

## Implementation of Enzymes in Amine-Focussed Processes

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Amines are a key structural motif for the synthesis of a wide range of pharmaceuticals (*e.g.* antibiotics), as well as pesticides and flavors. In this regard, imine reductases (IREDs) have emerged as a highly selective and sustainable alternative for asymmetric reductive amination reactions. On the other hand, many naturally abundant amines have also been used efficiently as starting materials in different processes where enzymes such as dehydrogenases and transaminases can be easily obtained to “activate” those substrates for further cascades. Herein, we will be discussing two different approaches showing how the enantioselective reduction of designed heterocyclic imines has been efficiently achieved through IRED-based catalysis combined with glucose dehydrogenase for cofactor-regeneration,<sup>1</sup> and how L-Dopa can be transformed in danshensu (the active component of Danshen, is one of the major traditional herb medicines in China) via hydrogen-borrowing strategy, combining phenylalanine dehydrogenase from *Bacillus sphaericus* and a novel hydroxyphenylpyruvate reductase from *Mentha x piperita*.<sup>2</sup> Both processes could be intensified in continuous flow conditions, achieving for both examples high yields and productivities.

### References:

- [1] A. I. Benítez-Mateos, D. Lim, V. Marchini, D. Roura Padrosa, H. Wu, F. Buono, F. Paradisi “*Biocatalytic Reduction of Six-membered Ring Heterocyclic Imines in Continuous Flow*” *ACS Sustainable Chemistry and Engineering* **2025**, *in press*.
- [2] V. Marchini, F. Paradisi “*Self-sufficient biocatalytic cascade for the continuous synthesis of danshensu in flow*” *Applied Microbiology and Biotechnology* **2025**, 109, 13