Affordable Biocatalysis: NADH-dependent Ene-reductases

Ene-reductases are the gold standard for alkene reduction in biocatalysis. However, their industrial implementation is hampered by their requirement for costly nicotinamide coenzymes. We aim to reduce these costs by smart enzyme engineering.

BACKGROUND

Ene-reductases catalyze the nicotinamide-dependent asymmetric reduction of activated C=C bonds, yielding highly enantiopure and industrially relevant compounds. Therefore, ene-reductases have become the state-of-the-art for alkene reduction in biocatalysis. Unfortunately, their industrial implementation is hampered by the requirement of (large quantities) of costly nicotinamide coenzymes, especially NADPH. As NADH is more stable and markedly cheaper than NADPH ($70,000/mol for NADPH vs. $2,600/mol for NADH), switching the coenzyme preference of these industrially valuable enzymes toward NADH is an excellent approach to reduce the economic costs associated with their use in biocatalysis.

TECHNOLOGY

We use a combination of rational and semi-rational approaches, including mutagenesis, kinetic, computational, and structural methods, to elucidate the mechanism behind the coenzyme preference in ene-reductases. Based on this knowledge, different protein design methods are applied to switch the coenzyme preference from NADPH toward NADH in industrially relevant ene-reductases, such as 12-oxophytodienoic acid reductase 3 (OPR3) and YqjM, thereby retaining the enzymes' catalytic activity.

OFFER

We offer to switch the coenzyme preference in the ene-reductase(s) of your choice. Any IP developed in the project would belong to you as our partner/investor.

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DEVELOPMENT STATUS:
Technology Readiness Level 2-5
(Technology validated in lab)

KEYWORDS:
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