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U.S. Department of Transportation

SunGrant INITIATIVE South Central Region

Project Title: *Vibrio Furnissii - A Biotechnology Platform for Biomass Conversion*

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Project Goals

The long-term aim of the project is developing an efficient and economical platform for the direct bioconversion of biomass into kerosene and other long-chain alkanes. The following objectives are : 1) To generate *V. furnissii* strains with altered hydrocarbon biosynthesis capacities, 2) To characterize the hydrocarbon profiles of *V. furnissii* strains with altered hydrocarbon-producing capacities, and 3) To characterize the genetic lesions in *V. furnissii* strains harboring altered hydrocarbon biosynthesis and accumulation phenotypes.

Expected Outcomes

It was originally proposed to study *Vibrio furnissii*, a gram-negative bacterium that purportedly possessed superb oleagenic properties. However, early in the course of our investigation, we learned that other investigators had failed to reproduce the oleaginous phenotype, raising serious questions about the use of this microbe as a biofuel platform. With this fact in mind, we turned our attention to *D. hansenii. D. hansenii* has several attractive features for biofuel production. First, the organism is genetically tractable. Therefore, it is amenable to genetic engineering. Second, it mediates the biotransformation of diverse feedstocks into the high-energy, long-chain hydrocarbons (C16-C18) commonly found in biodiesel. These hydrocarbons accumu late in large quantities when the organism is grown under defined conditions, approaching 50% of its dry weight. Third, the organism is halotolerant, and can grow in high salt conditions where the risk of contamination to industrial-scale bioreactors is limited. Finally, the organism synthesizes a variety of hydrocarbon structures under assorted culture conditions. Therefore, microbial metabolism can likely be fine tuned to address varied biofuel and co-product demands. Taken together, the organism under development constitutes a potentially attractive tool for converting diverse bioenergy feedstocks into high-energy fuels.

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