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Enzyme Discovery & Engineering to Create Biocatalysts Suitable for Efficient Applications

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PURPOSE OF THE ABSTRACT

This lecture will cover recent achievements in the discovery, protein engineering and application of enzymes in biocatalysis [1]. For the asymmetric synthesis of chiral amines, we created (S)-selective amine transaminases for the acceptance of bulky ketones [2]. Most recently, we have developed a sophisticated growth selection method and could create highly active and selective enzymes from three classes to make important chiral precursors for pharmaceutical building blocks [3]. For the regioselective methylation/alkylation, we have explored SAM-dependent O-methyltransferases to make flavonoids and related compounds [4] and developed engineered halide methyltransferases to transfer alkyl residues such as ethyl-, propyl- or allyl-, substantially expanding the repertoire of target compounds [5]. In addition, we have engineered a P450 enzyme for the highly selective formation of ursodeoxycholic acid (UDCA) from lithocholic acid [6]. For the recycling of plastics, we have investigated PET [7], for which we determined the first structure of an MHETase in complex with a substrate analogue [8] and also provided important adjustments of a published PETase structure [9]. We also used various methods of protein engineering to improve several PET-hydrolase for higher activity and thermostability [9]. Most recently, we have identified the first urethanases in a metagenomic library able to degrade polyurethanes [10] and designed an enzyme cascade to degrade poly(vinylalcohols) [11].

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

BIOCATALYSIS | CHIRAL COMPOUNDS | PROTEIN ENGINEERING | HIGH-THROUGHPUT SCREENING

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