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In silico discovery and characterization of novel fish epoxide hydrolase from Zebrafish, *Danio rerio*, and its application for the production of enantiopure epoxides

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Enantiopure epoxides are important intermediates for producing optically active compounds. In this study, novel fish epoxide hydrolase (EH) from *Danio rerio* was accessed and compared based on the multiple sequence alignments, phylogenetic analysis and homology modelling. *D. rerio* EH was cloned and expressed in *Escherichia coli* for the first time. The recombinant *E. coli* expressing the enantioselective EH gene of *D. rerio* was used for producing enantiopure styrene oxide by asymmetric resolution of racemic styrene oxide. The recombinant *E. coli* exhibited the enantiopreference toward (*R*)-enantiomer, and has a maximum hydrolytic activity as 8.3 μmol/mg cell min. We obtained enantiopure (*S*)-styrene oxide with high optical purity (> 99% *ee*) and a yield of 31.3% (theoretically 50% maximum yield) at 60 min from 60 mM of racemic styrene oxide using the recombinant *E. coli*.

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