SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIAC TECHNOLOGY

COURSE NAME : BIOCHEMISTRY

TOPIC : ENZYME INHIBITION

Enzyme Inhibiton

- Any substance that can diminish the velocity of an enzyme catalyzed
- These include drugs, antibiotics, poisons, and anti-metabolites.
- Useful in understanding the sequence of enzyme catalyzed reactions, metabolic regulation, studying the mechanism of cell toxicity produced by toxicants.
- Forms the basis of drug designing.

Enzyme Inhibitors

Blocking an enzyme's activity can kill a pathogen or correct a metabolic imbalance.

Many **medications** are enzyme inhibitors.

Enzyme inhibitors are also used as **herbicides** and **pesticides**.

EXAMPLE:

- Another example of competitive inhibition is **protease inhibitors**.
- They are a class of **anti-retroviral drugs** used to treat HIV.
- The structure of the drug ritonavir *(say ri-TAHN-a-veer)* **resembles the substrate of HIV protease**, an enzyme required for HIV to be made.

Types of Enzyme Inhibiton

- Reversible inhibitors
- Irreversible inhibitors

Reversible inhibitors can be classified into :

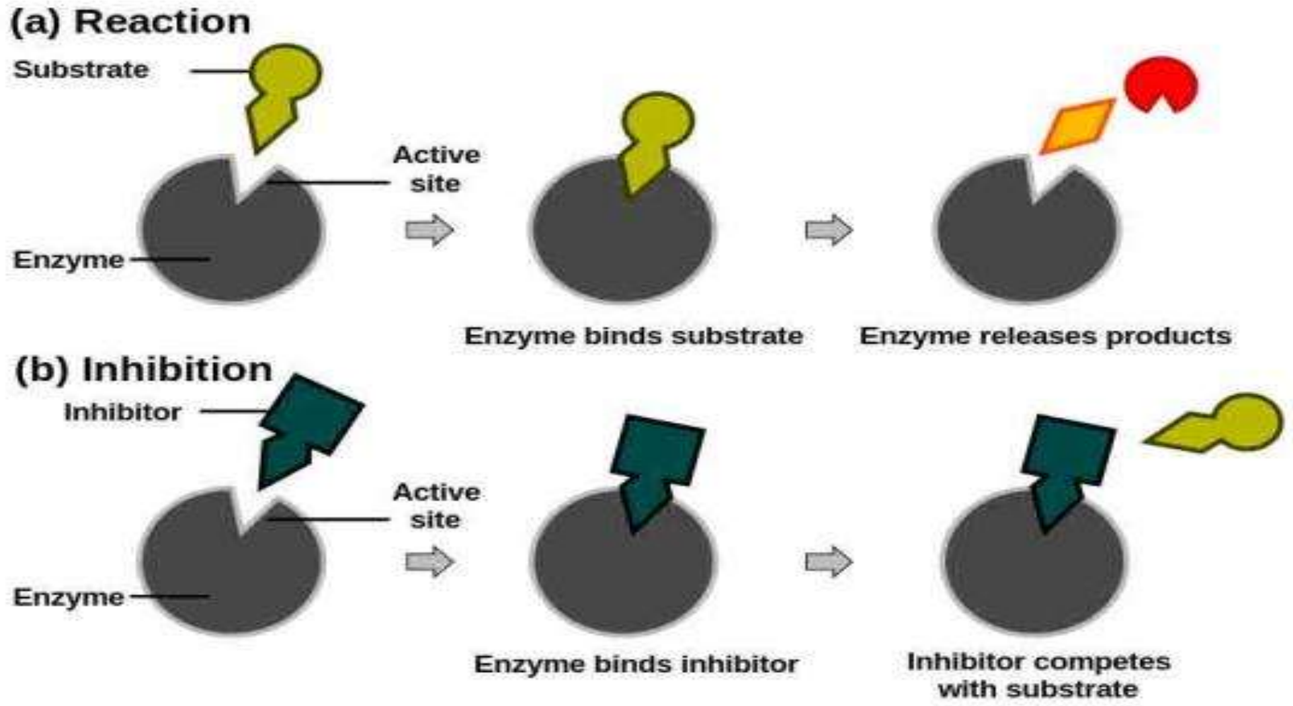
- **Competitive**
- **Non-competitive**
- **Un-competitive**

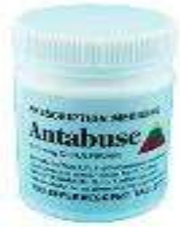
Two Types of Enzyme Inhibitors

1. Competitive inhibitor

Chemicals that resemble an enzyme's normal substrate and compete with it for the active site.

Reversible depending on concentration of inhibitor and substrate.





EXAMPLE: The drug **Antabuse** is used to help alcoholics quit drinking. Antabuse ***inhibits aldehyde oxidase***, resulting in the accumulation of acetaldehyde during the metabolism of alcohol. Elevated acetaldehyde levels cause symptoms of nausea and vomiting.

Competitive Inhibition

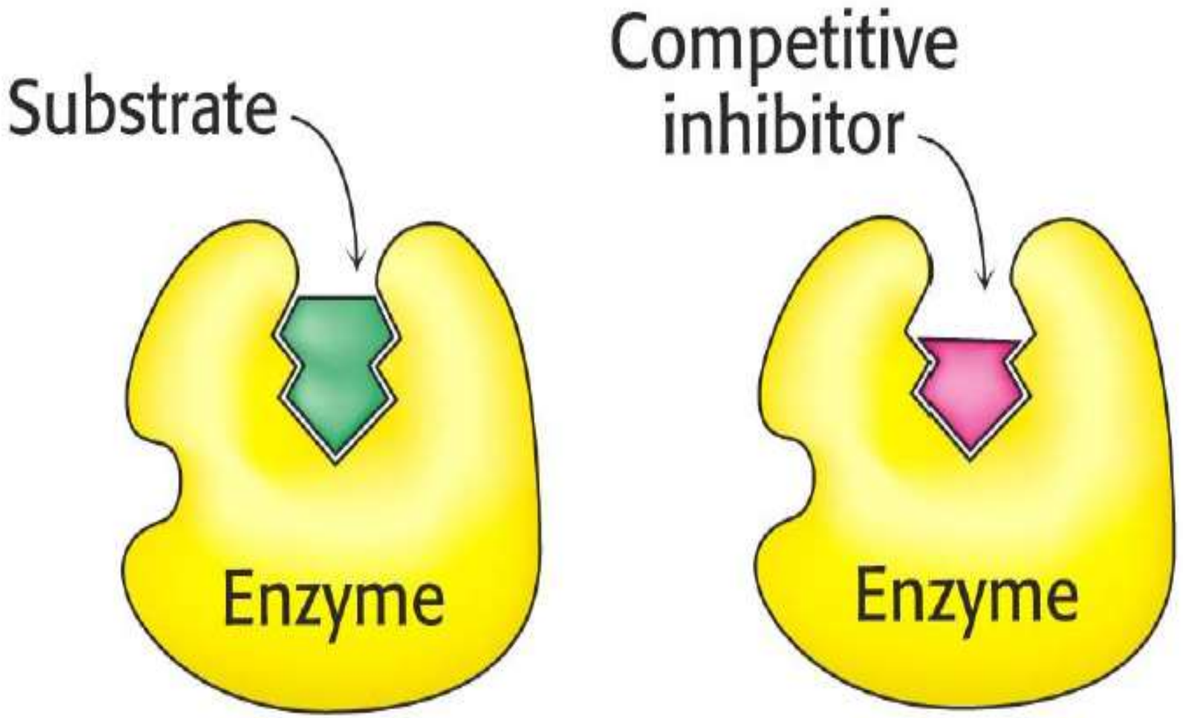
$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} P + E$$

$$+$$

$$I$$

$$K_I \Downarrow \Uparrow$$

$$EI + S \longrightarrow \text{NO REACTION}$$




Substrate
Active site
(a) A substrate can normally bind to the active site of an enzyme.

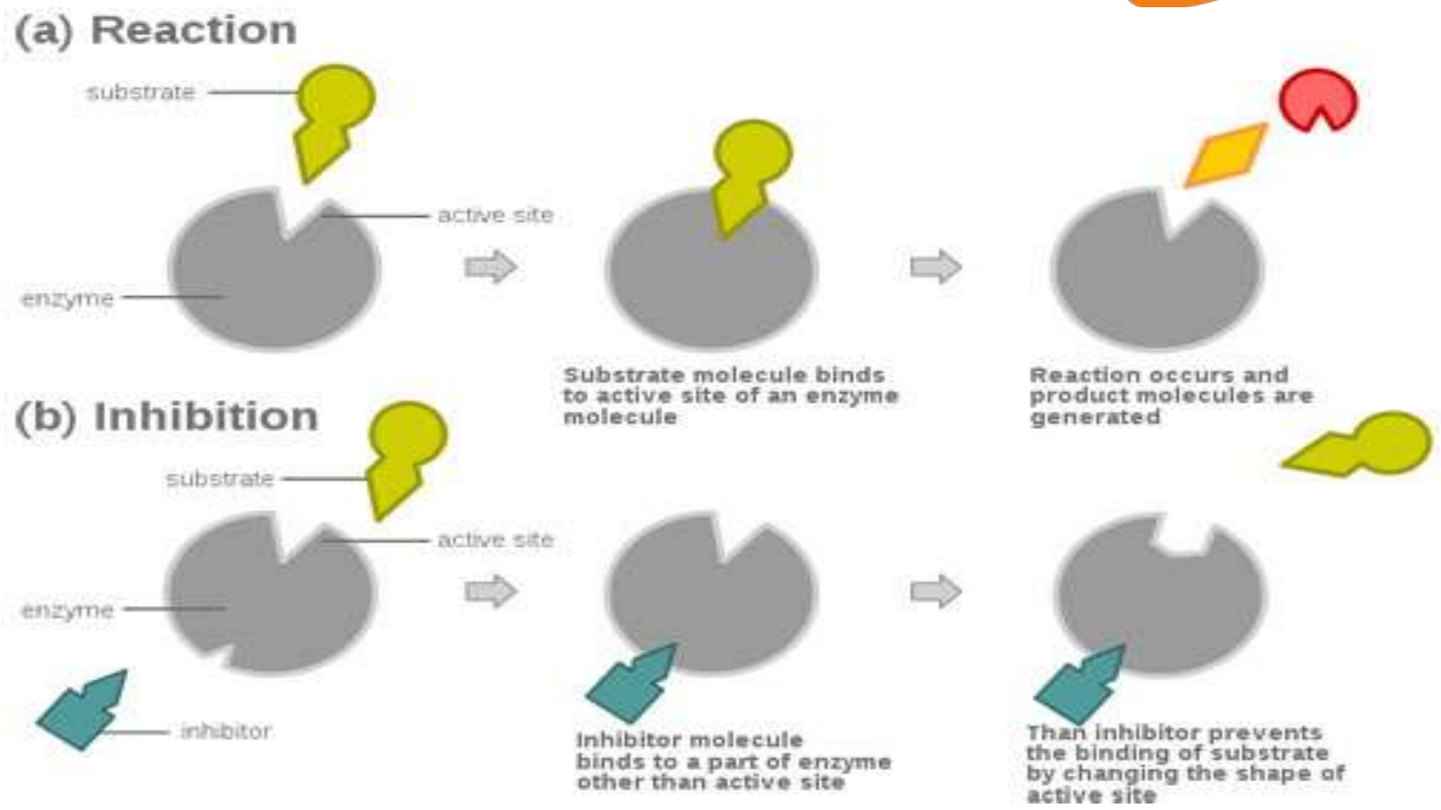

Competitive inhibitor
(b) A competitive inhibitor

Two Types of Enzyme Inhibitors

2. Non-competitive inhibitor

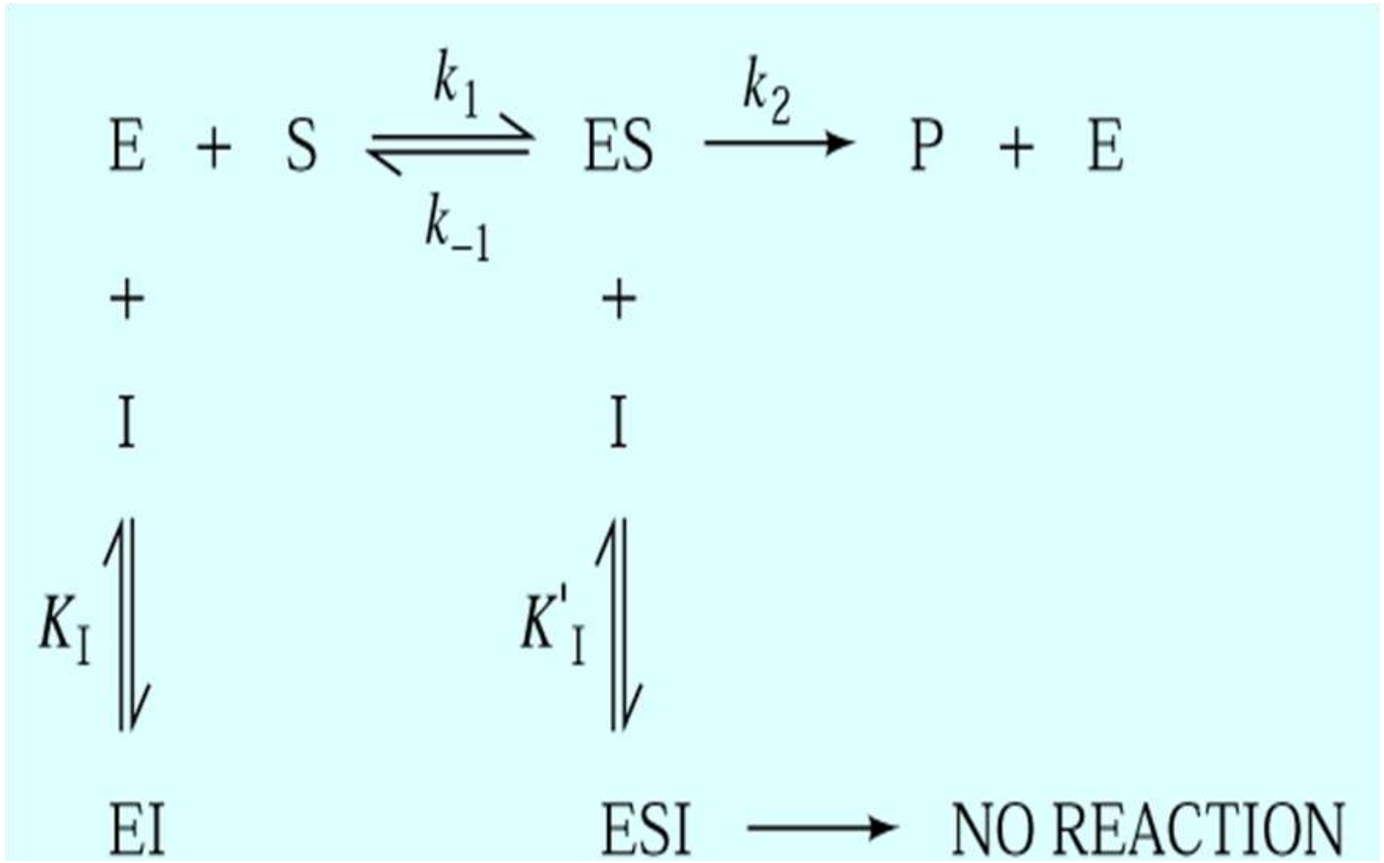
Do not enter active site, but bind to another part of the enzyme, causing the enzyme & active site to change shape.

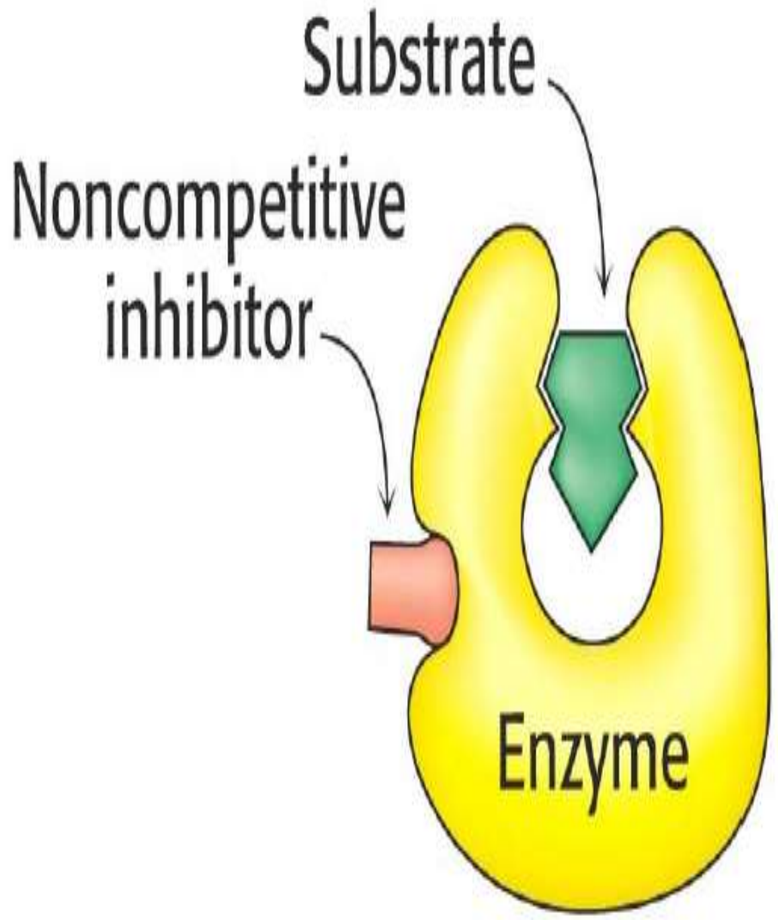
Usually reversible, depending on concentration of inhibitor & substrate.



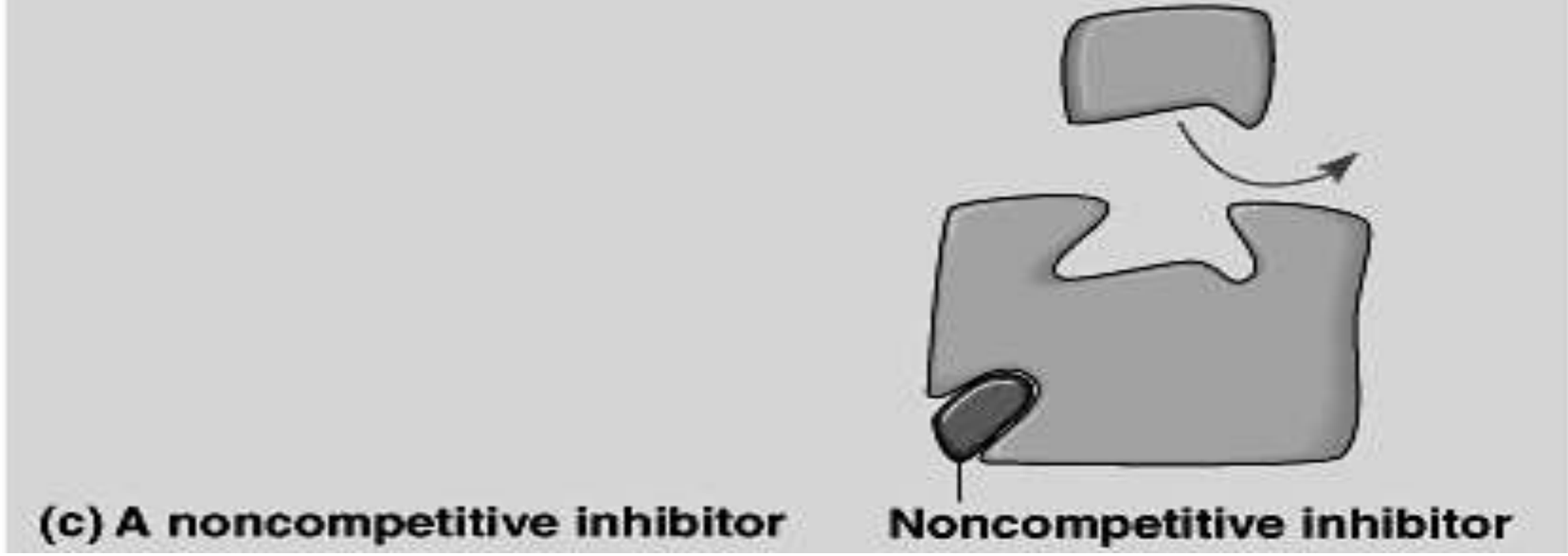
EXAMPLE: Compounds containing **heavy metals** such as lead, mercury, copper or silver are **poisonous**. This is because ions of these metals are non-competitive inhibitors for several enzymes.

Non-Competitive Inhibition





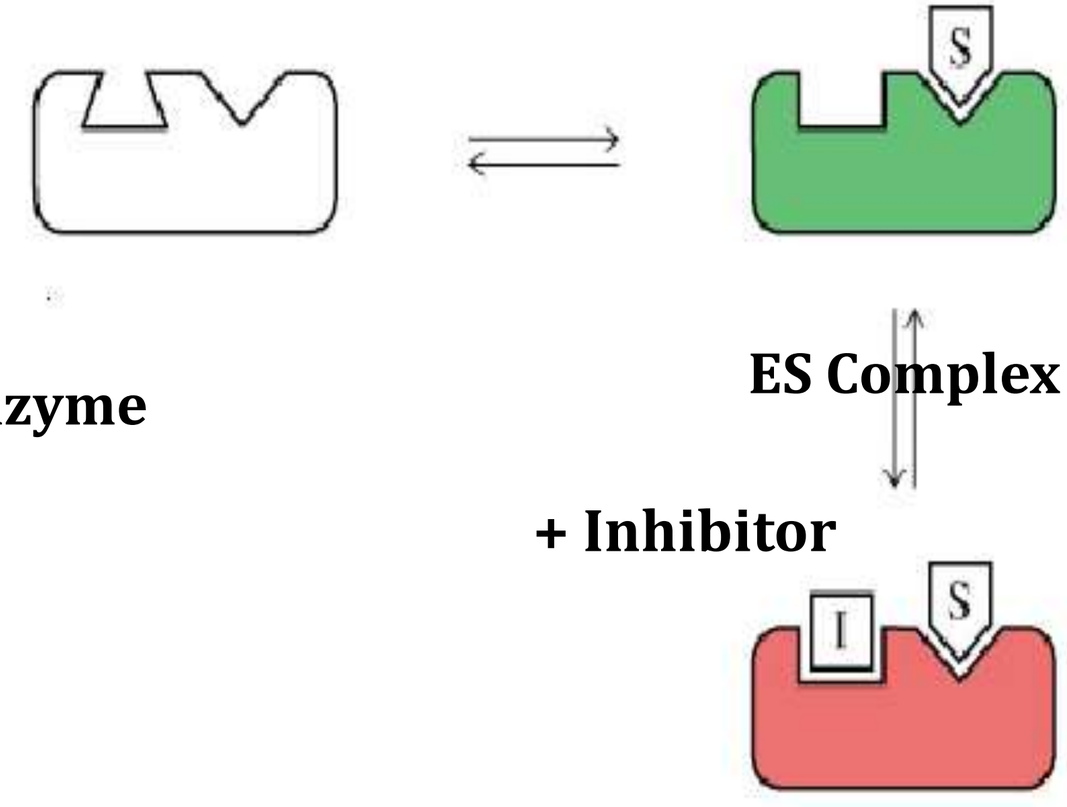

Substrate
Active site
(a) A substrate can normally bind to the active site of an enzyme.


(c) A noncompetitive inhibitor
Noncompetitive inhibitor

Un-competitive Inhibiton

- Binds only to the enzyme-substrate complex.
- Does not have the capacity to bind to the free enzyme.
- Not overcome by increasing substrate concentration.
- Both the K_m and V_{max} are reduced.

Un-competitive Inhibiton



Assessment

1. What is Enzyme Inhibition?

2. What are the types of enzyme inhibition?

3. Define Competitive Inhibition?

4. Define Non - Competitive Inhibition?

5. Define Un - Competitive Inhibition?

THANK YOU