

# SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai Approved by Pharmacy Council of India, New Delhi. Coimbatore -641035

**COURSE NAME** : MEDICINAL BIOCHEMISTRY

YEAR : PHARM D /I YEAR

**TOPIC** : ENZYME INHIBITION

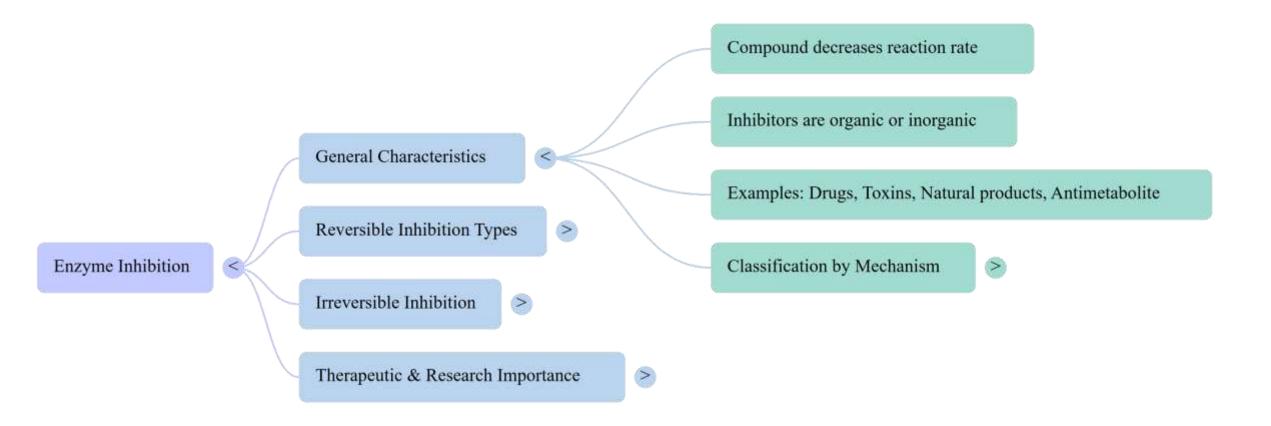


## **Design Thinking in COENZYME**

- **1.Empathize:** Deeply understand the student's or learner's challenges, needs, and experiences. This involves engaging with students, educators, and biologists to uncover pain points, preferences, and unmet needs in understanding microscopic cell processes.
- **2.Define:** Reframe the problem based on insights from the empathize phase and establish clear context. This involves synthesizing data to pinpoint the core issue, such as defining the need for clearer explanations of cellular mechanisms.
- **3.Ideate:** Brainstorm and explore a wide range of ideas and potential explanations, including innovative diagrams or models.
- **4.Prototype:** Simulate and build educational tools or visuals to enhance comprehension.

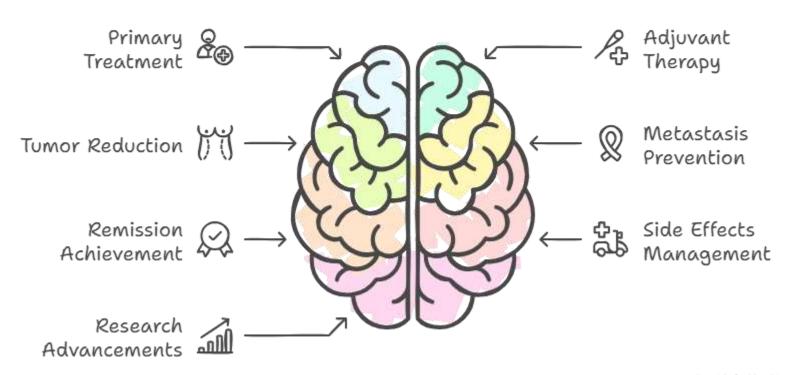


## **MINDMAP**



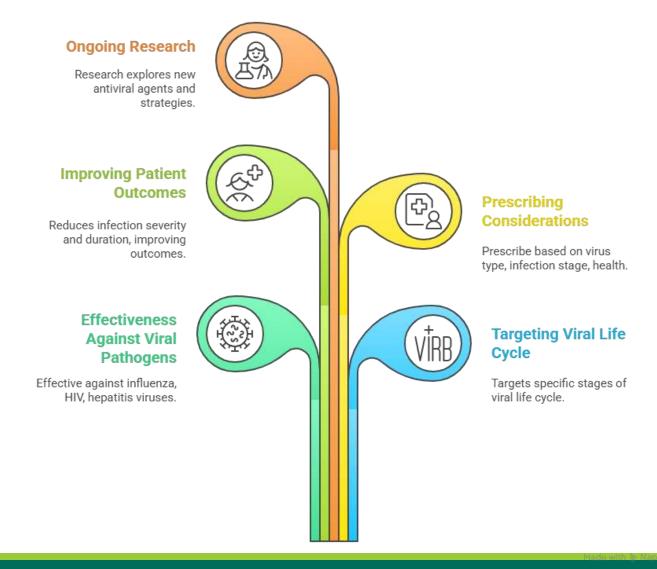


## Comprehensive Overview of Cancer Chemotherapy





#### **Unveiling the Multifaceted Role of Antiviral Drugs**





### **Enzyme Inhibition in Medical Treatments**

#### Antibiotics

Inhibit bacterial enzymes for cell wall or protein synthesis

#### Cancer Chemotherapy

Inhibit enzymes involved in DNA synthesis or cell division

#### Neurological Disorders

Acetylcholinesterase inhibitors increase acetylcholine levels



Target viral enzymes essential for replication

#### Cardiovascular Diseases

Statins inhibit HMG-CoA reductase to lower cholesterol



## **Drug Design Process**

#### Target Identification

Identifying enzymes critical in disease pathways

#### Structure-Based Drug Design

Using enzyme structure to design inhibitors



#### Inhibitor Design

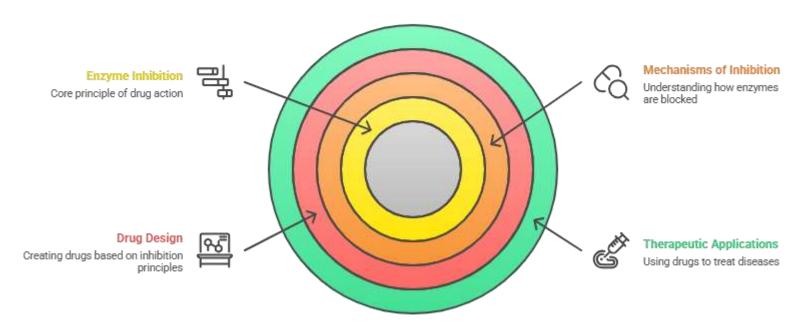
Designing molecules to selectively inhibit the target enzyme

#### High-Throughput Screening

Screening large compound libraries for inhibitors

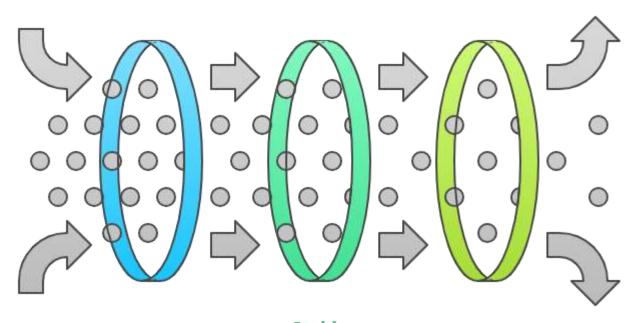


### **Enzyme Inhibition in Drug Development**





## **Irreversible Enzyme Inhibition Process**



## Covalent Bond Formation

Strong bond forms between enzyme and inhibitor

#### Stable Complex Formation

A stable, inactive complex is created

#### Enzyme Inactivation

Enzyme loses its activity permanently

#### Mechanisms of Reversible Enzyme Inhibition





#### **Hydrogen Bonds**

Hydrogen bonds facilitate transient inhibitorenzyme binding.



#### **Hydrophobic Interactions**

Hydrophobic interactions contribute to reversible enzyme inhibition.



#### **Ionic Bonds**

Ionic bonds enable reversible inhibitor-enzyme complex formation.



#### **Competitive Inhibition**

Competitive inhibitors block substrate binding at active site.



#### **Uncompetitive Inhibition**

Uncompetitive inhibitors bind only to enzymesubstrate complex.



#### **Non-Competitive Inhibition**

Non-competitive inhibitors bind away from active site.

Enzyme Activity Restoration



## Compare enzyme inhibition types for drug development.

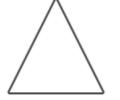








**Reversible Inhibition** 



Irreversible Inhibition



### Enzyme Activity Regulation Cycle

#### Enzymes Accelerate Reactions

Enzymes catalyze biochemical reactions.

#### Therapeutic Agents Used

Inhibitors are used as therapeutic treatments.

#### Metabolic Pathways Regulated

Inhibitors help control metabolic processes.

#### Uncontrolled Activity Leads to Diseases

Dysregulated enzyme activity causes health issues.

#### Enzyme Inhibitors Reduce Activity

Inhibitors slow down enzymecatalyzed reactions.



## **Enzyme Inhibition Overview**

#### Definition

Molecules that bind to enzymes and decrease activity

#### **Importance**

Fundamental to drug development

#### **Types**

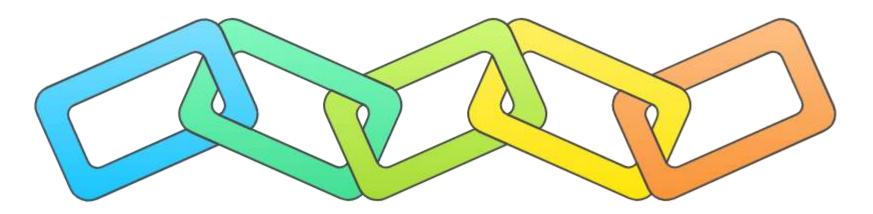
Different categories of enzyme inhibition

#### Mechanisms

How enzyme inhibition occurs

#### Significance

Role in drug design and therapeutics





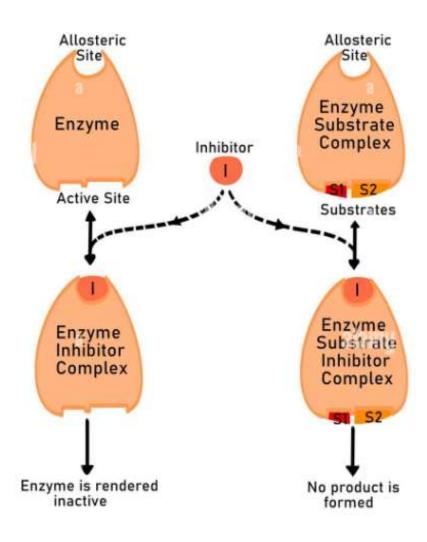
## **Biotin's Role in Carboxylation**

CO2 Uptake (0<sub>2</sub>)

Biotin picks up carbon dioxide from bicarbonate Biotin transfers carbon dioxide to substrate

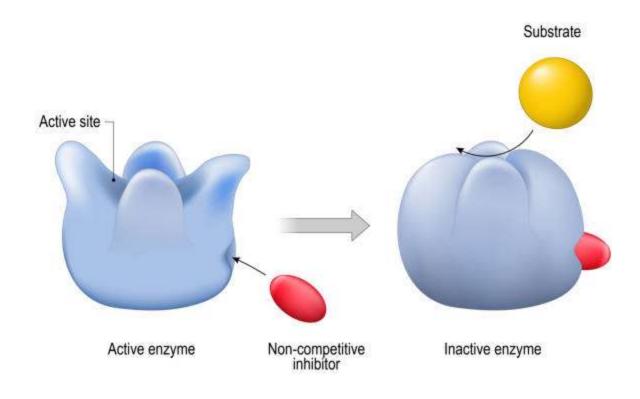
## Mixed Enzyme Inhibition







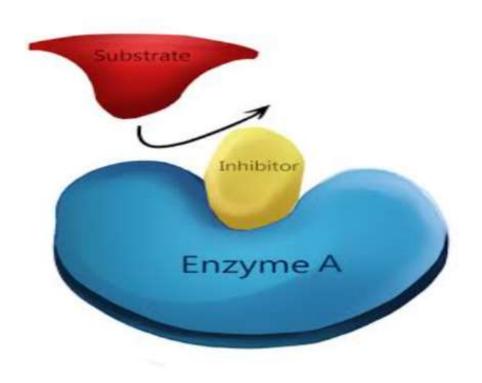
## Non-competitive inhibition





## **CLASS ASSESSMENTS**

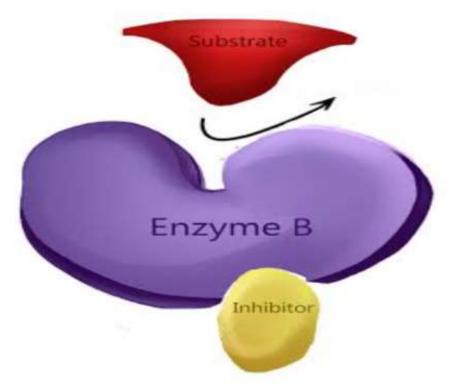
#### **IDENTIFY THE TYPE OF ENZYME BY SEEING THE PICTURE?**





## **CLASS ASSESSMENTS**

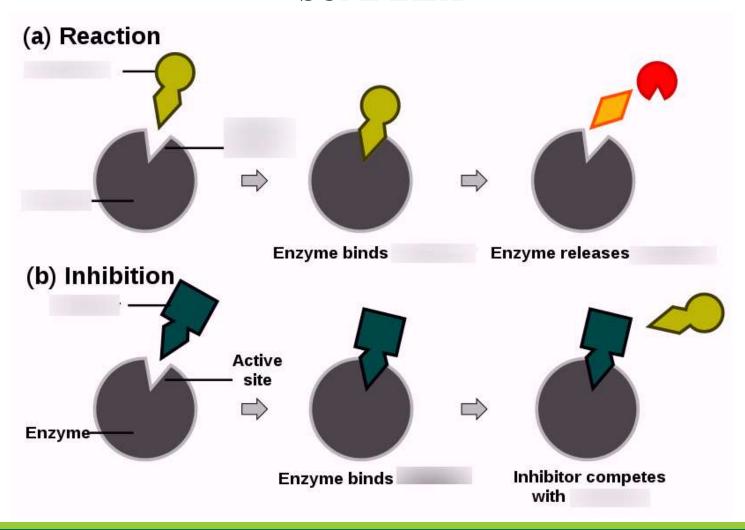








## **SUMMARY**





## **REFERENCES**

- ✓ Herpes review of biochemistry-Martin
- ✓ Text book of biochemistry- D. Satyanarayana
- ✓ Text book of clinical chemistry-Alex Kaplan & Laverve L szabo
- ✓ Principles of biochemistry-Lehninger
- ✓ Text book of biochemistry-Ramarao



thank you