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Halohydrin dehalogenase-catalysed biotransformation in micellar media

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PURPOSE OF THE ABSTRACT

Halohydrin dehalogenases (HHDHs) are enzymes that catalyse the formation and conversion of epoxides [1]. They have been widely used to transform epoxide into an β -substituted alcohol, often resulting in optically pure products [2]. However, the application of HHDHs in aqueous media, in which reactions are usually performed, is limited by the low solubility of hydrophobic substrates, their hydrolytic instability and the presence of numerous inhibitions [3]. Engineering the reaction medium can lead to significant improvements in terms of process efficiency, ultimately affording higher product yields.

In this work, micellar media were introduced as an alternative for enantioselective biosynthesis employing HHDHs. Three different non-ionic surfactants (TPGS-750-M, Brij® C10 and TWEEN®) were evaluated for the effect on the activity and stability of HHDH from *Agrobacterium radiobacter* AD1 (HheC) in form of cell-free extract and whole cells. Whole cells showed greater stability in 2% TPGS-750-M compared to the cell-free extract under the same conditions. This non-ionic surfactant with hydrophobic core forms micelles in water which serve as a medium for biocatalysis, but also as a reservoir for substrates and products [4].

To test if this feature may provide decreased substrate inhibition of HheC. The influence of different epoxide concentrations was compared for the azidolysis of 2-benzyl-2-methyloxirane in buffer and 2% TPGS-750-M. A considerable shift in maximum of enzyme activity towards higher substrate concentrations (from 10 to 50 mM) is observed in 2% TPGS-750-M, compared to the one achieved in a buffer. We also found that HheC in micellar media containing TPGS-750-M in a higher concentration (4 and 6%), has a better capacity to tolerate higher concentration of tested epoxide. These results suggest a promising effect of micellar media on biocatalytic properties of HheC.

FIGURES

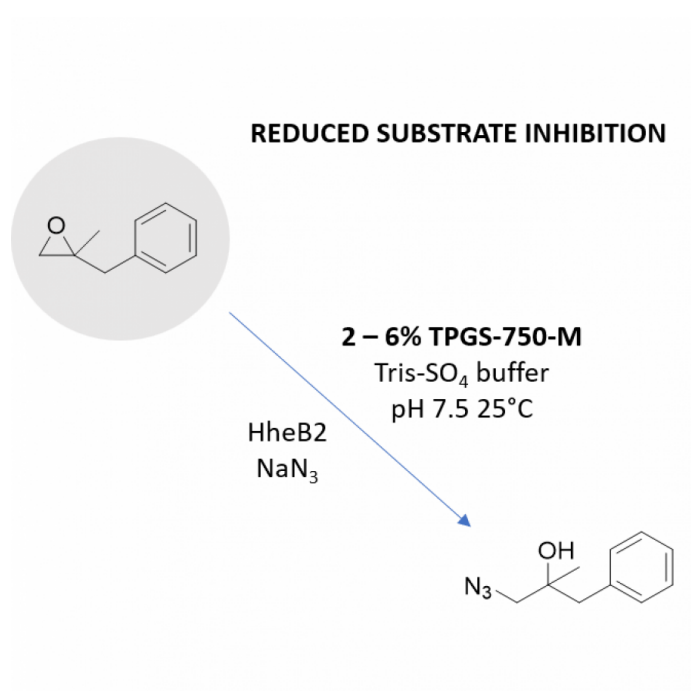


FIGURE 1

Halohydrin dehalogenase-catalysed biotransformation in micellar media

Selected reaction for evaluation of minimizing substrate inhibition of HheB2 in micellar media.

FIGURE 2

KEYWORDS

halohydrin dehalogenase | micellar media | substrate inhibition | enzyme stability

BIBLIOGRAPHY