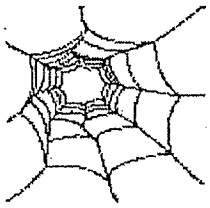


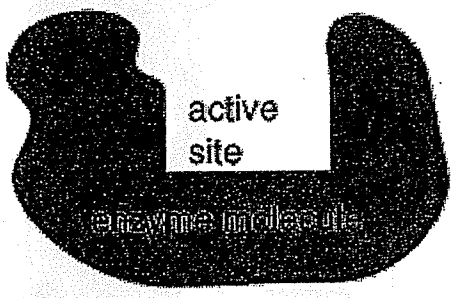
This unit is an explanatory page, referenced by several units dealing with the action of enzymes. As such it has a slightly different format than most units on this website - for example it does not lead directly on to the "next topic" in a sequence.
Clicking on the yellow screen icons in the right margin can bring in a number of animations which come up as separate pages, each of which can be closed afterwards!

Return to contents page ?

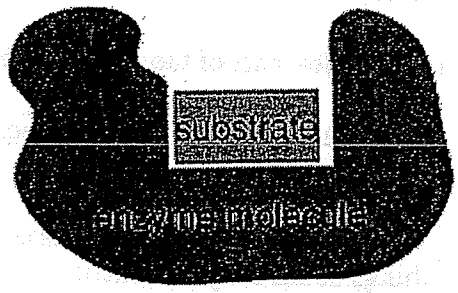
How enzymes work

Essential points about enzymes :
- all enzymes are **proteins**
- each enzyme has a **specific catalytic action**
- their **normal activity** depends on their **environment**
- **abnormal conditions** cause **reduced activity**

1 Enzymes are globular proteins - their molecules are round in shape. They have an area - usually thought of as a pocket-shaped gap in the molecule - which is called the **active site.**
Some enzymes are found inside cells (intracellular enzymes), and some - especially digestive enzymes - are released so they have their effects outside the cell (extracellular enzymes).
The accompanying diagrams are intended to illustrate a generalised account of the action of digestive enzymes.



2 (Only) the substrate (or substrates) fits/fit into the active site. There are several types of enzyme which contribute to different types of biochemical reaction - *see below.* It is not widely appreciated (even by some teachers!) that water is also a reactant in the digestion (enzyme-controlled breakdown) of most biological molecules.



catalyst: inorganic or organic substance which speeds up the rate of a chemical r without entering the reaction itself.

enzymes: organic catalysts made of protein.

- most enzyme names end in -ase
- enzymes lower the energy needed to start a chemical rx. (activation energy speeding the reaction

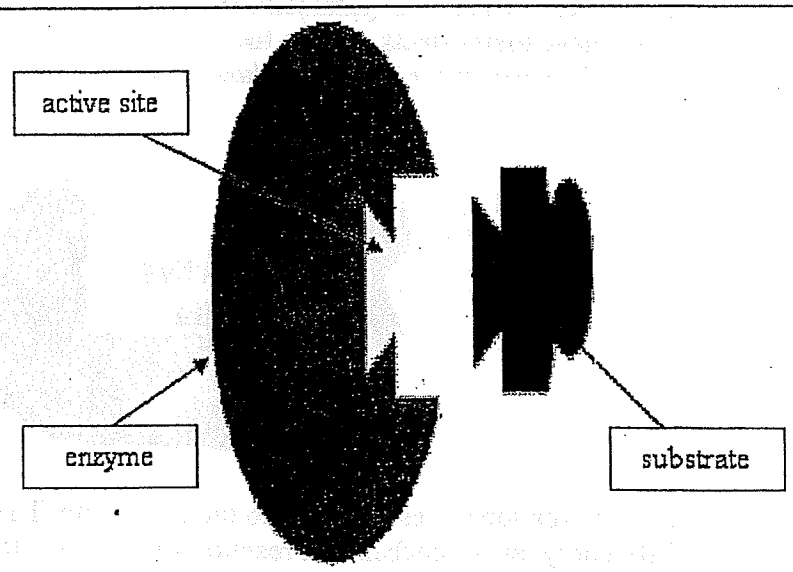
How do enzymes work?

substrate: molecules upon which an enzyme acts. The enzyme is shaped so that lock up with a specific substrate molecule.

enzyme
substrate ----------> product

sucrase
Sucrose ——————> Fructose + Glucose

Lock and Key Theory



Each enzyme is **specific** for one and ONLY one substrate (one lock - one key)

active site: part of the enzyme that fits with the substrate

Note that the active site has a specific fit for this particular substrate and no other.

This theory has some weaknesses, but it explains many basic things about enzyme function.

What Are Enzymes?

Enzymes are a delicate lifelike substance found in all living cells, whether animal or vegetable. Enzymes are energized protein molecules necessary for life.

They catalyze and regulate nearly all biochemical reactions that occur within the human body. Enzymes turn the food we eat into energy and unlock this energy for use in the body. They can not be seen with even the most powerful microscope, but their presence and strength can be determined by improved blood and immune system functions. There are three types of enzymes. Our bodies naturally produce two types, **digestive** and **metabolic enzymes** as they are needed, while **food enzymes can only be consumed orally.**

METABOLIC ENZYMES:
speed up the chemical reaction within the cells for detoxification and energy production. They enable us to see, hear, feel, move and think. Every organ, every tissue, and all 100 trillion cells in our body depend upon the reaction of metabolic enzymes and their energy factor. Metabolic enzymes are produced by the liver, pancreas, gallbladder and other organs. **In short, metabolic enzymes are the energy enzymes**

DIGESTIVE ENZYMES:
are secreted along the digestive tract to break food down into nutrients and waste. This allows nutrients to be absorbed into the blood stream and the waste to be discarded. **Human digestive enzymes include ptyalin, pepsin, trypsin, lipase, protease, and amylase.** The body does not make cellulase, an enzyme necessary for proper digestion of fiber, so it must be introduced through the raw foods we eat. **Without proper amounts of these enzymes our body cannot remove all the waste and will become toxic**

METABOLIC ENZYMES:
are introduced to the body through the raw foods we eat and through consumption of supplemental enzyme fortifiers. Raw foods naturally contain enzymes providing a source of digestive enzymes when ingested. However, raw food manifests only enough enzymes to digest that particular food, not enough to be stored in the body for later use. **The cooking and processing of food destroys all of its enzymes.** Since most of the foods we eat are cooked or processed in some way and since the raw foods we do eat contain only enough enzymes to process that particular food, our bodies must produce the majority of the digestive enzymes we require. **For these reasons it is recommended that we supplement our diet with enzymes.**

What do Enzymes Do?

Enzyme Homepage

Sub Contents ;

How Are Enzymes Named?

One researcher reports treating grain, sorghum or barley with the enzyme "gumase" while another reports the same with the enzyme "beta-glucanase" When methodologies are examined, it is discovered that both of these preparations are the same product. Unfortunately, this apparent contradiction in terms happens often. Enzymes have been named by several methods and this fact has been known to cause confusion in their classification. For example, common or "trivial" names of enzymes, generally contain a prefix representing the name of the substance or substrate upon which they act or affect, followed by the suffix "ase". The "ase" simply denotes or identifies that the substance is an enzyme. Examples of this system of nomenclature includes the enzyme that catalyzes the conversion of proteins into their component amino acids, the name of this enzyme is "protease" or "proteinase".

Another example is the enzyme that accelerates the breakdown of the two components of starch into sugars. The components of starch are known as "amylose" and "amylo-pectin", thus, the enzyme helping to break them down is called "amylase". Confusion may exist, however, when older names of enzymes are used. Included in these older terms are ficin, pepsin, bromelin and trypsin, which are older trivial names of individual types of protease preparations, the enzymes that accelerate digestion of proteins. There are also many sub- classes of enzymes. Amylases are a prime example; subclasses of amylase include: alpha-amylase, beta-amylase, and gluco-amylase, to name a few. All these enzymes do is accelerate the digestion of starch and are broadly classified as amylases, but their actions are all slightly different in nature.

To help sort this out, the International Union of Biochemistry in 1961 proposed a system for enzymes' classification and naming which is finding acceptance mainly in this discussion. One example of this system, however, is the term: "alpha 1, 4-glucan glucanohydrolase" which is a name for alpha-amylase.

All these systems of nomenclature may become confusing to someone who has use for only a few types of enzymes or uses them for industrial or agricultural purposes. Therefore, the use of the more widely known terms such as "amylase" and "protease" are more or less universally in these fields. It should be remembered, however, that there are many types of enzymes that fit into these broad categories that may be more or less suitable for specific agriculturally related application. The final selection for a specific application should be made only after consulting a knowledgeable individual well-versed in the technical aspects of the particular enzyme requirements and applicable characteristics.

<<<<Back

Next >>>>

Home | Microorganism | Enzyme | Natural Treatment | Products | Order | Contact Us