Microbial upgrading of lignin-derived carboxylates to branched-chain esters for drop-in biofuels

U.S. DEPARTMENT OF ENERGY | Office of Science

Background

- Volatile organic acids are low-value byproducts of fermentative metabolism such as anaerobic digestion of lignocellulosic biomass or organic wastes.
- Esters are valuable as drop-in biofuels or as flavor and fragrance bioproducts.

Approach

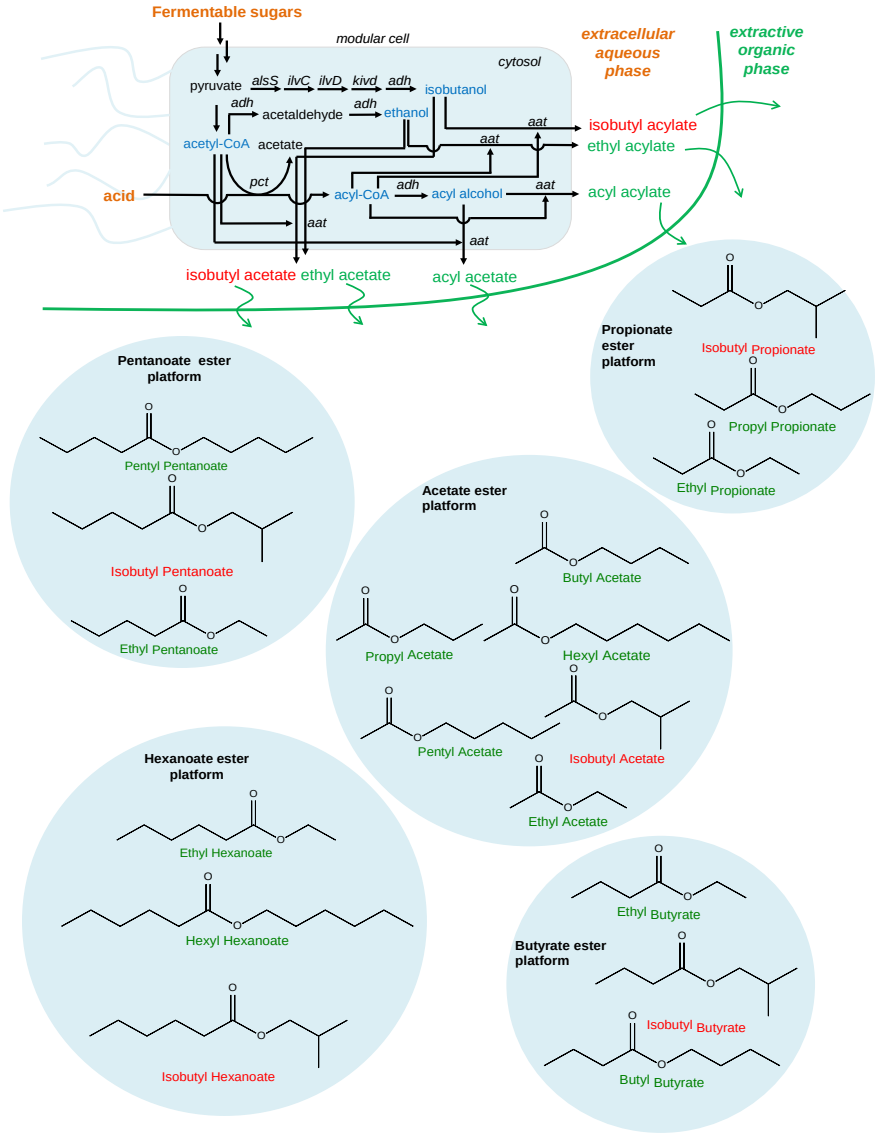
- By employing the modular cell engineering approach, a general framework was devised for upgrading volatile organic acids to high-value linear and branched chain esters.

Outcome

- A general framework for microbial biosynthesis of linear and branched-chain ester platforms was proven in *E. coli*.
- Successfully, biologically, upgraded 5 carboxylates to 16 out of a total of 18 potential esters.
- Characterized *in vivo* alcohol acyltransferases for linear and branched-chain ester biosynthesis.
- These targeted esters are discussed as potential fuels beyond flavor, fragrant, and solvent applications.

Significance

- An innovative biological conversion route was developed for conversion of lignocellulosic biomass or organic wastes into biofuels and high-value chemicals.



Layton, D.S., Trinh, C.T., 2016. "Microbial Synthesis of a Branched-Chain Ester Platform from Organic Waste Carboxylates," *Metab Eng Comm,* in press. doi:10.1016/j.meteno.2016.08.001

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