Bacterial contaminants of fuel ethanol facilities

A. What is this research project?

Bacterial contamination is a continual problem in commercial fermentation cultures, particularly in fuel ethanol fermentations which are not run under pure-culture conditions. Bacteria compete with yeast for nutrients and divert the flow of carbon away from ethanol. In addition, byproducts like acetic and lactic acids inhibit yeast growth and may result in "stuck" fermentations, which require costly shut-downs of facilities for cleaning. The offending microbes are usually species of lactic acid bacteria (LAB), whose fast growth rate and tolerance to alcohol and low pH allow them to compete with the yeast. Despite efforts to prevent contamination with extensive cleaning procedures or with antibiotic treatment, contaminants are continually reintroduced from various reservoirs.

- This project seeks to develop a fundamental understanding of acute and chronic bacterial contamination events, and to use that knowledge to develop new intervention methods.

B. What problem does it address?

- The emergence of drug-resistant strains and regulatory concerns over drug residues in the distillers' grains may limit future use of antibiotics to prevent and treat infections of fuel ethanol fermentations.
- New methods to control bacterial infections are needed.
- Our unique collection of bacterial strains from commercial ethanol fermentation facilities is available for modeling bacterial contamination and for testing new antibacterial agents.

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

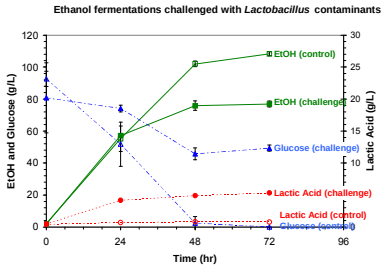
There are very few published studies on bacterial contaminants of fuel ethanol plants. This work provides a select collection of strains characterized at the genotypic and phenotypic levels.

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

- ARS provides scientific expertise in fermentation microbiology.
- Partners will have access to our unique strain collection.
- Partners will have access to methods for modeling "stuck" fermentations and biofilm formation.

E. Who are the potential customers?

Ethanol producers and researchers attempting to develop new intervention strategies that control bacterial contamination.



Modeling biofilm formation in a bioreactor.

Stage of Development

- We have isolated a unique collection of bacterial strains from normal-operating commercial ethanol facilities and from those experiencing acute contamination problems.
- Genotypic and phenotypic characterizations of these strains with respect to species identification, antibiotic susceptibility, and biofilm formation have been published.
- We have incorporated our strains into laboratory models of "stuck" fermentations and developed methods for measuring biofilms.

PARTNERSHIP OPPORTUNITY

Moving Forward

We are interested in using our strains and laboratory models to develop new methods (antibacterial agents or management strategies) that will prevent or control bacterial contamination in commercial fuel ethanol fermentations.

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