One-pot cascade preparation of dicarboxylic acids using engineered *Acetobacter malorum*

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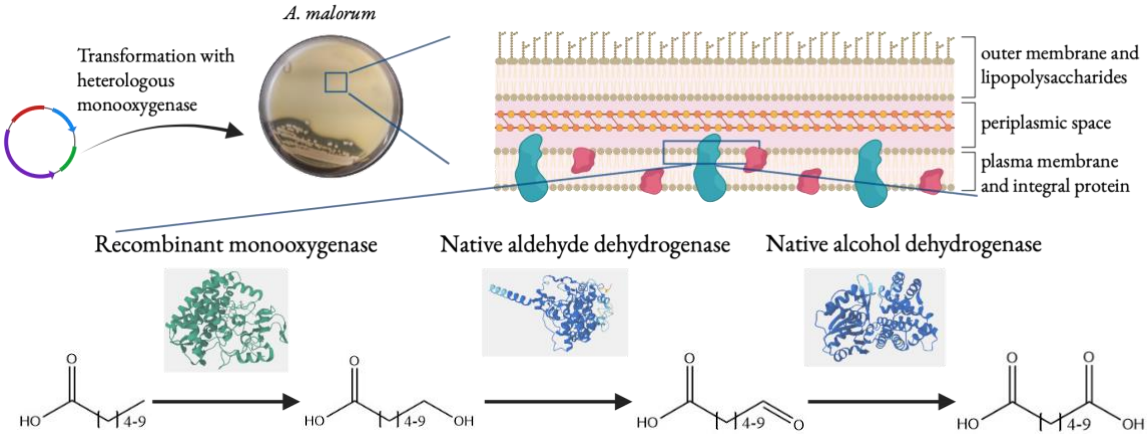
This study addresses the growing demand for sustainable chemical production by exploiting acetic acid bacteria (AAB) as a biocatalytic platform for the development of building blocks for sustainable biopolymers. AAB are Gram-negative, strictly aerobic bacteria with a remarkable capacity to oxidize a broad range of sugars, alcohols and polyols [1]. This metabolic versatility is driven by membrane-bound and periplasmic dehydrogenases, which ensure high stereo- and regioselectivity in oxidation reactions.
In this study, A*cetobacter malorum* DSM 112354 [2] demonstrated high conversion rates (ranging from 42 to 97%) in the oxidation of ω-hydroxycarboxylic acids to their corresponding C7–C12 dicarboxylic acids. Similar results were obtained using *A. malorum* cells immobilized within barium alginate beads.
A triple mutant of cytochrome P450 CYP153A$_{M.aq}$ from *Marinobacter aquaeolei* (M.aqRLT) capable of catalyzing the selective hydroxylation of the terminal methyl group of different fatty acids [3] has been introduced into *A. malorum* to expand its biocatalytic potential. This strategy enables a multi-step, one-pot oxidation cascade that converts fatty carboxylic acids into the corresponding dicarboxylic acids. These compounds are useful building blocks for the synthesis of bio-based polymers, addressing the growing demand for sustainable plastic materials.



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