Research in Genes and Proteins

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Biosensor Based on Coupled Enzyme Reactions for Determination of Arginase Activity

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DESCRIPTION

Enzymes are substances that act as catalysts for living organisms and regulate the rate at which chemical reactions take place without change in the process. The biological processes that occur in all living organisms are chemical reactions, most of which are controlled by enzymes. Without enzymes, many of these reactions would not occur at a perceptible rate. Enzymes catalyze all aspects of cell metabolism. These include the digestion of food, the breakdown of large nutrient molecules into smaller molecules, and the storage and conversion of chemical energy. Many hereditary human illnesses, such as albinism and phenylketonuria, result from a deficiency of certain enzymes. Fermentation of wine, fermentation of bread, coagulation of cheese and brewing of beer have been practiced for a long time, but it was not until the 19th century that these reactions were understood to be the result of the catalytic activity of enzymes. Since then, enzymes have become increasingly important in industrial processes involving organic chemical reactions. The use of enzymes in medicine includes killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases. Previously, all enzymes were thought to be proteins, but since the 1980s, the catalytic ability of a specific nucleic acid called a ribozyme has been demonstrated, disproving this axiom. Little is known about the enzymatic action of RNA, so this discussion will focus primarily on protein enzymes. Large protein enzyme molecules are composed of one or more chains of amino acids called polypeptide chains. The amino acid sequence determines the characteristic folding pattern of the protein structure that is essential for the specificity of the enzyme. When an enzyme is exposed to changes such as changes in temperature and pH, the structure of the protein can lose its integrity and enzyme capacity. Denaturation is sometimes, but not always, reversible. Some enzymes have additional chemical constituents called cofactors attached to them. Is this necessary for enzyme activity as it is directly involved in the catalytic process? Cofactors are either coenzymes, organic molecules such as vitamins, or inorganic metal ions. Some enzymes require both. Cofactors can bind tightly or loosely to enzymes. When firmly attached, cofactors are called prosthetic groups. Enzymes are biological catalysts, most often proteins. Accelerates the rate of certain chemical reactions in a cell the enzyme is not destroyed during the reaction and is used many times. Cells contain thousands of different types of enzyme molecules, each unique to a particular chemical reaction. Enzymes are proteins that function as biological catalysts (biocatalysts). The catalyst accelerates the chemical reaction. Almost all metabolic processes in cells require enzyme catalysis to run fast enough to sustain life. Metabolic pathways depend on enzymes that catalyze individual steps. Enzyme research is called enzymology, and in the field of pseudo enzyme analysis, we recognize that some enzymes have lost the ability to perform biological catalysis during evolution. This is often reflected in amino acid sequences and unusual "pseudo catalytic" properties. Like all catalysts, enzymes increase the rate of reaction by lowering their activation energy. Some enzymes can accelerate the conversion of substrate to product by a factor of 1 million. An extreme example is orotidine phosphate decarboxylase. This allows for reactions in milliseconds, otherwise it will take millions of years. Chemically, enzymes are like any other catalyst and are not consumed in a chemical reaction or change the equilibrium of the reaction. Inhibitors are molecules that reduce enzyme activity, and activators are molecules that increase activity. Many remedies and venoms are enzyme inhibitors. Enzyme activity drops significantly above optimum temperature and pH, and many enzymes denature when exposed to excessive heat, losing their structure and catalytic properties. Some household products use enzymes to accelerate chemical reactions. Organic cleaning powder enzymes break down protein, starch, or grease stains on clothing, and meat-beating enzymes break down proteins into smaller molecules, making meat easier to chew.

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