AL-MUSTAQBAL UNIVERSITY COLLEGE

Department of Biomedical Engineering

Biochemistry

Enzymes

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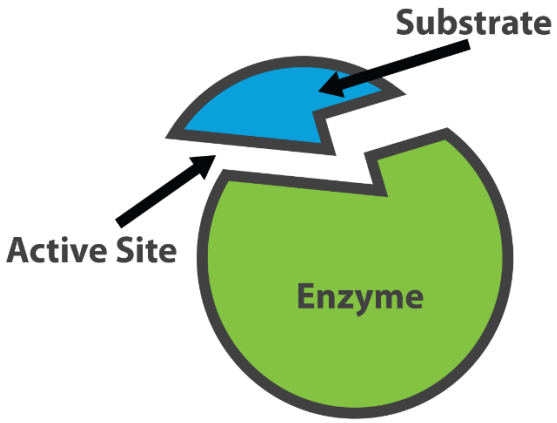
An enzyme is a biological catalyst and is almost always a protein. It speeds up the rate of a specific chemical reaction in the cell. The enzyme is not destroyed during the reaction and is used over and over. A cell contains thousands of different types of enzyme molecules, each specific to a particular chemical reaction.



What do enzymes do?

The digestive system – enzymes help the body break down larger complex molecules into smaller molecules, such as glucose, so that the body can use them as fuel.

DNA replication – each cell in your body contains DNA. Each time a cell divides, that DNA needs to be copied. Enzymes help in this process by unwinding the DNA coils and copying the information.

Liver enzymes – the liver breaks down toxins in the body. To do this, it uses a range of enzymes.

The mechanism of action of the enzyme:

All opinions agreed that there is a link between
The reactant and enzyme to form a temporary compound that then decomposes into products
Reaction According to Michaelis' theory, enzyme E binds with the substance
Substrate (S) reactant to form the temporary active compound ES.

- (E + S ⟶ ES)
- Then this temporary compound is decomposed by water into the reaction products (Z, Y).

and enzyme E.

- ES + H2O ⟶ Z + Y + E

Enzymes are a protein substance and the surface of the protein molecule is prepared with substances

Non-proteinogenic are the centers of activity that are configured

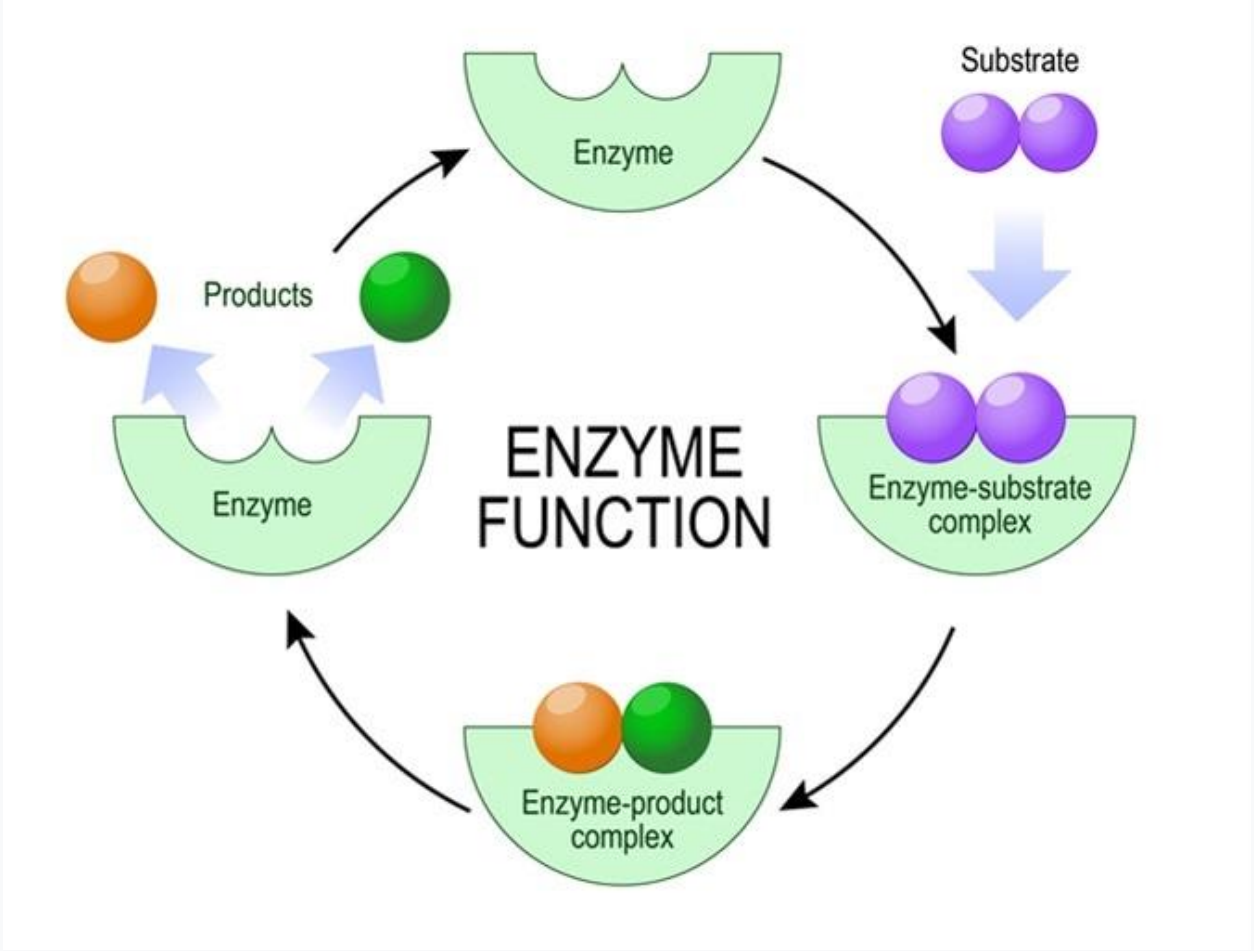
In a special way to suit a specific Substrate and the linkage occurs between the enzyme

The substrate at this position forms the active temporary compound

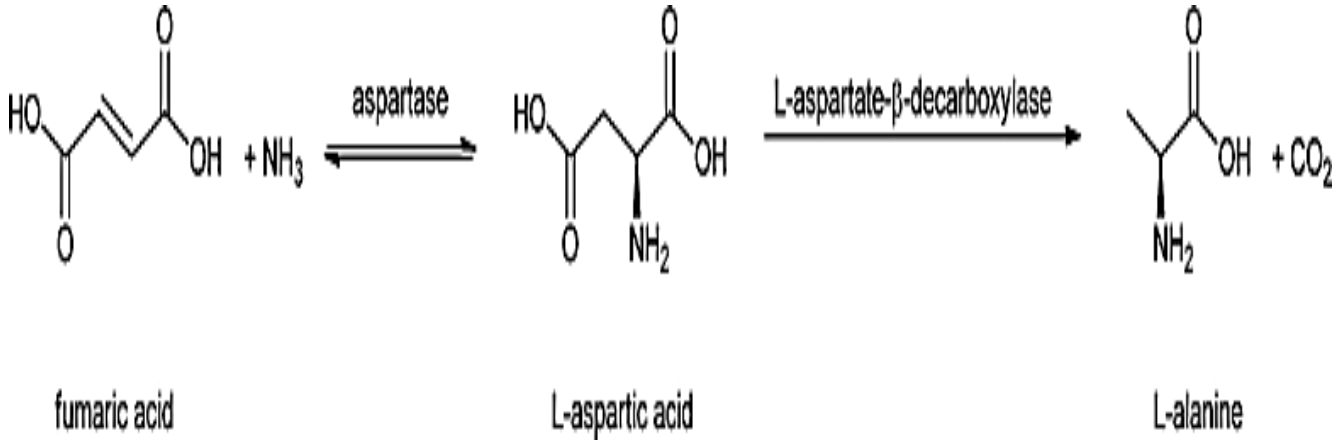
As a result, compression occurs in the bonds between the components of the material

The reaction, causing it to dissolve into its components and release the enzyme in its state

The original to restore its vitality again. This can be represented by the following figure



Aspartase Helps add ammonia to fumaric acid Fumaric acid And with a reverse reaction:

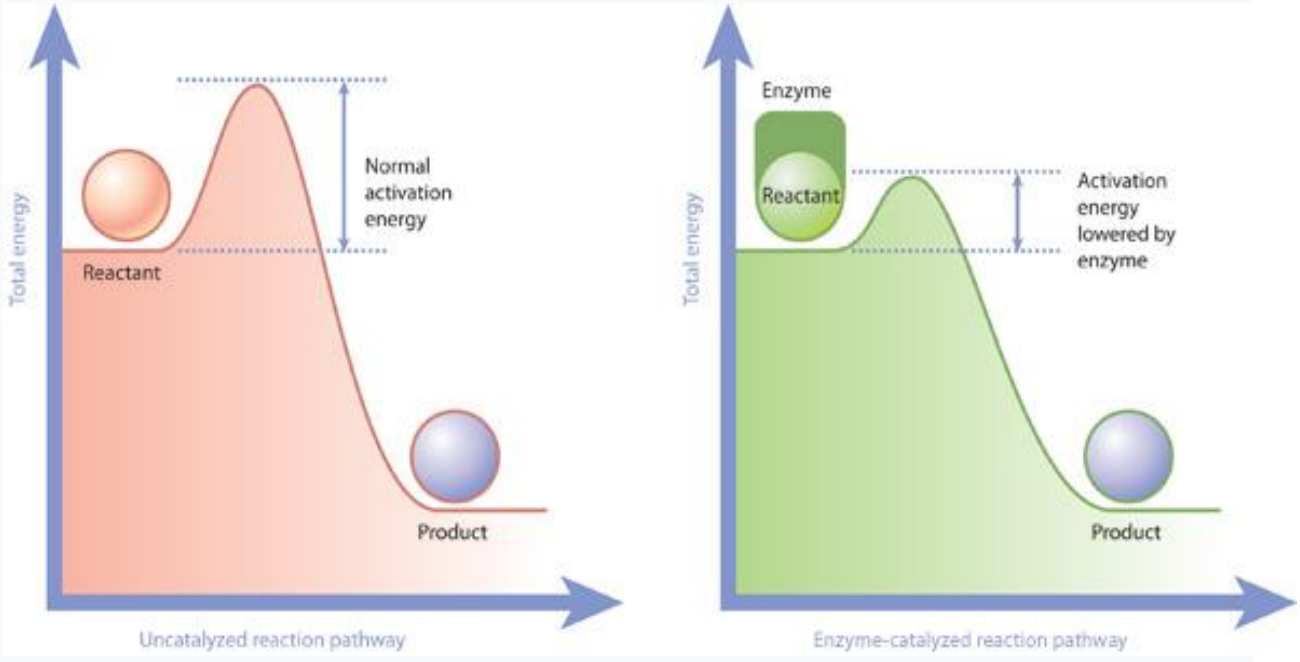


Activation energy

is the energy needed to break bonds in interacting molecules or to liberate external electrons to move from one atom to another.

** The greater the activation energy, the slower the reaction.

** While the reaction is fast, the lower the activation energy.



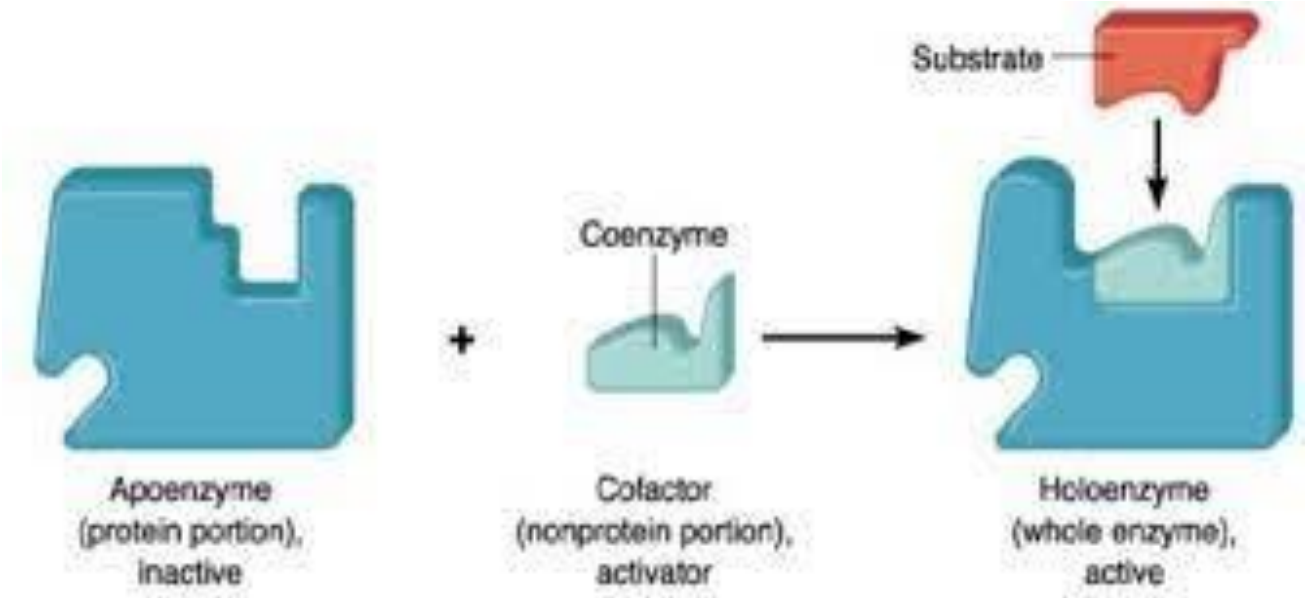
Structure of enzymes

A cofactor

is a non-protein chemical that assists with a biological chemical reaction. Co-factors may be metal ions, organic compounds, or other chemicals that have helpful properties not usually found in amino acids. Some cofactors can be made inside the body, such as ATP, while others must be consumed in food.

Coenzyme:

A substance that enhances the action of an enzyme. (An enzyme is a protein that functions as a catalyst to mediate and speed a chemical reaction).Coenzymes are small molecules. They cannot by themselves catalyze a reaction but they can help enzymes to do so. In technical terms, coenzymes are organic nonprotein molecules that bind with the protein molecule (apoenzyme) to form the active enzyme (holoenzyme).



Examples of specific enzymes

There are thousands of enzymes in the human body, here are just a few examples:

- **Lipases** – a group of enzymes that help digest fats in the gut.
- **Amylase** – helps change starches into sugars. Amylase is found in saliva.
- **Maltase** – also found in saliva; breaks the sugar maltose into glucose. Maltose is found in foods such as potatoes, pasta, and beer.
- **Trypsin** – found in the small intestine, breaks proteins down into amino acids.
- **Lactase** – also found in the small intestine, breaks lactose, the sugar in milk, into glucose and galactose.
- **Acetylcholinesterase** – breaks down the neurotransmitter acetylcholine in nerves and muscles.
- **Helicase** – unravels DNA.
- **DNA polymerase** – synthesize DNA from deoxyribonucleotides.

In a nutshell

Enzymes play a huge part in the day-to-day running of the human body. By binding to and altering compounds, they are vital for the proper functioning of the digestive system, the nervous system, muscles, and much, much more.