CASE STUDY: ENZYMES

NAME:

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DATE:

**DEFINITION, EXAMPLES, FUNCTIONS AND STRUCTURE OF AN ENZYME**

Enzymes are protein that help speed up metabolism or the chemical reactions in our bodies. They build some substances and break others down. All living things have enzymes. Our bodies naturally produce enzymes. But enzyme are also in manufactured products and food . These are thousands of individual enzymes in the body. Each type of enzyme only has one job. Enzymes are protein in nature. Though some are ribonucleic acids (RNA)molecules. The RNA is responsible in translating information from the DNA and creates proteins.Each cell in the body contains enzymes and are essential for the following factors; Respiration, digestion muscular and nervous function and many other functions as brought out below;

1)**Digestion**.

Enzymes in the digestive system helps in the breaking down of the food we eat into substance that the body can use. The following are the enzymes involved in digestion;

Enzyme Amylase

Responsible for breaking down carbohydrates/starch to sugars, it is secreted by salivary glands and pancreas

Enzyme Maltase

This enzyme is released by the small intestine and is responsible for breaking down malt sugars into glucose that can be used by the body in energy production

Enzyme Lactase

This is responsible for the breakdown of lactose sugars found in dairy products and is produced by the cells known as enterocytes in the intestine.

Enzyme Lipase

Responsible for breaking down fats into fatty acid sand is produced in the mouth in small quantities but in large quantities by the pancreas

Enzyme Proteases

This enzyme is responsible for breaking down proteins into amino acids which are responsible for several functions such as; blood clotting, immune function, cell division etc.The main proteases are;Pepsin, secreted by the stomach to break down protein into small groups of amino acids;Trypsin,formed where an enzyme secreted by the pancreas activated by an enzyme in the small intestine;Chymotrypsin,responsible for breaking down peptides into free amino acids.

Enzyme Sucrase

Responsible for breaking down sucrose into fructose and glucose and is found along the intestinal villi. N/B: The digestive enzymes are released mainly when one anticipates eating or feels the smell and taste of food.

2) **DNA Replication**

Under this process the following enzymes are utilized;Primase,catalyse the synthesis of short RNA molecules. Helicase, Separate double stranded DNA into single strand allowing each to be copied;DNA Ligase,joins discontinuously synthesized fragments;DNA Gyrase,reduces super coiling which builds up during DNA unwinding.

**3)Respiration**

Enzyme in respiration help in creating chemical bonds in the first step of cellular respiration. Cellular respiration is the process by which cells convert glucose into carbon dioxide and water and it takes place three steps; glycolysis, citric acid cycle and oxidative phosphorylation.There are two types of enzymes involved in cellular respiration; Dehydrogenase and coenzyme (NAD).The main function of these enzymes is to assist in transferring electrons from one molecule(oxidation)

**4)Transferring material around the cell.**

Enzymes generate movement by bringing about muscular contraction and help in transporting cargo around the cell as part of cytoskeleton.The enzyme responsible for this function is permease, its function is to allow the diffusion of specific molecule or ions into or out of the cell in the direction of concentration gradient

**5.Blood-clotting**

Blood-clotting proteins generated thrombin an enzyme that converts fibrinogen to fibrin and a reaction that leads to the formation of fibrin clot tissue outside the vessel stimulated thrombin production by the activation of vessels stimulates thrombin production by the activation of the clotting system. Thrombin causes platelet aggregation. Platelets exposed to thrombin secret their granules and release the contents of these granules into the surrounding plasma. Platelete aggregation is the property of platelets to clump with each other to form a platelet plug. Two proteins on the platelet. Membrane play an important role in platelet aggregation: glycoprotein iib and glycoprotein iiia. These proteins form a complex in the membrane and expose a receptor site after platelet in the membrane play an important role in platelet aggregation : glycoprotein iib and glycoprotein iiia. These protein form a complex in the membrane and expose a receptor site after platelet activation that binds fibrinogen (a bivalent molecule with two symmetrical halves that is found in relatively high concentration in plasma). Fibrinogen can bind simultaneously to two platelets. Thus, fibrinogen links platelets together (aggregation) through the glycoprotein iib-iiib complex that serves as the fibrinogen receptor. Injury to vessel stimulates thrombin production by the activation of clotting system. Thrombin causes platelet aggregation. Platelets exposed to thrombin secrete their granules and release the contents of these granules into the surrounding plasma

6. **Enzymes responsible in HIV Virus**

When HIV (Human Immunodeficiency Virus) invades a CD4 cell, the cell becomes reprogrammed to create new copies of HIV. To do this, HIV, needs the help of certain enzymes: reverse transcriptase, protease and integrase. The major classes of HIV medications work by blocking these enzymes and preventing CD4 cell from turning into HIV replicator.

**Functions of enzyme protease**.

HIV protease cut up large precursor proteins into smaller proteins. These smaller proteins combine with HIV’s genetic material to form a new HIV virus. Protease inhibitors prevent HIV from replicating by blocking protease.

It also helps in digestion and catabolism of proteins. They catalyze the hydrolysis of peptide bonds absorbed and utilized by cells. They are required for the blood coagulations process.

Enzyme protease is released by the pancreas into the proximal small intestine, where they mix with proteins already denatured by gastric secretions and blocks of protein , which will eventually be absorbed and used thought the body.

HIV protease is responsible for processing of the gag and gag-pol polyproteins during virion maturation. The activity of this enzyme is essential for virus infectivity, rendering the protein a major therapeutic target for AIDS treatment.

**Functions of enzyme integrase.**

Enzyme integrase catalyzes nucleophilic attack of 3 hydroxyl group at the ends of the processed DNA on a pair of phosphodiester bonds in the target DNA (DNA stand transfer) . cellular enzymes complete intergration by repairing the resulting integration intermediate. Intergrase therefore splices the viral DNA into cellular chromosome.

Integrase is a retroviral enzyme that catalyzes the insertation of viral DNA (Vdna) into host chromosomal DNA, which is necessary for efficient viral replication.

Integrase is also an attractive target because, like reverse transcription activity is normally present in human cells. And this fact could reduce the side effects of intergrase inhibitors used to treat HIV infection

**Functions of enzyme integrase.**

HIV uses reverse transcript (RT) to convert its RNA into viral DNA, a process called reverse transcription.

Reverse transcriptase helps in DNA replication, repair and mutagenesis.

**The structure of the enzyme.**

Enzymes are a linear chain of amino acids, which gives rise to a three-dimensional structure. The sequence of amino acids specifies the structure, which in turn identifies the catalytic activity of the enzyme. Upon heating, the enzyme’s structure denature, resulting in a loss of enzyme activity, which typically is associated with temperature.Compared to its substrate, enzymes are typically large with varying size, ranging from 62 amino acid residue to an average of 2,500 residue found in fatty acid in catalysis and is situated next to the binding sites.The catalysis site and binding site together constitute the enzyme’s active site. A small number of ribozymes exist which serve as an RNA-based biological catalyst. It reacts in complex with proteins.We have got a three dimensional structure of enzymes namely; the primary structure, the secondary structure and the tertiary structure.

The primary structure

Here, enzyme made up of amino acids linked together via amide (peptide) bonds in linear chain. The resulting amino acid chain is called a polypeptide or protein. The specific order of amino acid in the protein is encorded by the DNA sequence of the corresponding gene.

The secondary structure.

The hydrogen in the amino group (NH2) and the oxygen in the carboxyl group (COOH) of each amino acid can bond with each other by means of hydrogen bond this means that the amino acids in the same chain can interact with each other . As as a result, the protein chain can fold up on itself.

Secondary structure: It can either wrap round forming the a-helix, or it can fold on top of itself forming the B-sheet.

The tertiary structure

As a consequence of the folding-up of the 2D linea running of the human body. Enzymes work by combining with molecules to start a chemical reaction. They work with molecules to start a chemical reaction. They work best at certain PH levels and temperatures. They play a vital role in the proper functioning of the play a vital role in the proper functioning of the digestive system, the nervous system, muscles and more.

**Conclusion**

An Enzyme is a catalyst ,protein in nature that facilitates chemical reaction in the body and it functions in the following sections in the body; digestive ,respiration , DNA replication ,transferring of material around the cell and many more.

**References**

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