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Perspective

Enzymes Structure-Function Relationships

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Abstract

The study of enzymes' structure-function relationships and how they fold into their natural states is the goal of the discipline of biochemistry known as enzymology.

Enzymology is the study of how processes are catalyzed by enzymes, how this catalysis is controlled, how enzymes evolve and work, and how enzymes may be blocked to provide medicines.

INTRODUCTION

For several processes, including digestion and liver function, enzymes are crucial. Health issues might result from having too much or too little of a certain enzyme. Healthcare professionals may also use the enzymes in our blood to look for injuries and illnesses.

Proteins called enzymes aid in accelerating our bodies' chemical processes, or metabolism. Some compounds are created; while others are broken down (Johnson LN et al., 1999). Everything that is alive has enzymes.

Enzymes are created by our bodies spontaneously. However, food and manufactured goods both contain enzymes.

ABOUT THE STUDY/DESCRIPTION

The aiding of digestion is one of the most crucial functions of enzymes. The process of converting the food we eat into energy is called digestion. For instance, our saliva, pancreas, intestines, and stomach all contain enzymes. They disintegrate proteins, carbs, and lipids. These nutrients are used by enzymes for cell development and repair (Jencks WP, 1987).

A material that catalyzes a chemical process does so without being consumed or produced by the reaction itself. A protein that serves as a catalyst is an enzyme. In enzymology, a reactant in an enzyme-catalyzed reaction is referred to as a substrate (Brown AJ, 1902). The direct molecular contact between an enzyme and its substrate accounts for the rate enhancement an enzyme may achieve, which can speed up a process by several orders of magnitude compared to its non-enzymatic rate. The active site is a region of the protein molecule where this interaction takes place, first producing an enzyme-substrate (ES) complex (proteins are normally considerably bigger than their substrates).

The characteristics of active locations are further detailed below. The selectivity of their substrates is another attribute of enzymes. Enzymes frequently have a superb capacity to distinguish between chemically similar compounds. The ES complex or its homolog can be directly viewed using techniques for structure determination. Almost all biological processes contain enzymes. Enzymes are largely and historically associated with metabolic activities, although they also take role in regulatory and energy transfer processes (Olson BJ et al., 2007).

Enzymes also help with:

- Breathing.
- Building muscle.
- Nerve function.
- Ridding our bodies of toxins.

Different types of enzymes:

- Carbohydrase breaks down carbohydrates into sugars.
- Lipase breaks down fats into fatty acids.
- Protease breaks down protein into amino acids.

What health conditions can enzyme problems cause?

Lack of a certain enzyme frequently leads to metabolic problems. Genes can be passed on from parents to their offspring (inherited). Here are a few instances of hereditary metabolic disorders:

• Fabry disease stops the body from producing alpha-galactosidase A, an enzyme that breaks down fat (lipids).

• Myelin-producing enzymes are impacted by Krabbe disease (globoid cell leukodystrophy), which affects the condition of the condition (Central Nervous System).

• The enzymes required to break down certain branch chain amino acids are impacted by maple syrup urine illness.

Other medical diseases linked to abnormalities in enzymes include:

• Crohn's illness An autoimmune reaction of the intestinal system may be influenced by an imbalance of the bacteria in your gut (gut microbiome). This might have an impact on how Crohn's disease manifests and how severe it is.

The absence of sufficient digestive enzymes in your pancreas is known as exocrine pancreatic insufficiency (EPI). Nutrients cannot be absorbed from food or broken down. EPI can be brought on by chronic pancreatitis, pancreatic cancer, diabetes, or cystic fibrosis.

• Lack of the enzyme required to break down the lactose and dairy carbohydrates causes' lactose intolerance.

CONCLUSION

An enzyme-catalyzed reaction may involve a series of several primary stages, and as a result, many transition states. A thorough explanation of this series of fundamental stages, or enzyme mechanism, is a major focus of enzyme research. Because of their structural and chemical variety, proteins form effective enzymes. Furthermore, as we'll soon see, non-protein cofactors significantly expand the chemical repertory of enzymes. Despite the wide range of actors in mechanistic models that describe how enzymes function, a number of similar motifs have been found in investigations of several distinct enzymes (Johnson KA, 2013). We may attempt to apply certain mechanistic principles to the wide range of enzymes and the processes they catalyze if reversed-viewed as a unifying approach in biochemistry.

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