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Biology

What is the impact of enzyme's use in human society

'Enzymes are special kinds of proteins that are found in all living matter. Living cells need enzymes to live and grow. Enzymes are catalysts, substances which speed up chemical reactions present in very small amounts without being changed in the reaction' [1] .It was firstly named *enzyme* by a German physiologist, Wilhelm Kühne in 1878. This term comes from Greek *ενζυμον* "in leaven" to describe the process. This word was later used to refer to nonliving substances, such as pepsin [2]. Enzymes are used for medical reasons [3], to treat a variety of illnesses, as well as to make various drinks and things to eat [4]. Enzymes can be found in everywhere, in the food we eat, such as cheese, yoghurt; in different drinks, such as wine [4]; in laundry detergents, and also in our body.

The use of enzymes has begun years ago, since 1874, when the Danish chemist, Christian Hansen, made the first preparation of relatively high purity used for industrial purposes [5]. He produced the first specimen rennet by extracting dried calves' stomachs with saline solution [5].

People have been using enzymes unconsciously for ages in their food and drink, such as cheese, yoghurt, bread, beer, wine and others. In grapes, for instance, which are used to make wine, there is a natural form of fungus, called yeast. The

enzymes in yeast break down glucose into ethanol and carbon dioxide gas in absence of oxygen. This process is called fermentation [4].

In Japan, an old tradition, Koji, was used for production of certain foodstuffs based on soya protein and fermented beverages. A Japanese scientist, Takamine, developed a fermentation process for the industrial production of fungal amylase. The method of Takamine is still used for the production of various enzymes [5].

Another development of enzymes was in the desizing of textiles. It was firstly used by Boidin and Effront in 1917. Enzymes were and are still used in detergents for washing protein stained cloth in detergents containing enzymes. Firstly, the detergent contained trypsin, but later on, in 1959, a Swiss chemist, Dr. Jaag, developed a new product, Bio 40, containing a bacterial protease, instead of trypsin [5]. What's more, enzymes play a big role in starch industry, by breaking down starch into glucose. In 1950s, fungal amylase was used in the manufacture of specific types of syrup, which contained range of sugar that could not be produced by conventional acid hydrolysis [5].

Enzymes are still used nowadays for many different functions. Proteases and fungal alpha-amylase enzymes are often used in baking industry. These enzymes are normally inactivated at about 50^0C, but are destroyed during baking process, releasing sugar monomers from starch [2]. Another use of enzymes is the use of trypsin enzymes for baby foods [2].

Barley enzymes are released during the mashing stage of beer production, producing simple sugar, amino acids and peptides used for fermentation [2]. A further use of enzymes is in the brewing industry. For example, betaglucosidase enzymes are used to improve the filtration quality in brewing industry; amyloglucosidase enzymes are used to lower the calories of beer; protease enzymes are used to remove cloudiness produced during storage of beers [2]. An additional use of them is in fruit juices and also in dairy industry. Rennin enzymes are used to hydrolyse protein; microbially produced enzyme has increased its use in dairy industry; lactases enzyme breaks down lactose to glucose and galactose [2]. Also, in starch industry, amylase, amyloglucosidease and glucoamylase enzymes are used to convert starch into glucose and various syrups. In meat tenderizers, papain enzyme is used to soften meat for cooking [2].

In biological detergents, different types of enzymes, such as primarily proteases, amylases, lipases and cellulases are used to help removing protein strains, resistant starch residues, fatty or oily strains, and also used in biological fabric conditioners [2].

Protease enzymes are necessary to remove proteins on contact lens to prevent possible infections as well as to dissolve gelatine off scrap film, in photographic industry [2]. Plus, amylase, xylanase, cellulase and ligninase enzymes are useful in paper industry, in degrading starch to lower viscosity, helping sizing and covering paper; smoothing fibres; promoting ink removal; removing lignin to soften paper [2].

Last but not least, enzymes such as restriction, DNA ligase and polymerase, are very helpful in molecular biology. They are used to manipulate DNA in genetic engineering, which is important in pharmacology, agriculture and medicine. Molecular biology is moreover important in forensic science [2].

Enzymes are proteins, so they are completely biodegradable; they are non-toxic to plants and animals [6]. However, if they are breathed at very high concentrations and frequently, they may cause respiratory allergies, and this happens often in laundry detergents [6]. Also, they can cause allergy from contact with the eyes [1].

On the other hand, enzymes are also used for medicinal uses. For instance, an Austrian doctor, Dr. Neuhofer, treats her multiple sclerosis patients with an enzyme mixture, which resulted successful, showing improvement in over 85% of the patients [3]. Enzyme capsules are also consumed for a recovery after an injury [3]. Their function was shown in a study of the effect of an anti inflammatory enzyme mixture on the treatment of hematoma, knows as bruise.

Furthermore, researchers in Munich and Berlin have discovered that an enzyme, beta-secretase or BACE1, which has central role in Alzheimer's disease, has a key function in the normal development of the nervous system, as well [7]. As a result of the researches I would say that enzymes are generally harmless, but they can also cause respiratory allergies breathed frequently at very high concentration, or from contact with eyes.

All in all, people have been using enzymes since the early times, without knowing of their existence or their functions. They were used for foods, drinks, industrial purposes, and also in starch industry. Enzymes are still being used in many different industries in many facilities. They are very useful, since they can work in low temperatures, but they are very specific in their function as well. They have an optimum temperature and if the temperature gets too high, they denature. As a conclusion, I would say that enzymes play a great role in our lives. They are very useful, but they can also cause problems if used improperly.

(1017 words)

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