**Enzymes**

Enzyme, a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process.

Practically all of the numerous and complex biochemical reactions that take place in animals, plants, and microorganisms are regulated by enzymes. These catalytic proteins are efficient and specific—that is, they accelerate the rate of one kind of chemical reaction of one type of compound, and they do so in a far more efficient manner than human-made catalysts. They are controlled by activators and inhibitors that initiate or block reactions.

 All cells contain enzymes, which usually vary in number and composition, depending on the cell type; an average mammalian cell, for example, is approximately one-billionth (10−9) the size of a drop of water and generally contains about 3,000 enzymes.

Enzyme synthesis and activity also are influenced by genetic control and distribution in a cell. Some enzymes are not produced by certain cells, and others are formed only when required. Enzymes are not always found uniformly within a cell; often they are compartmentalized in the nucleus, on the cell membrane, or in subcellular structures. The rates of enzyme synthesis and activity are further influenced by hormones, neurosecretions, and other chemicals that affect the cell’s internal environment.

The existence of enzymes was established in the middle of the 19th century by scientists studying the process of fermentation. The discovery of the role of enzymes as catalysts followed rapidly. Developments before 1850 included (in 1833) the separation from malt of the enzyme amylase, which converts starch into sugar, and (in 1836) the isolation from the stomach wall of animals of a component of gastric juice that could partially digest food in a test tube, the enzyme was pepsin.

Enzymes were known for many years as ferments, a term derived from the Latin word for yeast. In 1878 the name enzyme, from the Greek words meaning “in yeast,” was introduced; since the late 19th century it has been employed universally.

**Enzyme Structure**

Enzymes are a linear chain of amino acids, which give 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, enzyme’s structure denatures, resulting in a loss of enzyme activity, that typically is associated with temperature.

Compared to its substrates, enzymes are typically large with varying sizes, ranging from 62 amino acid residues to an average of 2500 residues found in fatty acid synthase. Only a small section of the structure is involved in catalysis and is situated next to the binding sites. The catalytic 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.

**Chemical Nature of Enzymes**

All enzymes are proteins, however all proteins are not enzymes. However, there are some conjugated enzymes with a non-protein moiety attached to the protein part of enzyme, which is called Apo enzyme. The non-protein part is known as co factor. If the co factor is of inorganic nature like potassium calcium, magnesium, manganese it is known as prosthetic group. Prosthetic group is generally tightly bound to the protein part of enzyme and it is difficult to separate it with simple method like diffusion. The enzyme with prosthetic group and Apo enzyme is called holoenzyme.

If co factor attached to an enzyme protein is organic moiety like NADP, NAD, FAD, etc , it is called coenzyme. A co enzyme is generally loosely bound to Apo enzyme and can easily be separated than prosthetic group. Co enzymes are heat resistant also.