ENGINEERING SACCHAROMYCES CEREVISIAE FOR INCREASED UTILIZATION OF XYLOSE FROM BIOMASS FEEDSTOCKS

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This summary describes the generation of a *Saccharomyces cerevisiae* strain that exhibits increased ethanol productivity using sugars contained in biomass feedstocks. Biomass feedstocks are composed of hexose and pentose sugars, locked into a higher-order structure. The most abundant of these sugars are glucose and xylose. Pre-treatment of the feedstock is required to release these sugars in their usable monomeric form. Glucose is readily fermented to ethanol by *S. cerevisiae*, however, xylose is not. Strains have been engineered to utilize xylose by addition of genes from the native xylose-consuming yeast *Pichia stipitis*. These strains do not grow well under aerobic or anaerobic conditions when xylose is the only sugar available.

The *S. cerevisiae* strain described here expresses the *P. stipitis* proteins for xylose utilization but also expresses a protein that increases the uptake of xylose into the cell. Current *S. cerevisiae* strains are limited in their ability to transport xylose into the cell. In these strains with poor xylose uptake, glucose and xylose are sequentially consumed with glucose being the preferred sugar. Additionally, *S. cerevisiae* does not see xylose as a strictly fermentable sugar, further limiting its conversion to ethanol. Increasing xylose uptake into the cell increases the consumption rate of xylose. More importantly, it allows xylose to be co-utilized with glucose. Both of these factors result in increased ethanol productivity as more xylose is being consumed when the cells are fermenting, due to the presence of glucose. Tests with our in-house strains showed up to 46% more xylose uptake and 40% more xylose consumed. These strains also co-consumed xylose in the presence of glucose. The modifications to this strain, while important to the bio-fuel industry, have broader applications to any industrial process that uses biomass as a feedstock.

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