How to identify and characterize novel transaminases? Two novel transaminases with opposite enantioselectivity for the synthesis of optically active amines

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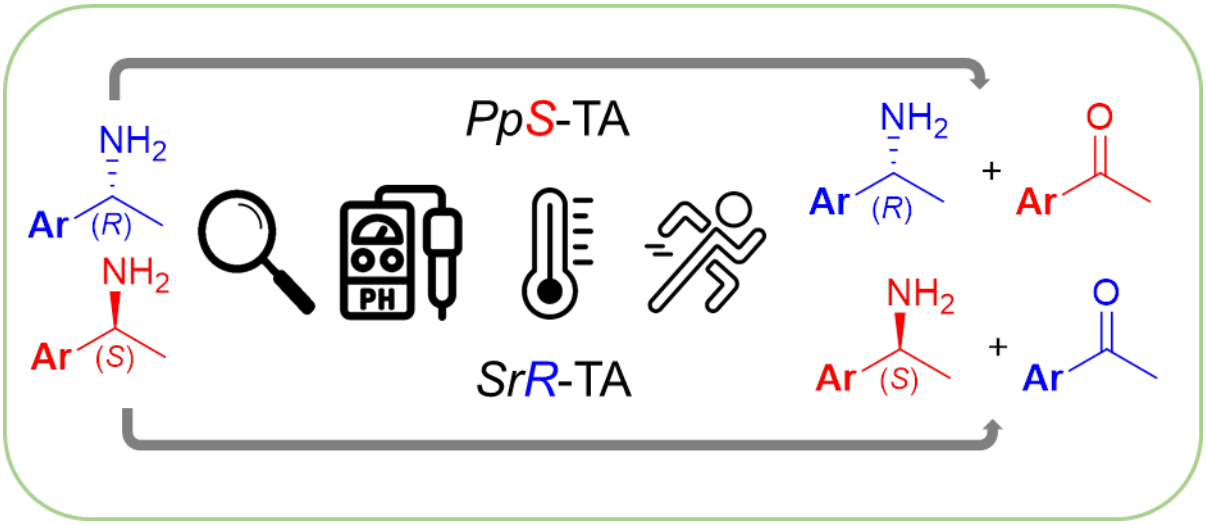

Highlights

- Discovery of two novel amine transaminases with opposite stereopreference
- Operational activity/stability assessment of the new amine transaminases
- Biocatalytic synthesis of enantiopure (*R*)- and (*S*)-1-arylethane-1-amines

Abstract

Amine transaminases (TAs) are attractive biocatalysts for the synthesis of chiral aromatic amines representing highly valuable motifs of APIs. The increased industrial need of novel methods to produce chiral amines for APIs resulted in an emerged discovery of new TAs. Joining the current wave of TA related research, this study reports the identification of genes encoding an (*S*)-selective TA from *Pseudomonas psychrotolerans* TA (*PpS*-TA) and an (*R*)-selective TA from *Shinorizobium* sp. TA (*SrR*-TA) by sequence data mining. Functional analysis of the novel TAs revealed their pH profile, thermal stability, optimal buffer system, DMSO tolerance, and operational stability in kinetic resolution (KR) of racemic 1-phenylethane-1-amines. The (*S*)-selective *PpS*-TA maintained its operational stability even at high temperature and pH values, enabling conversions from racemates approaching the optimal ~50% value of a highly selective KR. Although with lower activity, the (*R*)-selective *SrR*-TA remained active at higher DMSO co-solvent concentrations up to 30%, enabling elevated substrate concentrations for aromatic amines of low water-solubility. The kinetic parameters of the novel *PpS*-TA and *SrR*-TA in KRs of several racemic 1-arylethane-1-amines (±)-**2a-d** and pyruvate (co-substrate) revealed superior catalytic efficiencies (k_{cat} values) compared to the well-characterized (*S*)-TA from *Chromobacterium violaceum* (*CvS*-TA) indicating the biocatalytic potential of the two newly characterized TAs.