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Building a de novo Synthetic Metabolic Pathway for Producing Branched-C5 Alcohols

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Many of the chemicals currently proposed as biofuels are derived from natural pathways, *i.e.* they already exist in nature. However, these natural chemicals were not designed to be fuels, so they have many costs associated with their use. The ability to build unnatural pathways to synthesize chemicals designed to have desirable fuel properties and be compatible with the current infrastructure would address many of the problems facing today's biofuels. This project demonstrates how pathways that don't exist in nature can be built, without the traditional approach of screening libraries of hundreds to thousands of enzymes, by taking advantage of the promiscuous nature of enzymes and enzyme superfamilies. Using this new approach, the project has constructed an unnatural pathway for synthesizing three different branched-C5 alcohols (3-methyl-3-butenol, 3-methyl-2-butenol, and 3-methyl-butanol) from the mevalonate pathway in E. coli. The three branched-C5 alcohols are promising biofuel candidates with many favorable fuel properties.

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