

**DRUG METABOLISM
(BIOTRANSFORMATION)
and
PRODRUGS**

**INTRODUCTION TO
PHARMACEUTICAL CHEMISTRY**

Drug metabolism is the metabolic breakdown / chemical changes of drugs by living organisms, usually through specialized enzymatic systems.

- **Metabolite** is the product of a drug after metabolic reactions.

- Metabolism is a very important mechanism for the elimination of drugs from the body.

PRO DRUG

- While not exhibiting any activity in vitro, they give the active compounds metabolically in vivo. These are called **pro drugs**.

PHASES OF METABOLISM

Phase I Reactions

- Functionalization reactions

1. OXIDATION REACTIONS

- Aromatic oxidation (Aromatic hydroxylation)
- Alken epoxidation
- Oxidation of aliphatic and alicyclic carbon atoms
- Oxidation of carbons adjacent to an sp² center
(Oxidation of carbon atoms in benzyl, allylic and carbonyl or imine α- position)
- Oxidation of carbon-nitrogen systems
(Oxidative N-dealkylation, oxidative deamination, N-oxide formation, N-hydroxylation)
- Oxidation of carbon-oxygen systems (Oxidative O-dealkylation)
- Oxidation of carbon-sulfur systems
(Oxidative S-dealkylation, S-oxidation, desulfurization)
- Alcohol and aldehyde oxidation

2. REDUCTION REACTIONS

- Carbonyl (aldehyde, ketone) reduction
- Nitro reduction
- Azo reduction

3. HYDROLYSIS REACTIONS

- Hydrolysis of esters and amides

Phase II Reactions

- Conjugation reactions

- **glucuronic acid**
- **sulfate**
- **acetate**
- **an amino acid**