtained from fungi, bacteria, for example, penicillin and streptomycin.
- **Genetic engineering (recombinant DNA technology):** Several drugs are produced by recombinant DNA technology, for example, human insulin and hepatitis B vaccine.

Synthetic

Synthetic drugs form the largest source of medicines. Synthetic drugs are pure and designed to target specific macromolecules, for example, angiotensin-converting enzyme (ACE) inhibitors and thiazides. On the other hand, semisynthetic drugs are chemically modified natural products that are highly selective than their natural counterparts, for example, atropine substitutes.

Multiple Choice Questions

1. Which of the following is/are drug(s) obtained from natural sources?

- A. Angiotensin-converting enzyme (ACE) inhibitors.
- B. Thiazides.
- C. Morphine.
- D. Methamphetamine.

Answer: B

Alkaloids are alkaline nitrogenous bases, having potent activity, for example, morphine, atropine, and quinine. Drugs can be obtained from plants, animals, microorganisms, and recombinant deoxyribonucleic acid (DNA) technology. Morphine is an opiate alkaloid isolated from the plant *Papaver somniferum*.

2. "Essential drugs" are:

- A. Life-saving drugs.
- B. Drugs that meet the priority health care needs of the population.
- C. Drugs that must be present in the emergency bag of a doctor.
- D. Drugs that are listed in the pharmacopeia of a country.

Answer: B

The WHO has defined essential medicines (drugs) as "those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost effectiveness."

3. An "orphan drug" is:

- A. A very cheap drug.
- B. A drug that has no therapeutic use.
- C. A drug needed for treatment or prevention of a rare disease.
- D. A drug that acts on orphan in receptors.

Answer: C

These are drugs or biological products for diagnosis/treatment/prevention of a rare disease or condition, or a more common disease (endemic only in resource-poor countries) for which there is no reasonable expectation that the cost of developing and marketing it will be recovered from the sales of that drug.