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Engineering industrial yeast for renewable advanced biofuels applications

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Abstract

The industrial yeast *Saccharomyces cerevisiae* is a candidate for the next-generation biocatalyst development due to its unique genomic background and robust performance in fermentation-based production. In order to meet challenges of renewable and sustainable advanced biofuels conversion including cellulosic ethanol production, it is necessary to engineer the yeast with enriched capabilities to overcome toxic chemical compounds liberated from lignocellulose-biomass pretreatment and to efficiently utilize pentose and hexose sugars harbored in the biomass. Using a systems biology approach including evolutionary engineering and genetic engineering, we developed new genotypes of industrial yeast strains that are able to utilize xylose and glucose simultaneously and *in situ* detoxify major biomass pretreatment inhibitors such as furfural and 5-hydroxymethylfurfural while producing ethanol. This presentation will outline major technical difficulties and discuss successful strategies for this advanced development. Challenges in new strain development toward industrial applications will also be discussed.

Biography

Dr. Liu holds a PhD from University of Illinois and has more than 30 years experience in teaching and research. As a Scientist at USDA-ARS, Dr. Liu pioneered tolerant yeast research and development for lignocellulose-to-ethanol conversion using genomics and published a monograph on “Microbial stress tolerance for biofuels: systems biology” by Springer. Dr. Liu holds 8 U.S. patents (including pending issues) and authored over 100 publications, and serves Editor and Associate Editor of professional journals.