

Introduction to Pharmacology

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At the end of this lecture, the students should be able to define and comment on:

The drug, its sources, drug action and effect, main and side effects

Pharmacology

Pharmacy

Substandard and counterfeit drugs

Expiry date

The Drug

A drug is any chemical agent that interacts with living processes and used because of this action in the: treatment, prevention or diagnosis of disease (biologically active substance)

Treatment could be curative (as antibiotics in bacterial infections) or suppressive (as in treatment of hypertension, diabetes, epilepsy ...etc

Prevention e.g. malaria, Tb contacts, aspirin after myocardial infarction ...

Diagnosis e.g. edrophonium (short-acting anticholinesterase) in the diagnosis of myasthenia gravis

Sources of drugs

A drug may occur naturally in: animals e.g. insulin, or plants: e.g. morphine from opium

It may be semi-synthetic e.g. aspirin from salicylates

Or wholly synthetic e.g. phenobarbitone and most recent drugs

A drug should pass through 4 filters before being prescribed for the patients:

Efficacy (Is it efficacious? If yes...)

Safety (Is it safe? If yes ...)

Suitability (Is it suitable to be administered?)

Cost (it should not be expensive)

Drugs are rarely highly selective for one system. For this reason, they have:

- a main effect i.e. the one we wish to use therapeutically
- Side effects are undesirable in a particular condition

These side effects could be:

- harmless e.g. red discoloration of urine by rifampicin
- harmful (adverse) e.g. aplastic anemia, bleeding, ...

Drug action and Drug effect

Drug action: is the initial drug combination with cellular components (enzymes, membrane or other functional components)

Drug effects: is the biochemical or physiological changes resulting from its action

Example:

A drug like salbutamol (Ventolin) can bind and stimulates β_2 -receptors in bronchial smooth muscles (drug action)

The result of this is relaxation of bronchial smooth muscles and bronchodilatation (drug effect)

Pharmacology

Is the science that deals with the properties and effects of drugs including their mechanism of action.

There are two main aspects of pharmacology

- Pharmacodynamics

is the study of biochemical and physiological effects of the drug on the body including its mechanism of action

- Pharmacokinetics

is the study of the effect of the body on the drug in terms of absorption, distribution, metabolism and excretion.

Pharmacy

is concerned with the preparation and dispensing of drugs

Preparation (Industrial pharmacy)

Dispensing (Clinical pharmacy)

Substandard Drugs

A drug is called a **substandard** drug when the composition of a drug product **do not conform** with the correct scientific specifications (it is a reference work for pharmaceutical drug specifications, called Pharmacopoeia)

These substandard drugs can be:

Ineffective leading to exacerbation of the patient's condition, or **Toxic**, or **Both** And can be fatal

Substandard products may be caused by:

- **Human error** (defective batch) (unintentional)
- **Counterfeiting** (fake drugs) (intentional)

Examples of counterfeit (fake drugs): (Look-alike products)

These look-alike products may:

- contain little or no active ingredient
- possibly contain harmful ingredients
- be expired but have been repackaged and remarketed with a much later expiration date.

Magnitude of the problem

The WHO has estimated that 10% of global pharmaceutical sales involves counterfeit drugs. In countries with weak regulatory authorities (e.g. developing countries), counterfeit medicines may comprise 20-50% of available products.

The Expiration (Expiry) Date

When the expiration date is, for example, 3 years, this indicates that during these 3 years, the manufacturer *guarantees* full potency and safety of the drug.

What happens after this period?

At the time of expiry date, the drug may lose more than 10% of its original potency when stored under proper storage conditions.

Therefore, expiration date *does not* indicate the drug is no longer effective or becomes harmful. Few drugs become harmful (toxic) when expired (renal tubular damage that was associated with use of degraded tetracycline)

Shelf-life of a drug

A product's "shelf life" generally means the length of time you can expect a product to look and act as expected and to stay safe for use. This length of time varies, depending on the type of product, how it is used, and how it is stored.