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Microbial Production of Isoprenoid Biodiesel

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Biodiesel, composed primarily of fatty acid methyl esters (FAMES), has been one of the most successful renewable biofuels. They are derived from vegetable oil or animal fat. Limited supplies of feedstock, as well as competition for arable land, have been major drawbacks to expanding the use of biodiesel as alternative fuel. Microbial systems are used extensively for industrial small molecule production. Current techniques could be used to facilitate the production of biodiesel-like molecules in a microbial system. Furthermore, the agricultural industry generates a large and currently untapped supply of plant biomass (lignocellulose) that could be utilized as a renewable source of feedstock for these systems, resulting in carbon-neutral transportation fuels. In an effort to harness this potential, we have designed a new class of biodiesel fuels based on isoprenoids. We have chemically synthesized and tested a number of isoprenoid-based biodiesel candidates to determine which compounds are compatible with current engine technology. Biosynthetic pathways for the production of these validated isoprenoid-based fuel candidates have been designed in *E. coli*. Some of the pathways are constructed and tested for the production of target biofuels. The optimization of the production and the construction of more pathways genes are currently under investigation.