Research Tools


# Modified *E. coli* for Enhanced Production of Pyruvate, Ethanol

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**WARF: P140301US02**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing *E. coli* strains for producing high value chemicals from biomass at near theoretical yield.**

## Overview

Pyruvate is a starting material for synthesizing a variety of biofuels and chemicals. It can be readily converted into more than 60 commercial chemicals, including ethanol and several active pharmaceutical ingredients. Pyruvate is also an important component in many food additives, weight loss agents and antiaging skin treatments.

Industrial methods for producing pyruvate are toxic, energy intensive and depend on a byproduct of the wine industry. Microbial fermentation is a cheap and viable alternative with estimated savings up to ~85 percent. To date the process has relied primarily on two microorganisms – a *T. glabrata* yeast and an *E. coli* mutant – but there is interest in engineering efficient new strains to increase savings even further.

## The Invention

UW–Madison researchers have developed a variety of new *E. coli* strains capable of producing pyruvate up to 95 percent of the maximum theoretical yield from renewable sources under aerobic conditions. This exceeds the highest previously reported yields of 78 percent.

The researchers used a genome-scale metabolic model of *E. coli* to identify multiple gene deletion targets that couple growth rate with pyruvate production. Further engineering of these new strains enabled them to produce ethanol at near maximum theoretical yields.

## Applications

- Efficient and economical production of pyruvate and other commodity chemicals

## Key Benefits

- Cheaper and more efficient pyruvate production
- “Greener” bio-based alternative (coupled with cost savings from conventional solvent production)
- Fermentative route is biomass derived and offers a less carbon-intensive approach while still providing cost savings compared to traditional methods.
- New strains outperform competitors by more than double digits (95 vs 78 percent of max. theoretical yield).
- *E. coli* is a robust, industrially accepted and widely used biocatalyst for high value products.

## Stage of Development

The researchers have engineered six strains demonstrating high pyruvate yields from glucose (with up to 0.92 g pyruvate per g of glucose).

## Additional Information

**For More Information About the Inventors**

- Jennifer Reed

**Related Intellectual Property**

- View Divisional Patent in PDF format.

**Tech Fields**

- Materials & Chemicals : Biochemicals & biomaterials
- Research Tools : Microbial technologies

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854