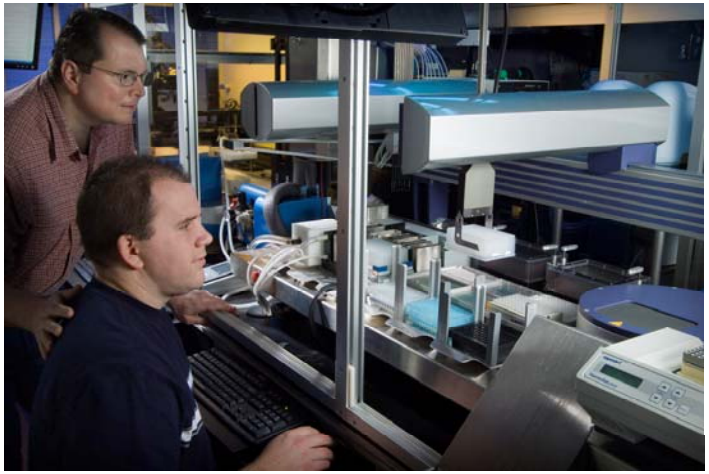
High-level expression of heterologous proteins in *Saccharomyces cerevisiae*



A. What is this technology?

- A yeast expression system for rapid production of large amounts of soluble functional protein: This three-plasmid system utilizes the small ubiquitin-like modifier (SUMO) vector set combined with the efficient endogenous yeast protease.
- It provides high levels of expression for three different proteins simultaneously.
- Used to express a test peptide of potential commercial value in an industrial *Saccharomyces cerevisiae* strain also engineered with xylose utilization and metabolic correction enzymes.

B. What problem does it address?

- Optimization of genetically engineered strains of *S. cerevisiae* that ferment xylose to ethanol is needed. It will require the simultaneous expression at sufficiently high level of all the enzymes and proteins required to allow yeast strains to grow efficiently on pentose as well as hexose sugars anaerobically.
- For cost-effective industrial ethanol production from biomass, it may be necessary to express hydrolytic enzymes to saccharify the lignocellulosic feedstocks.
- Cost-effectiveness of the fuel ethanol fermentation process could be further enhanced by obtaining high-value co-products from the process, such as monomers for polymer production or commercially important proteins and peptides.

C. What is the significance of this solution?

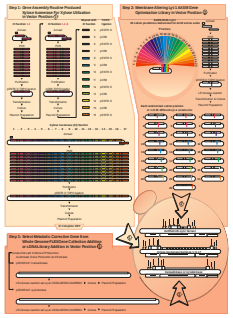
- The system provides a yeast platform for fermentation of lignocellulosic biomass by utilizing xylose as well as glucose from lignocellulose.
- Many valuable hydrolytic enzymes could be produced by this strain, for combined bioprocessing using simultaneous saccharification and fermentation.
- Valuable co-products are being developed: insecticidal peptides, veterinary biologicals, animal feed improvements, and antibacterials can be expressed for increased profitability.

D. Who could use this technology?

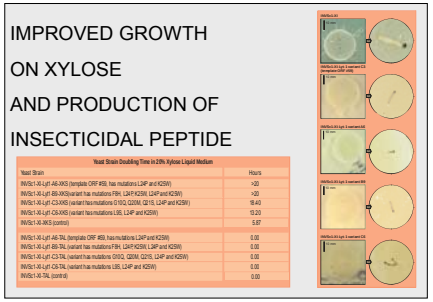
Cellulosic ethanol companies attempting to develop a cost-effective ethanol production process from lignocellulosic hydrolysates, as well as companies interested in producing valuable co-products from this engineered yeast.

E. How is this technology unique?

- The system provides a means to produce bulk proteins from yeast strains at fuel ethanol refineries.
- The system is compatible with advanced proteomic workcells for automated high-throughput screening.



3-Vector system in *Saccharomyces cerevisiae* carried out on robotic workcell



Valuable co-products

High value expression platform for production of bulk proteins from yeast strain used at fuel ethanol refineries

Stage of Development

Strains that can grow on xylose and glucose are in the process of being patented by USDA-ARS tech transfer office, and are available to license.

PARTNERSHIP OPPORTUNITY

Moving Forward

Companies interested in producing valuable enzymes will find this automated production of optimized genes, and improved yeast strains expressing these genes, useful. This strain can be used for bulk production of proteins carried out at ethanol plants for low-cost production strategies and increased profitability.

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