

# Harnessing Alpha Ketoacid Decarboxylases to Enable the Production of Valuable Chemicals from Renewable Feedstocks

## Background/Objective

- Alpha ketoacid decarboxylases (KDCs) are a class of enzymes that play a key role in cellular metabolism and fitness; they catalyze the conversion of alpha ketoacids into aldehydes, precursors, or drop-in chemicals for the biosynthesis of a variety of alcohols, carboxylic acids, esters, and alkanes crucial for biomanufacturing of platform chemicals and fuels.

## Approach

- In this review, we provide a comprehensive analysis and current perspective on the diversity, structures, reaction mechanisms, and biomanufacturing applications of KDCs.

## Results

- Significant progress has been made in repurposing KDCs to enhance enzyme efficiency and robustness for conversion into specific classes of chemicals.
- We describe modular KDC-dependent pathways for the biosynthesis of aldehydes and their derived compounds from various feedstocks.
- We discuss modular metabolic engineering to optimize production of aldehydes for biomanufacturing of biofuels and chemicals.

## Significance/Impacts

- This comprehensive review of KDCs identifies key gaps and future research directions in both fundamental and applied science to harness the diversity of KDCs for biomanufacturing chemicals and fuels.

Ha, K., et al., *Biotechnol Advances* (2025), doi: 10.1016/j.biotechadv.2025.108531

## Diversity, structure, mechanism, and function of KDCs

