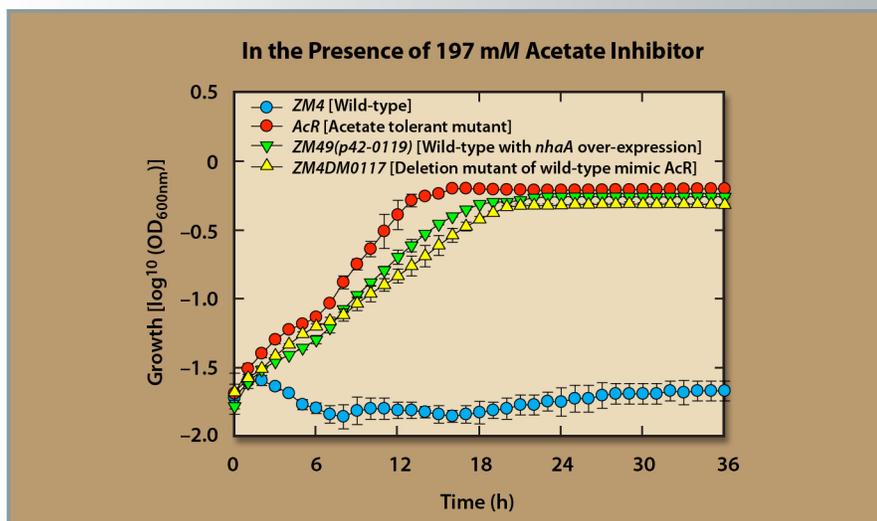


Genetically Modified Microorganisms with Enhanced Resistance to Acetate

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Technology Summary

Efficient conversion of lignocellulose to alternative fuels is hindered by the difficulty of breaking down plant biomass. Pretreatment of materials is a necessary part of the production process; but during pretreatment, chemicals such as acetate form and inhibit or even stop fermentation. To address this challenge, ORNL researchers developed a method to genetically modify strains of microorganisms that display an enhanced resistance to acetate.

The invention provides methods for producing these microbial strains, sequencing the genes, and making the necessary expression vectors to activate the microbial action. Applying these microorganisms to the pretreatment process is promising for improved efficiency in converting lignocellulose to ethanol. This invention also offers the potential to significantly improve production rates for alternative biofuels.

The inventors genetically modified the microorganism *Zymomonas mobilis*, a bacterium, to increasingly express the sodium-proton antiporter NhaA (a protein involved in the transport of molecules or ions across a cell membrane). They sequenced the amino acids of the genetically modified *Z. mobilis* and introduced an expression vector to direct expression of the antiporter. The genetically modified *Z. mobilis* improves the fermentation kinetics of sugars in lignocellulose under elevated acetate conditions. Next, they did similar work with the budding yeast *Saccharomyces cerevisiae*, a choice catalyst for fermentation processes.

Advantages

- Improves fermentation efficiency of lignocellulose to ethanol
- Improves production rates for alternative biofuels

Potential Applications

- Biofuel production
- NhaA deletion in the genetically modified *Z. mobilis* is useful as a parental host for improving other strains
- Overexpression of NhaA is useful for increased acetate tolerance in other bacteria

Patent

Steven David Brown and Shihui Yan, *Microorganisms Having Enhanced Resistance to Acetate (Related Compositions and Methods of Use)*, U.S. Patent Application 12/770,025, filed April 29, 2009.

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