Chia-Ling Wu has received extensive education and training in biological and biochemical science with a B.S. in Life Science (2002) from National Yang-Ming University in Taiwan, and a M.S. in Biochemistry (2006) from Purdue University. With an interest in microbial metabolic engineering and the production of advanced biofuels, she joined Laboratory of Renewable of Resource Engineering at Purdue University and started working with a team on yeast strain development for biofuel production as a research assistant. After two and half year she decided to continue her research as a PhD student in the same laboratory under Department of Agricultural Engineering. Her future plan after graduation is to join a biotechnology company where she can continue work on product synthesis through metabolic engineering and microbial fermentation.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: Chia-Ling Wu

Title: System Biology Approaches to Determine the Factors for Acetic Acid Resistance by Comparing *S. Cerevisiae* 424A (LNH-ST) and 424A (LNH-ST) – AAR during Glucose / Xylose Co-Fermentation

MajorProfessor(s): Nathan Mosier, Miroslav Sedlak

Date: Tuesday, April 16, 2013

Time: 1:30 PM

Location: ABE 301

Abstract:

There is currently much focus on the development the economical production of cellulosic ethanol as a renewable fuel alternative. Inhibitors, especially acetic acid, found in the biomass hydrolyzate present a major challenge converting the feedstock to ethanol. Acetic acid inhibits microbial fermentation on both cell growth and ethanol production. Therefore, developing a microorganism with sufficient tolerance to acetic acid during fermentation is the key to the success of the industry.

Acetic acid is particularly inhibitory to fermentation of xylose, which accounts for about 30% of the total sugars in the feedstock. For this study, an acetic acid-resistant *S. cerevisiae*, 424A (LNH-ST) – AAR, was developed through adaption. Fermentation analysis showed that this strain could ferment twice as much as xylose into ethanol with a specific xylose consumption rate that was 642% faster compared to the original strain. The mechanism of acetic acid resistance in the AAR strain was subsequently investigated by using two system biology approaches, metabolic and transcriptomic analyses, leading to the identification of the key factors for xylose fermentation in the presence of acetic acid.

Application:

This is the first study in the literature indentifying the key factors for xylose fermentation by yeast in the presence of acetic acid. The findings from this study provide valuable information in order to better design microorganisms suitable for cellulosic ethanol production and can serve as a starting point for overcoming a key obstacle in the industry.