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Review article

The Impact of extremophilic Enzyme: Widely Application in Industrial uses

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Abstract

Some areas to be restricted have not detected bacterial life. Over the past year, the bacterial communities have become increasingly aware that they are exposed to very different conditions, such as temperature, pH, pressure, and salt. These microorganisms are termed Extremophiles. These Extremophiles produce biocatalysts and their function under Extreme conditions. Several novel applications of their biocatalyst are unique properties in the different industrial processes. At present, only a small percentage of these earth's resources are used. An extremophile is a new development in agriculture and production but the development is also related to the production and integration of genes into larger forces, increasing the number of enzyme-induced changes in chemicals, food, pharmaceuticals, and other industrial applications.

Introduction

Extremophiles are the organisms which survive in extreme environmental condition. We study them on earth is to better understand the wide range of the condition under which life evolve and survive. It helps us to understand some different environmental extremes. For biotechnology and industrial application, more than 300 different enzymes have

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been identified and many available enzymes do not withstand industrial reaction conditions. The extreme condition can refer to temperature, radiation, and pressure but also to geochemical extremes.

Psychrophiles

A microorganism capable of living below a temperature of 4 °C. Psychrophiles can also grow and reproduce at low temperatures ranging from -20 °C to +10 °C. This is why they are found in colder regions such as the polar region and in the deep ocean. Recently, enzymes derived from Psychrophiles have been a boon to industrial use, thanks to ongoing efforts to reduce energy consumption.

The paper industry and Pulp are also interested in the degrading Enzyme Polymer that operates at low temperatures (Bentahir *et al.,* 2000, Kim *et al.,* 1999, Fields *et al.,* 2001, Smal *et al.,* 2000, Watanabe *et al.,* 2002). The use of Multi-Food Processing will also benefit from the availability of low-temperature Enzyme. There is a growing desire to incorporate Psychrophilic enzymes into the detergent. A feature of the enzyme derived from Psychrophiles is the combination of low-temperature functions and high activity to produce a moderate temperature. This can be explained by the increased flexibility of molecules compared to the mesophilic and thermophilic Enzyme. There is a growing number of role models from environmental and protein engineering studies (D'Amico *et al.,* 2003, Fersht 1999, Schoichet *et al.,* 2002, Van den Burg *et al.,* 1998).

Thermophilies

These microorganisms have the ability to survive in conditions as high as 140 °F or higher temperatures. In particular, the extremophilic Proteases, Lipases, and polymer degradation enzymes, such as cellulase, amylases, and chitinase have very much useful in founding an industrial application. Thermophilic eubacteria are suggested to have been among the earliest bacteria hence, mainly Extremophilic Proteases, lipases, and polymer-reducing enzymes, such as cellulase, chitinase, and Amylases found their way into the Industrial Application (Table- 1). The structural features of the thermophilic Extremozymes have attracted a lot of attention. Several three-dimensional arrangements have been resolved compared to those performed by a mesophilic partner, with the main purpose of teaching how thermostability works (Beadle and Schoicet 2002, Sterner and Liebl 2001, Vieille and Zeikus 2001, Van den Burg and Eijsink 2002).

Table-1: Classification of extremophiles and examples of applications of some of their enzymes

Type	Growth characteristics	Enzymes	Applications
Thermophilic	Temp>80^0C (hyperthermophile) and 60-80^0C (thermophile)	Protease Glycosylhydrolases (eg. Amylase, pullulanase, glycoamylases, glucosidases, cellulases, xylanases) Chitinases Xylanases Lipaseses, esterases Dna polymerases Dehydrogenases	Detergents, hydrolysis in food and feed, baking Starch, cellulose, chitin, pectin, processing, textiles Chitin modification for food and health products Paper bleaching Detergent, stereo-specific reactions Molecular biology (eg. PCR) Oxidation reactions
Psychrophiles	Temp<15^0C	Proteases Amylases Cellulases Dehydrogenases Lipases	Detergents, food applications (eg. Dairy products) Detergents & bakery Detergents, feed and textiles Biosensors Detergents, food and cosmetics
Helophiles	High salt, (eg. 2-5M NaCl)	Proteases dehydrogenases	Pepdtide synthesis Biocatalysis in organics media
Alkaliphiles	pH >9	proteases, cellulases	Detergents, food and feed
Acidophiles	pH<2-3	Amylases, glucoamylases Proteases, cellulases	Starch processing Feed component

Alkaliphiles

Growing optimally around a Ph of 10 means this clear can capable of survival in alkaline environment. An organism with the rights to survive and flourish in compounds worthy of neutralizing powerful microorganism acid enzymes that can live in conditions of strong acidic or strong alkaline reaction, e.g., in detergent manufacturing.

Acidophilic

These microorganisms are growing rapidly in acidic environment, normally at very low pH (<3) Protease, amylase, lipases and other Enzyme that are tolerant to and active at high ph and high chelator concentration of modern detergent are desirable. Several useful Enzyme have already been identified and obtained (Kocabıyık and Erdem, 2002). To detect alkaline in the mixture homology-based PCR and activity screening have been applied to serum. Proteases in a collection of thermoacidophilic archaeal and bacterial strain isolated from hot Environment (Paiardini *et al*., 2003).

Halophilic

These microorganism need to survive high salt concentrations to grow[17,18], with most species requiring more than 2.0 M NaCl for growth and survival Halophiles coat themselves with a special protein layer that blacks Excessive salt from Entering its cells. Halophiles caot themselves with a special protein layer that blacks Excessive salt from Entering its cells. Halophiles absorb salt at concentrations which are isotonic to the atmosphere, like sodium and potassium chloride (NaCl, KCl) (Madern and Zaccai, 2000; Klibanov, 2001). As a consequence, the protein from halophiles has to deal with the intensity of very high salts. The Enzyme have adopted to this Environment Pressure by acquiring a relatively large number of negatively charged amino acid residues on their surface to prevent precipitation. Consequently, in surroundings with lower salt concentration (Demirjian *et al.*, 2001) the solubility of halophilic Enzyme is often very poor, which could limit their Applicability.

Radioresistant Microbes

These organisms are able to withstand in high or extreme radiations Radioresistant microbes often channel the energy from radioactivity to purposes such as producing food for themselves, and some have evolved aggressive DNA repair mechanisms to reverse any genetic damage caused by radiation. Eg. *Dienococcus radiodurans*, is listed by the *Guinnes Book of World Records* as “the world’s toughest bacterium”.

Barophiles

These organisms are able of surving high pressure environmental condition such as ocean floor. As 1000 m depth in sea beneath is disguised by a high hydrostic pressure, where coldness, darkness and short age of organic matter takes place.

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