The Torch
Vol. 3 (28)

L-haloacid dehalogenase: An overview

Bedri Batuhan Yaman

In industrial biotechnology, archaeal enzymes are frequently used for various purposes such as separation of racemic mixtures, as biocatalysts, as DNA processing enzymes etc. Many archaeal cells live in "extreme" conditions and are hence termed as extremophiles. Moreover, the enzymes produced by extremophiles are gaining precedence in the pharmaceutical industry. The reason behind this transition is their low energy consumption and reduced waste production. In addition to that, the waste generated by the extremophiles are termed as bioproducts which makes them safer to handle. L-haloacid dehalogenase is an enzyme that is produced by the extremophile, Sulfolobus tokodaii. In the industry, this enzyme has been cloned and expressed in E. Coli . The application fields of this enzyme includes chiral halo-carboxylic acid production and bioremediation. The chiral halo- carboxylic acids are valuable intermediates for the drug industry. The L-haloacid dehalogenase aids in the conversion of 2-halo alkanoic acids to 2-hydroxyl alkanoic acids. Furthermore, halogenated substances are toxic to the environment and they can be degraded using dehalogenases. The maximum activity of this enzyme can be observed at 60Ã¢â€žÆ’. Additionally, at 70Ã¢â€žÆ’, this enzyme has a half-life of over one hour. There are two domains of the enzyme monomer. The central domain has a Rossmann fold (the tertiary fold formed when proteins bind to nucleotides) with a six-strand parallel β-strand bundle flanked by five alpha-helices and 3-10 helices. However, the subdomain is made up of alpha-helices. The active site is placed between the two domains and the dimer is formed by the native enzyme. Due to its large active site, this enzyme can act on longer chains. Nonetheless, the biochemical activity of dehalogenases can be utilised to produce drugs and for biodegradation of environmental pollutants. In conclusion, the potential of L-haloacid dehalogenases or the archaeal enzymes is becoming more popular. The utilisation of this enzyme is highly effective in several fields and thus further research can aid in bringing out the various perspectives and applications of this enzyme.

Keywords: Dehalogenase, Archaea, Archaeal enzymes, Sulfolobus tokodaii, Drug Industry, Toxicity

Citation:
Bedri Batuhan Yaman. L-haloacid dehalogenase: An overview. The Torch. 2022. 3(28). Available from: https://www.styvalley.com/pub/magazines/torch/read/l-haloacid-dehalogenase-an-overview.