Improving Ethanol Production in *Clostridium thermocellum*

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Project Goals: The BioEnergy Science Center (BESC) is focused on the fundamental understanding and elimination of biomass recalcitrance. BESC's approach to improve accessibility to the sugars within biomass involves 1) designing plant cell walls for rapid deconstruction and 2) developing multitalented microbes for converting plant biomass into biofuels in a single step (consolidated bioprocessing). BESC research in biomass deconstruction and conversion targets CBP by studying model organisms and thermophilic anaerobes to understand novel strategies and enzyme complexes for biomass deconstruction.

Clostridium thermocellum has been considered as a candidate for biofuel production due to its ability to rapidly solubilize crystalline cellulose and produce ethanol. Low ethanol yield and titer are currently the primary obstacles preventing *C. thermocellum* from further consideration as a consolidated bioprocessing organism. Recent development of a system for genetic modification of this organism has resulted in the creation of more than 30 mutants, some of which exhibit dramatic improvements in ethanol yield. Analysis of these strains using a metabolic flux analysis framework has allowed us to understand the role of electron carrier flexibility in determining ethanol yield.

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