By Gaia Vaccari, Meda Skinkytė and Emilie K Nygaard

Hyperthermophiles and Biotechnology

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Background

Extremophiles are microbes capable of living at extreme environments such as very high or low temperature, pH or salinity[1].

Hyperthermophiles are those capable of growth at temperatures over 80°C[1].

They can be found in deep sea hydrothermal vents, terrestrial hot springs, solfataras, and other high temperature environments[1].

Applications

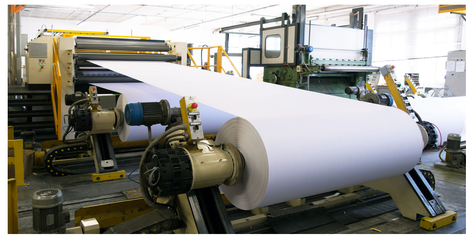
Because they have functional proteins and enzymes at extreme temperatures, biotechnology can use them for exciting fields, such as in animal feed, pulp and paper, biofuel, cosmetics, industry and more[2].

Some hyperthermophiles enzymes used in biotechnology are:

- Cellulases and xylanases[3]
- Cyclodextrin glucanotransferases[4]
- Hydrogenases[5,6]

Enzymes

The exposures of the cellulose fibre to enzymatic pulping enhance the bonding forces of paper and improve paper strength via degradation of xylan and removal of lignin using **cellulases** and **xylanases** [3].



Cyclodextrin glucanotransferase is an industrially important enzyme that produces cyclodextrins from starch. It can be applied as catalysts in the synthesis of glycosylated molecules and can act as antistaling agents in the baking industry[4].

Hydrogenase is key for recycling reduced ferredoxin in the production of hydrogen as a by-product. H_2 productions can possibly be used as a clean energy carrier for electric cars[5,6].

Natural environments

Drawbacks

Although hyperthermophiles have been known about for quite some time, technologies for efficient culturing and exploitation are still novel[7].

Hyperthermophiles require specific growth conditions, hard to simulate in a laboratory setting, and at larger scales[7].

Conclusion

Hyperthermophiles are found at Earth´s most extreme environments. To live at extremes, they need enzymes that function at extremes.

Hyperthermophilic enzyme productivity and activity are key in effective utilization in industry. Bioinformatic tools will help to develop robust strains with wide applications[5].

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