**Engineering E. coli to convert plant biomass into fuels**

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**Project Goals:**
**We sought to demonstrate the production of three advanced (non-ethanol) biofuels directly from plant biomass without the use of added enzymes.**

One approach to reducing the costs of advanced biofuel production from cellulosic biomass is to engineer a single microorganism to both digest plant biomass and produce hydrocarbons that have the properties of petrochemical fuels. We engineered *Escherichia coli* to grow using both the cellulose and hemicellulose fractions of several types of plant biomass pretreated with ionic liquids. Our engineered strains express cellulase, xylanase, beta-glucosidase and xylobiosidase enzymes under control of native *E. coli* promoters selected to optimize growth on model cellulosic and hemicellulosic substrates. Our strains grow using either the cellulose or hemicellulose components of ionic liquid pretreated biomass, or on both components when combined as a coculture. Both cellulolytic and hemicellulolytic strains were further engineered with three biofuel synthesis pathways to demonstrate the production of fuel substitutes or precursors suitable for gasoline, diesel, and jet engines directly from ionic liquid-treated switchgrass without externally-supplied hydrolase enzymes. This demonstration represents a major advance towards realizing a consolidated bioprocess. With improvements in both biofuel synthesis pathways and biomass digestion capabilities, our approach could provide an economical route to production of advanced biofuels.

This work conducted by the Joint BioEnergy Institute was supported by the Office of Science, Office of Biological and Environmental Research, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.