Sample research paper on enzymes scientific paper

Health & Medicine, Body

Abstract

Enzymes are the large biological molecules that play the role of metabolic processes responsible for maintaining the human life. They have the ability of high selectivity, as natural catalysts. They accelerate both the specifity and rate of metabolic processes, from food digestion and DNA synthesis. Most scientific enzymes are proteins in nature, even though some RNA molecules which are catalytic have been studied. The structures of enzymes normally adopt a three dimensional structure, and in order to assists in catalysis, it may employ the organic and inorganic forms. This experiment is meant to describe the properties and characteristics of enzymes including the catecholase catalyzed reactions. Change in absorbance is studied and a graph of the results plotted. Calculations of absorbance are then established from the data obtained from the experiment and calculations from the graph by determining the gradient of the graph.

Introduction

Enzymes are natural catalysts in the body system which speeds up chemical reactions. In purely enzymatic reactions, the substrates, which are molecules at the beginning of a chemical reaction, are converted into a different form of molecules, referred to as the end products. All biological reactions in the body system might require the natural catalysts to intervene and play the role of speeding up the reaction. This is because there is a certain level of speed rate that should be maintained in order to sustain the human life. The set of enzymes created in the cell of the body system determines the type of metabolic pathway that occurs in the respective cell.

Like all the chemical catalysts in the laboratory, enzymes work on the principle of lowering the activation energy of the given reaction. This dramatically increases the rate of the reaction taking place in the cell. Reactions attain the equilibrium state at a more rapid state and products are formed at a higher rate. Enzyme catalyzed reactions are million times faster than reactions which are not catalyzed by enzymes. Just like any other catalyst, enzymes are never consumed into the reaction in which they are catalyzing. They only participate by increasing the reaction rate to the required standard in order to sustain the human life. Enzymes have a factor that differentiates it completely from other catalyst, where they are more specific to their substrates. They are natural chemicals known to catalyze over four thousand biochemical reactions.

The activity of enzymes in the body system can be affected by other molecules referred to as enzyme inhibitors. These are chemicals within the human cell which reduce the activity of enzymes on chemical reactions. Other molecules which boost and increase the activity of these natural catalysts are known as activators. Substances which may act as enzyme inhibitors include poison and drugs taken into the body system. Other factors that affect the activity of enzymatic action include the pH, pressure, temperature, the concentration of the substrate. Some enzymes are used for commercial purposes, like in the synthesis of some antibiotics. In order to speed up biochemical reactions, some households employ the use of enzymes. An example is the biological washing powder that breaks down fat or protein stains on clothes. Enzymes which are present in meat tenderizes have the ability to breakdown proteins into smaller and finer meat, easier to chew by people.

Results

Change in absorbance during a catecholase catalyzed reaction.

Graphical representation of results

Discussion

According to the graph, the change in absorbance is directly proportional to increase in time. As time is increased, the realized absorbance level also increases. This, therefore, means that the enzymatic activity on the given chemical reactions within the human cells is increased as time increases. This activity is not measured by the how much the enzyme is consumed in the reaction because these natural chemicals only speed up the chemical reactions but are not consumed in the given reactions within the human cells. The graph clearly indicates that enzymes have the ability of speeding up the reaction rates. This is evident by looking at the proportional increase of the reaction rate with respect to the time given.

Enzymes behave like all other catalysts. They do not affect the position of a chemical equilibrium in any given reaction. A chemical reaction will always run in the same direction as it would, even in the event the enzyme was not present. The only difference made on the reaction is that it is made more quickly. In the absence of enzymes, some abnormalities might however occur, where un-catalyzed spontaneous reactions might lead to different and unexpected products in the body system. In these conditions, different and unexpected products are formed at a faster rate compared to the required product. This, therefore, might alter the normal functioning of a living cell in the body system. The trade-off behaviors occur during moments dedicated to sleeping and times watching for predators, which are instances of low and high risk, respectively.

In order to favor a thermodynamically unfavorable reaction, enzymes have the ability of coupling up two reactions. A good example is the hydrolysis of the ATP used to drive other chemicals in the body system. The animal must at all times display its greatest level of a predator habit during situations of high risk, which are brief and frequent, and lower its vigilance during low-risk situations. This ensures that the animal can partake in its current activity while ensuring its safety at the same instance. At the group level, birds use increasing group size as a deterrent to predator attacks. Risk dilution is another preventive strategy where an animal becomes a member of a large group. The likelihood of an animal being hurt when it is in a large group is very minimal because the risk is diluted. Other members of the group are also known to show geometric selfish herd effect, a situation where animals in the center of the group decrease their predation risk by surrounding ‘ themselves with the other members of the group. Other factors that influence the working of the group size include the amount and extend of visual obstruction, the abundance and type of predator, and the distance to the closest safe refuge. There are known increased risks of big group size. This may result to competition hypothesis where the larger group increases the ability and competition to find food for them. There is an increased competition for the limited resources available for bigger groups of the animals.

The chemical catalysts of the body do not at any time need additional components in order to display their full activity. They only require non-protein molecules referred to as co-factors in order to be completely bound for their enzymatic activity. Co-factors can either take the form of organic molecules which include the heme and flavin, and the inorganic form which include the iron-sulfur clusters and the metal ions. Organic cofactors can take several forms of groups including the prosthetic groups. These groups are the types which are tightly bound to a specific enzyme or their respective coenzymes, which are continuously released from their active site during the reaction process. The mostly known coenzymes include the NADPH, adenosine triphosphate, and the NADH. They play the role of transferring chemical groups between specific enzymes.

Carbonic anhydrase is a good example of an enzyme that contains a cofactor. The zinc cofactor forms the major part of its active site. Therefore, the cofactor molecules are usually tightly bound to these enzymes and are found in the active sites which are involved in the real catalysis process within the cells of the human system. The heme and flavin cofactors are commonly involved in redox reactions within the human cells. There are other enzymes that require a cofactor but do not contain a bound. Such enzymes are referred to as the apoproteins or the apoenzymes. A combination of the apoenzymes together with its cofactors within the cells of the humans system is referred to as the holoenzyme. This is an active form of this enzyme. In most cases, cofactors of enzymes are not always covalently bonded to their specific enzymes. The organic prosthetic groups are the ones identified by scientists to be covalently bound to their specific enzymes. The word holoenzyme is also applicable to those enzymes that have several protein subunits. Examples of this include the DNA polymerases. The holoenzyme in this case is always a complete complex that contains all the subunits required for the specific enzymatic activity. The coenzymes also form a portion of the enzymes. They are molecules that are small in size that are tightly or loosely held to an enzyme. Prosthetic groups may refer to tightly bound coenzymes within the cells of the human system. These molecules have a role of transporting chemical groups within the cell from one enzyme to another. Examples of such chemicals include the thiamine, vitamins, folic acid, and the riboflavin. All these are compounds that are not directly synthesized by the body system, therefore, must be acquired from the diet ingested in the body through the meals. Coenzymes usually have the ability of being regenerated and their concentrations are always maintained at a steady and constant level inside the human cell. This is ideal for maintaining the stability and normal functioning of the cell, for metabolic processes to take place effectively. They have the ability of being regenerated continuously, indicating that they are they are produced in even small amounts, and are used effectively and intensively. An example of this is the ability of the human body to turn over its own weight each day in ATP.

CONCLUSION

Looking at the results of the experiment conducted, it is clear that the enzymes are involved in speeding up the chemical reactions that are involved in the cells. They are not consumed in the reactions that take place. This is evident from the increasing rate of the reaction with increase in time.

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