A novel biocatalyst: *Lactobacillus buchneri*

A. What is this research project?

- *Lactobacillus buchneri* strain NRRL B-30929 is an attractive biocatalyst platform for converting biomass to fuels and chemicals.
- This facultative anaerobe is unique in both its rapid growth on and simultaneous consumption of mixtures of highly concentrated xylose and glucose sugars derived from hemicellulose.
- The strain was originally isolated from an ethanol production plant and is tolerant to high ethanol concentrations.
- Generation of the genome sequence for NRRL B-30929 will foster engineering of carbohydrate metabolism and modification of endproduct profiles for biofuel production.

B. What problem does it address?

- Conventional yeasts for starch-to-ethanol fermentation are not applicable for lignocellulose-based ethanol production, because a mixture of sugars instead of glucose alone is present in biomass.
- Inhibitory compounds are released or formed during pretreatment and hydrolysis of biomass feedstocks.
- Production and accumulation of ethanol may result in termination of fermentation due to ethanol stress.

C. How is the project different from or how does it enhance other projects?

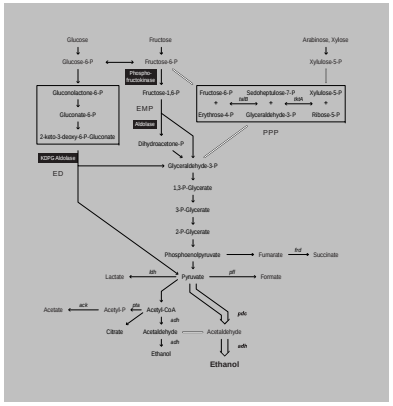
New microbes, traits, and genes are needed for robust biocatalysts for conversion of biomass to biofuels and bioproducts.

D. What are the potential benefits of partnering with ARS on this research?

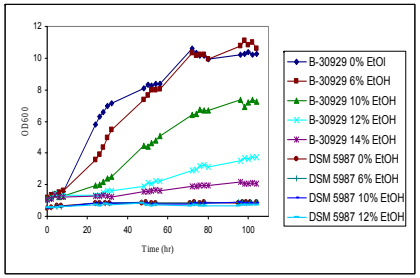
ARS provides expertise in fermentation biotechnology and microbial strain development for production of biofuels and value added products.

E. Who are the potential customers?

Scientific community and researchers. The genome sequence will enable an array of "omics" strategies to guide improvements in production of biofuel and other value-added products. The *L. buchneri* strain can be used by researchers for developing new biocatalysts that convert biomass sugars into ethanol and other value-added products.



Proposed metabolic pathways by NRRL B-30929 with mixed substrates and fermentative production of ethanol



Comparison of NRRL B-30929 and DSM 5987 for growth in MRSsi with 0-16% ethanol

Stage of Development

- Experimental data have been published regarding mixed sugar flask fermentations, metabolic profiling, and laboratory scale bioreactor fermentations.
- Genome sequencing of *L. buchneri*, funded by Department of Energy, is ongoing.

Moving Forward

New ethanol stress/tolerance related proteins/genes can be identified and used by researchers to develop ethanol tolerant biocatalysts for biomass to biofuel.

Researchers

Siqing Liu, ARS, Peoria, IL
David Mills, University of California, Davis
Timothy D. Leathers, ARS, Peoria, IL
Microbial sequencing team at DOE Joint Genome Institute

Contact Information

Siqing Li, Bioproducts and Biocatalysis Research Unit
National Center for Agricultural Utilization Research
309-681-6566; Siqing.Liu@ars.usda.gov

USDA ARS MWA BIOENERGY RESEARCH

Challenges for Today. Solutions for Tomorrow.

www.ars.usda.gov/mwa