Photoinduced Chemomimetic Biocatalysis for Enantioselective Intermolecular Radical Conjugated Addition

CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

Background/Objective

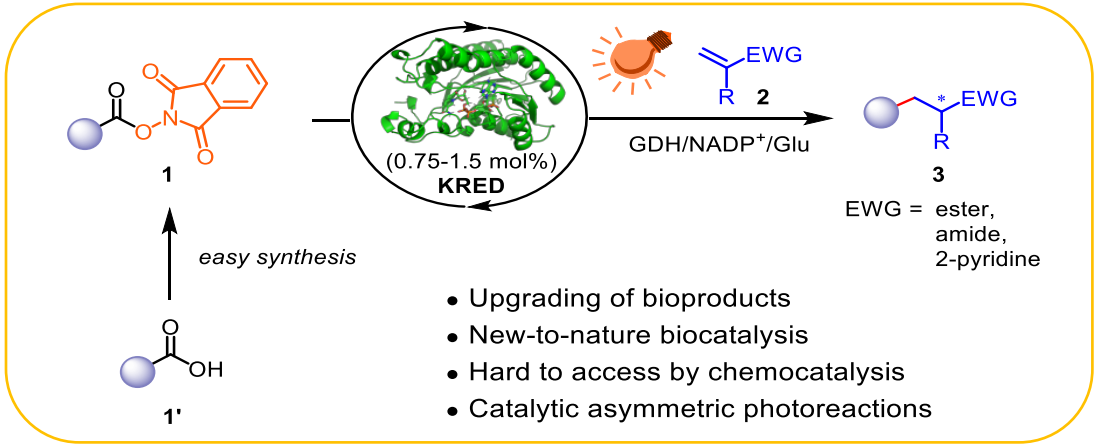
- Photobiocatalysis combines enzymes (biocatalysis) with the use the energy of light to accelerate a chemical reaction (photocatalysis). The enzymes can be engineered to perform reactions that are either not found in nature or hard to perform with traditional chemical production methods.
- We engineered enzymes called ketoreductases (KREDs) and used them for photobiocatalysis to transform α,α-disubstituted terminal alkenes and *N*-(acyloxy)phthalimides into value-added chiral compounds.

Approach

KRED was engineered using a semi-rational mutagenesis strategy to create a small, high-quality variant library to improve catalytic efficiency.

Results

The resulting photobiocatalysis reaction uses biomass-derived fatty acids to produce chiral carbonyl compounds, known as α-chiral esters, which are valuable to create products.



New photobiocatalytic reaction developed for fatty acid upgrading.

Significance/Impacts

This work shows potential for using engineered enzymes to upgrade biomass-derived fatty acids generated from CABBI feedstocks into value-added bioproducts using photobiocatalysis reactions.

Huang, X., Feng, J., Cui, J., Jiang, G., Harrison, W., Zang, X., Zhou, J., Wang, B., Zhao, H. May 2, 2022. "Photoinduced Chemomimetic Biocatalysis for Enantioselective Intermolecular Radical Conjugate Addition." *Nature Catalysis*. DOI: 10.1038/s41929-022-00777-4.