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Authors: Muhammad Naeem, Ashfaq Ur Rehman, Bin Shen, Lidan Ye, Hongwei Yu

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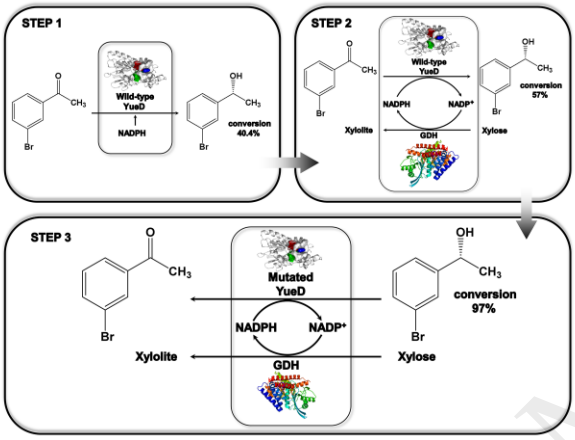
Semi-rational engineering of carbonyl reductase YueD for efficient biosynthesis of halogenated alcohols with in situ cofactor regeneration

Muhammad Naeem[a], Ashfaq Ur Rehman[b], Bin Shen[a], Lidan Ye[a], Hongwei Yu[a*]

[a] Institute of Bioengineering, College of Chemical and Biological Engineering, Zhejiang University, Hangzhou 310027, P. R. China. E-mail: yuhongwei@zju.edu.cn
[b] State Key Laboratory of Microbial Metabolism, Department of Bioinformatics and Biostatistics, School of Life Sciences and Biotechnology, Shanghai Jiao Tong University, 800 Dongchuan Road, Shanghai, 200240, China

Graphical Abstract:



Highlights:

- V181A mutation of YueD improved reduction of halogenated acetophenones;
- MD simulation implied expansion of catalytic pocket upon V181A mutation;
- Xylose serves as a good co-substrate for YueD-GDH cofactor regeneration system;
- Up to 99% conversion of halogenated acetophenones was achieved using V181A-GDH.

Abstract:

Optically active 1-phenylethanol and its derivatives are versatile chiral precursors for many pharmaceuticals. The increasing market demand of enantiopure alcohols calls for exploration of more robust biocatalysts capable of delivering high conversion rates at high substrate concentrations. The carbonyl reductase YueD from *Bacillus subtilis* was engineered for improved reduction of halogenated acetophenones. Based on in silico docking and Alanine screening, mutant Val181Ala with 97% conversion of the model substrate 3-bromoacetophenone