

## Enzymes and its regulation mechanism.

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### Commentary

Enzymes are required for majority of the processes required. Enzymes catalyze a reaction by reducing the energy of activation needed for the reaction to happen. Enzymes got to be tightly regulated to make sure that the levels of the product don't rise to undesired levels. This is often accomplished by enzyme inhibition. Enzymes will be regulated by other molecules that either increase or reduce their activity. Molecules increasing the activity of an enzyme are known as activators, while molecules that decrease the activity of an enzyme are called inhibitors. Many different chemicals can either impede or increase enzyme action, and they affect enzyme function in diverse ways. Two general strategies can be used to control enzyme activity:

1. Control of enzyme quantity
2. The enzyme's catalytic efficiency is influenced by the catalytic efficiency of enzymes.

#### Altering the speed of enzyme synthesis and degradation

Enzymes are proteins that are produced from amino acids under gene control and then degraded back to amino acids after performing their function. The quantity of an enzyme is determined by the pace at which it is synthesised and, as a result, degraded. Increased enzyme quantity could also be thanks to a rise within the rate of synthesis, a decrease within the rate of degradation or both. Decreased enzyme quantity could also be thanks to a decrease within the rate of synthesis, a rise within the rate of degradation or both. for instance , the number of liver arginase enzyme increases after protein rich meal thanks to a rise within the rate of its synthesis; also it increases in starved animals thanks to a decrease within the rate of its degradation.

### Induction

Induction means a rise within the rate of enzyme synthesis by substances called inducers. Enzymes are categorised according to their response to inducers.

- I. Constitutive enzymes, the concentration of those enzymes doesn't depend upon inducers.
- II. Inducible enzymes, the concentration of those enzymes depends on the presence of inducers ex: induction of lactase enzyme in bacteria grown on glucose media.

### Repression

Repression is known as decrease within the rate of enzyme synthesis by substances called repressors. Repressors are low relative molecular mass substances that decrease the speed of enzyme synthesis at the extent of organic phenomenon. Because repressors are typically end products of biosynthetic reactions, repression is often referred to as feedback control. For instance, dietary cholesterol decreases the speed of synthesis of HMG CoA reductase (hydroxy - methyl glutaryl CoA reductase), which

may be a key enzyme in cholesterol biosynthesis. Derepression (D) Enzyme synthesis resumes at its regular pace if the repressor is removed or exhausted. E- Substrate, coenzyme, and metal ion activator concentrations. The conformation of an enzyme determines its susceptibility to breakdown. When a substrate, coenzyme, or metal ion activator is present, the enzymes shape changes, slowing down the rate of breakdown.

Altering the catalytic efficiency of the enzyme by catalytic efficiency of enzymes is affected by:

- A- Allosteric regulation
- B- Feedback inhibition
- C- Proenzyme (zymogen)
- D- Covalent modification
- E- Protein - Protein interaction

#### Covalent modification

The creation of covalent bonds modifies the activity of a variety of enzymes.

- e.g.:
1. Methylation (addition of methyl group).
  2. Hydroxylation (addition of hydroxyl group).
  3. Adenylation (addition of adenylic acid).
  4. Phosphorylation (addition of phosphate group)

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