

# Understanding Enzyme Inhibitors

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them

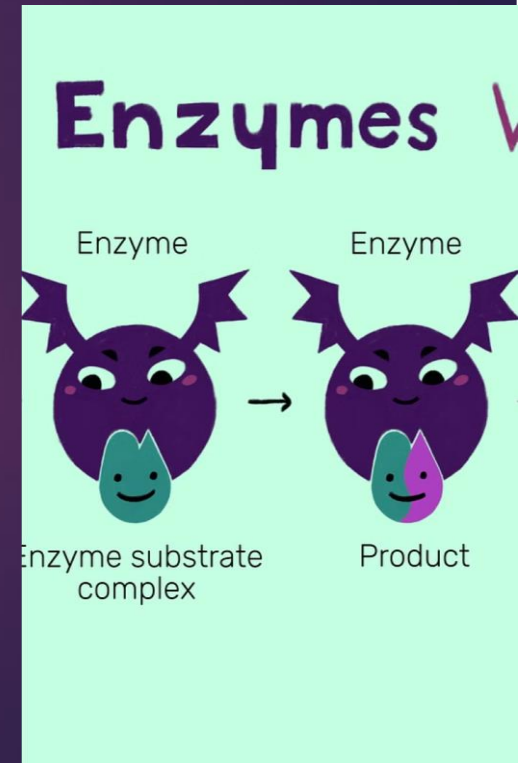


Co-funded by  
the European Union

# INTRODUCTION

## Definition

Enzymes are biological catalysts that speed up chemical reactions. Enzyme inhibitors are molecules that decrease enzyme activity, playing a crucial role in biology and medicine.



# Enzyme Function

1

## Active Site

Enzymes have a specific active site where substrates bind and reactions occur.

2

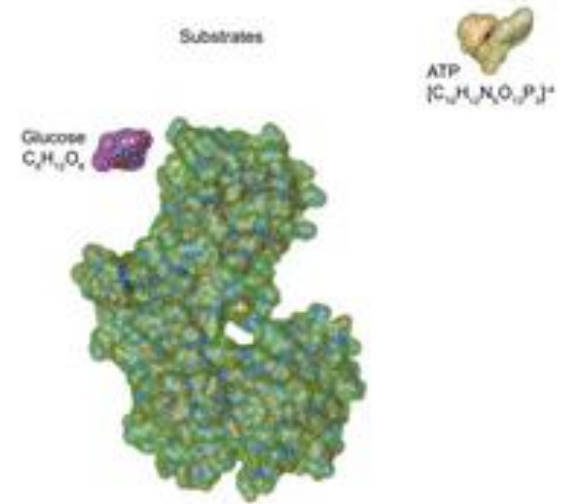
## Catalysis

Enzymes lower the activation energy required for a reaction, speeding it up.

3

## Specificity

Enzymes are highly specific, only catalyzing certain reactions with particular substrates.



# Competitive Inhibition

## Binding

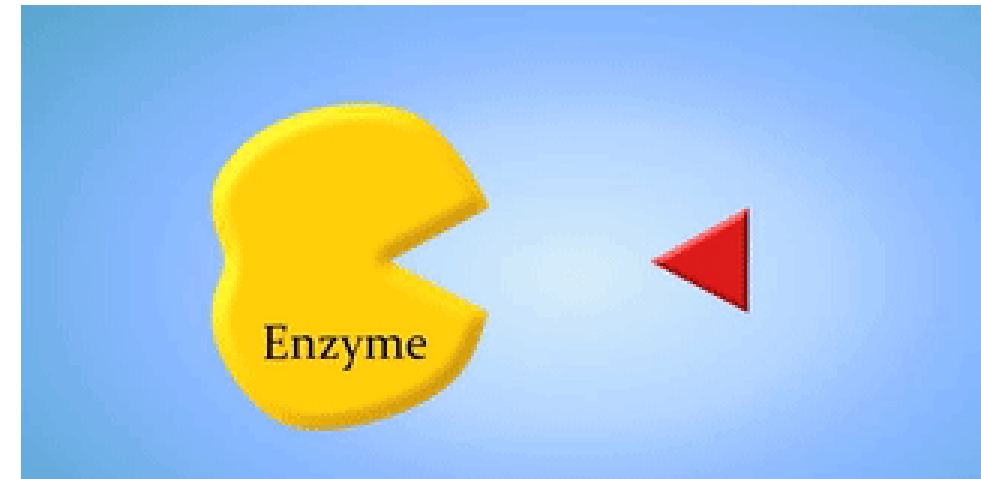
Competitive inhibitors bind to the the enzyme's active site, blocking blocking substrate access.

## Effect

Competitive inhibition decreases the enzyme's affinity for the substrate, reducing reaction rate.

## Reversibility

Competitive inhibition is reversible, as the inhibitor can be can be displaced by the substrate.



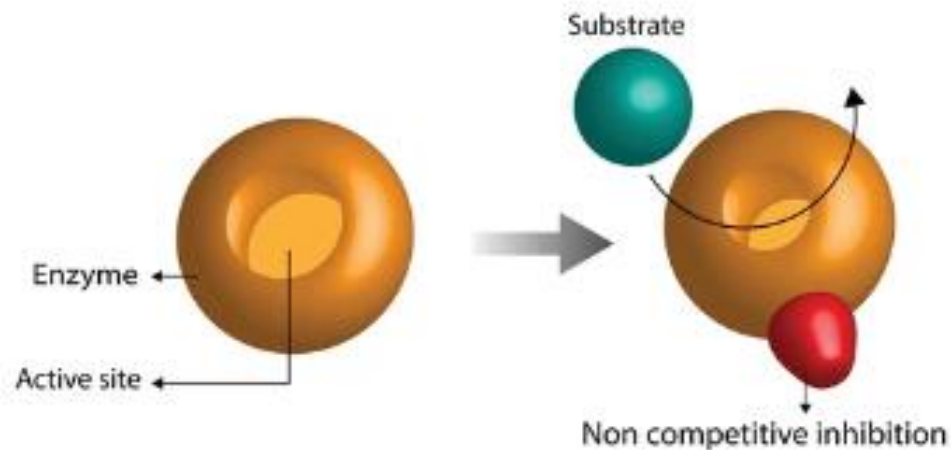
# Non-Competitive Inhibition

## Binding

Non-competitive inhibitors bind to bind to a site other than the active site.

## Reversibility

Non-competitive inhibition is also reversible, as the inhibitor can be displaced.



## Effect

Non-competitive inhibition changes the changes the enzyme's shape, reducing reducing its activity.





# Enzyme Inhibitors in Medicine

## Antibiotics

Penicillin is a competitive inhibitor that blocks bacterial cell wall synthesis.

## Cancer Treatments

Tyrosine kinase inhibitors target enzymes involved in cancer cell growth.

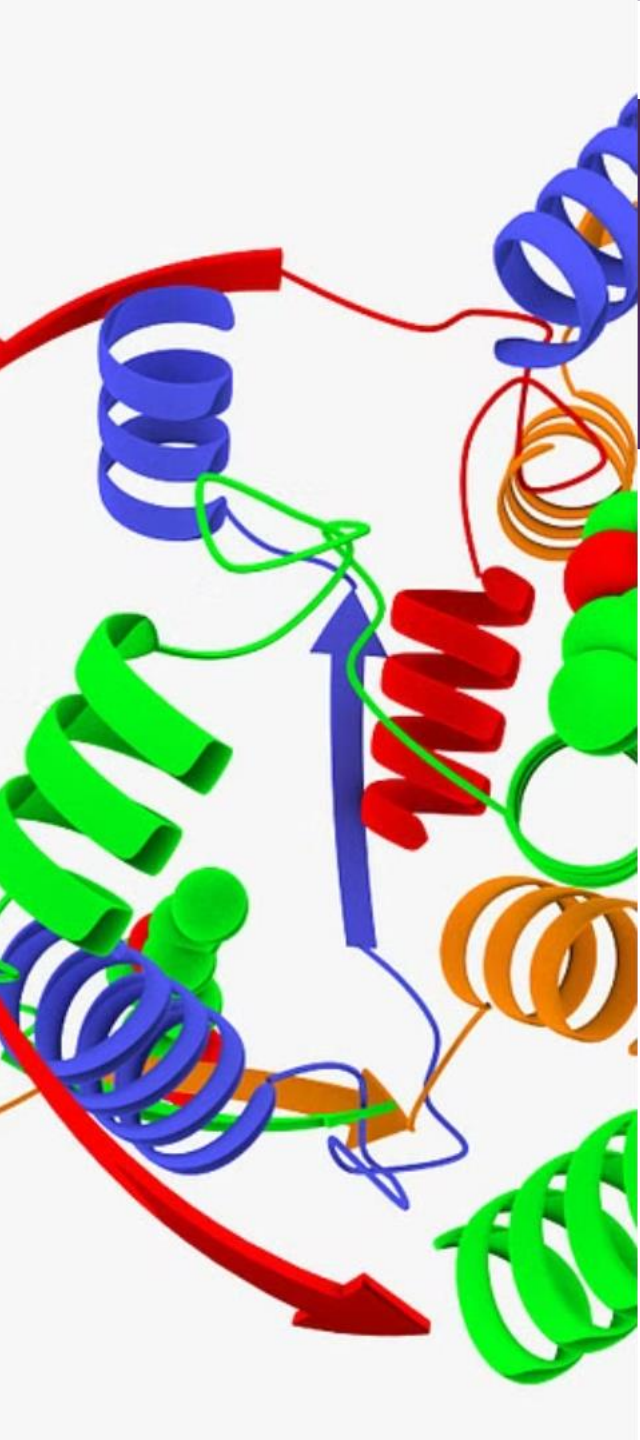
## Antiviral Drugs

HIV protease inhibitors block an enzyme essential for viral replication.



# Visualizing Enzyme Inhibition

- 1 Enzyme**  
3D models show the enzyme's active site and substrate binding.
- 2 Competitive Inhibitor**  
The inhibitor blocks the active site, preventing substrate binding.
- 3 Non-Competitive Inhibitor**  
The inhibitor binds elsewhere, changing the enzyme's shape and function.



# Enzyme Inhibition in Research



## Screening

Researchers screen libraries of compounds to find new inhibitors.



## Kinetics

Studying enzyme kinetics helps understand inhibition mechanisms.



## Modeling

Computer simulations visualize inhibitor-inhibitor-enzyme interactions.





# Real-World Applications

1

## Medicine

Enzyme inhibitors are used to treat diseases like cancer, HIV, and bacterial infections.

2

## Agriculture

Herbicides and insecticides often work by inhibiting essential enzymes in plants and insects.

3

## Biotechnology

Enzyme inhibitors are valuable tools for researchers studying biological processes and developing new products.



iStock  
Credit: Bacsica



# Activity

Step 1

Create an account (if you don't have one) at [www.thingiverse.com](http://www.thingiverse.com)

Step 2

Go to the following address:  
[www.thingiverse.com/thing:1235558](http://www.thingiverse.com/thing:1235558)

Step 3

Download all the files (5 files)

Step 4

Upload the files on  
the 3D printer

Step 5

Print all the 5  
elements

Step 6

Visit again the address  
<https://www.thingiverse.com/thing:1235558> and follow  
the lesson plan proposed

# THANK YOU FOR YOUR TIME

