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Opinion Article

Importance of Enzymes and their Applications

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DESCRIPTION

Nearly all of the chemical reactions that take place in biological systems are catalysed by enzymes. Catalytic RNA and DNA are also included in the category of enzymes, which are often proteins. Enzymes function as efficient biological catalysts by reducing the activation energy barrier of a reaction, hence speeding up the reaction. They enhance the reactions specificity as well.

Enzymes that have been immobilised are those that have been adsorbing or crosslinking to a solid support for research or commercial applications, such as producing vast quantities of goods through biosynthesis. The immobilisation substrate might be either water-soluble matrices or inert, water-insoluble calcium alginate.

An enzyme's structural folding is programmed by nature to enable its on-demand bio functionality, yet manually modifying an enzyme's conformation has long been difficult. Here, we create an exogenous hydrogen-bonded organic framework to alter cytochrome c's conformation and so permit the enzyme to have non-native bioactivity. On the natural cytochrome c, the hard organic framework with hydrogen bonds and a net-arranged carboxylate inner cage has been set in place.

Enzymes are used by nature to carry out a variety of biological tasks that cannot be accomplished by artificial substitutes. The immobilisation of heme units in various protein scaffolds to perform specialised tasks, such as substrate oxidation, electron transfer, sensing, metal ion storage, and transport, is one of the most striking instances. This is seen in heme enzymes. A highly stable heme protein that functions as a part of the electron transport chain in mitochondria is cytochrome c (Cyt c), in which the heme is covalently connected with the protein scaffold by two disulphide bonds and axially coordinated by histidine (H18) and Methionine (M80). Because enzymes are environmentally neutral and don't produce greenhouse gases or energy-intensive waste products, they are replacing chemicals in many industrial production processes. Microbial sources of enzyme production are the most preferred source for industrial enzyme production because the microbes are easily accessible, they grow at a very fast rate, and they can be genetically modifiedto produce enzymes that can perform optimally at different industrial production conditions. This helps the microbes survive the harsh production conditions and meet the ever-increasing demand for enzymes in many industries. Numerous industries have found use for microbial enzymes. Enzymes that perform well under harsh industrial conditions are in high demand right now, thanks to their numerous applications in the food, animal feed, dairy, beverage, agriculture, leather, paper industries.

Applications

Hydrolases: Hydrolases are a class of enzymes that use water to catalyse the cleavage of bonds in large molecules, breaking them down into smaller molecules. Proteases/peptidases, amylases, glycosidase, lipase, phospholipases, lactase, and acylase are examples of hydrolases.

Lyases: Lyases are a class of enzymes that catalyse elimination or addition reactions without the need for hydrolysis or oxidation. Decarboxylases, pectolyase, aldehyde lyase, dehydratases, adenylyl cyclase, and hydratases are examples of lyases.

Isomerases: Isomerases are a class of enzymes that catalyse intramolecular bond formation and breakage in order to convert a parent molecule to its isomeric form. Racemases, epimerases, and cis-trans isomerases are examples of isomerases. Genetically engineered microbes cultured in selective growth media can also produce acid and alkaline enzymes.

Ligases: Ligases are enzymes that catalyse the joining of two or more molecules to form a new chemical bond and new molecule(s) by using the energy derived from the hydrolysis of ATP or any other energy-rich phosphate bond. Ligases include synthetases, chelatases, DNA ligases, carboxylases, and others.

CONCLUSION

Enzymes are efficient biological catalysts. Catalysts reduce reaction activation energy. The faster a reaction, the lower its activation energy.They are used by nature to carry out a variety of biological tasks that cannot be accomplished by artificial substitutes. Because enzymes are environmentally neutral and don't produce greenhouse gases, they are replacing chemicals in many industrial production processes.

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