# 01: Introduction to Pharmacology

## History Of Pharmacology

**Materia medica**: the science of drug preparation and medical use of drugs began to develop around the 17th century. Pharmacological studies developed from this.

**Magendie and Bernard**: Laid the foundations for animal physiology and pharmacology in the 18th and 19th centuries.

**Pharmacogenomics**: the study of how an individual’s genetic make up affects his or her response to a drug.

## Introduction To Pharmacology Terminology

**Pharmacology**: study of the way that substances interact with the systems of the body to activate or inhibit its processes.

**Toxicology**: the term used to describe the undesirable effects of drugs.

**Drug**: any substance that brings about a change in biological function through its chemical actions.

**Prodrug**: a substance that is administered in its inactive form, but once absorbed, is converted into an active drug molecule.

**Xenobiotic**: a drug molecule that is a chemical not synthesized by the body.

**Poison**: drugs that cause harmful and undesirable effects.

**Toxins**: poisons that are of biological origin.

## Physical Nature Of Drugs

There are four characteristics of drugs that affect how they interact with the body.

- **Drug size**
- **Drug reactivity and drug-receptor bonds**
- **Drug shape**
- **Degree of ionization**

**Drug Size**: affects binding to receptors as well as the permeability through membranes.

**Drug Reactivity and Drug-Receptor Bonds**: Drugs may bind with receptor molecules through covalent, electrostatic and hydrophobic bonds

- **Covalent bonds**: tend to be stronger and hence result in irreversible interactions
- **Hydrophobic bonds**: on the other hand are relatively weak

**Drug Shape**: shape of the drug molecule is important factor in determining how well it will fit into its receptor

**Ionization State of a Drug**: Drug molecules exist in ionized and unionized forms

**Henderson-Hassellbalch Equation**: Calculates the percentage of ionized & unionized molecules in solution.

## Types Of Drug Interactions

**Drug interactions can be divided into**:

- **Pharmacodynamic**: the actions of the drug on the body
  - **Agonist**
  - **Antagonist**
- **Pharmacokinetic**: the actions of the body on the drug

**Agonists**: initiate changes in cell function, producing effects of various types. Their potency depends upon their:

- **Affinity**: the tendency to bind to receptors
- **Efficacy**: the ability to initiate changes once bound

**Full Agonists**:

- Produce maximal effects
- Have high efficacy

**Partial Agonist**:

- Produce a lower response at full receptor occupancy than full agonists
- Have intermediate efficacy

**Antagonists**: prevent agonists from activating receptors

- **Reversible competitive antagonism**: Progressively inhibit the agonist response; at maximal concentrations, they completely prevent the response.

- **Irreversible competitive antagonism**: Block the chain of events that leads to the production of a response by the agonist.

**Non-competitive antagonism**:

- **Chemical antagonism**: interaction of two substances in solution so that the effect of the active drug is lost
- **Pharmacokinetic antagonism**: one drug affecting the absorption, metabolism or excretion of another drug
- **Physiological antagonism**: two agents producing opposing physiological effects

**Pharmacodynamic effect**: the duration of drug action depends upon how long the drug occupies the receptor.

**The Dose-Response Relationship**: for a given dose of a drug, there will be a given biological response that is directly proportional to the given dose.

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How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then recite it out on a blank sheet of paper.