CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

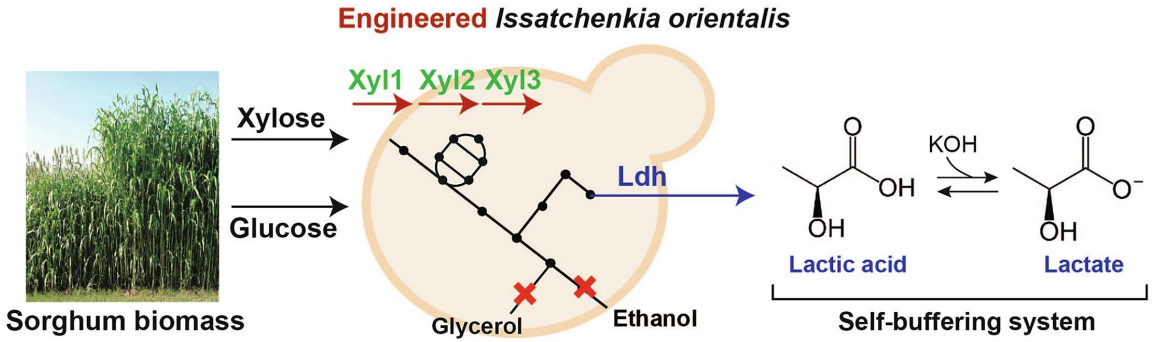
# Self-Buffering System for Cost-Effective Production of Lactic Acid from Glucose and Xylose Using Acid-Tolerant Issatchenkia orientalis

## Background/Objective

Lignocellulosic biomass provides abundant carbon sources such as glucose and xylose to produce organic acids through yeast fermentation. However, the economic feasibility of this bioprocess is uncertain because it requires neutralization to maintain optimal pH for growth, leading to downstream processing steps that increase production costs. Low-pH fermentation using the yeast *I. orientalis* could eliminate these steps since it has a high tolerance to acidic conditions and inhibitors found in lignocellulosic hydrolysates. Here we developed a bioprocess for *I. orientalis* to produce lactic acid from glucose and xylose using an innovative self-buffering strategy for low-pH fermentation.

## Approach

*I. orientalis* strain SD108XL was genetically engineered to produce lactic acid from xylose and successfully fermented sorghum hydrolysates. A self-buffering strategy was developed where the lactic acid generated by the fermentation served as a buffer. A techno-economic analysis (TEA) compared the economic viability of this strategy against a traditional pH control method.




**Graphical abstract of lactic acid production.**

## Results

*I. orientalis* SD108 produced 67 g/L of lactic acid from 73 g/L of glucose and 40 g/L of xylose, simulating a sugar composition of sorghum biomass hydrolysates. Additionally, the TEA underscored the efficiency of the self-buffering strategy in streamlining the downstream process, thereby reducing production costs.

## Significance/Impacts

This demonstrates a cost-effective strategy to produce organic acids from sorghum-derived glucose and xylose using *I. orientalis*.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