

Enhanced 2'-Fucosyllactose Production by Engineered *Saccharomyces cerevisiae* Using Xylose as a Co-Substrate

Background/objective

2'-Fucosyllactose (2'-FL), an oligosaccharide in human milk, can be used as an infant formula ingredient if it can be produced economically by yeasts. Glucose and lactose are substrates for producing 2'-FL in yeasts, but the accumulation of byproducts due to overflow metabolism of glucose hampered efficient 2'-FL production regardless of host strain. To circumvent this problem, xylose, which is the second-most abundant sugar in plant cell wall hydrolysates and is metabolized through oxidative metabolism, was used for efficient 2'-FL production by *S. cerevisiae*.

Approach

- ❖ Engineered *S. cerevisiae* to produce 2'-FL from a mixture of xylose and lactose by introducing a heterologous 2'-FL biosynthetic pathway.
- ❖ Evaluated 2'-FL production by the engineered *S. cerevisiae* on glucose and xylose through metabolite analysis and fermentation profiles.

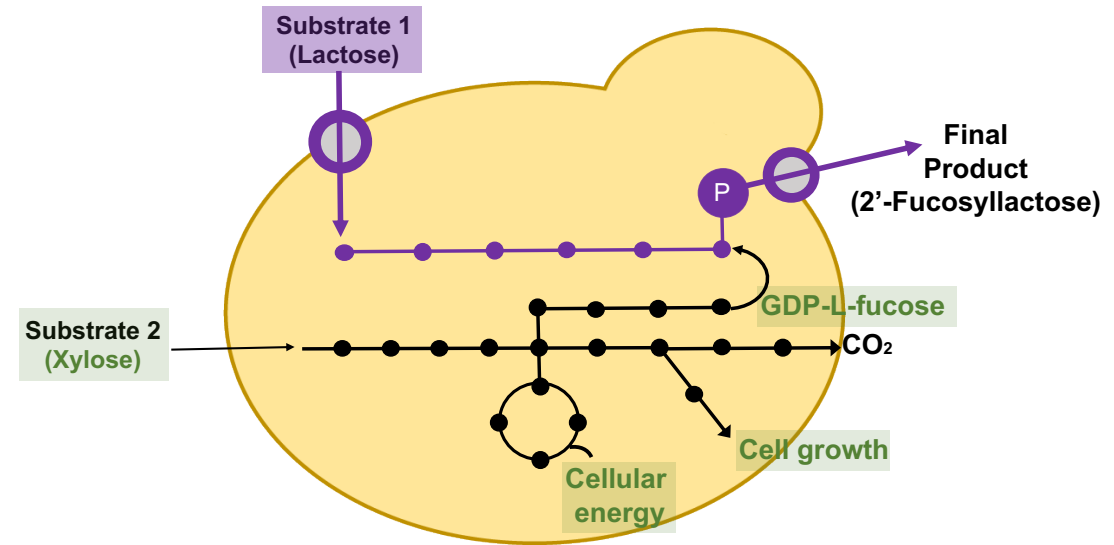
Results

- ❖ Exhibited higher 2'-FL titer, productivity, and yield from xylose than from glucose as a co-substrate in the engineered yeast.
- ❖ Achieved the highest 2'-FL titer (25.5 g/L) among 2'-FL production by *S. cerevisiae* reported to date.
- ❖ 2'-FL secretion capability of the engineered *S. cerevisiae* was different depending on the culture media.

Significance

The proof-of-concept level production of 2'-FL by engineered *S. cerevisiae* can be promoted to industrial level production using xylose as a carbon source.

Lee, J. W., et al. 2020. "Enhanced 2'-Fucosyllactose Production by Engineered *Saccharomyces cerevisiae* Using Xylose as a Co-Substrate." *Metabolic Engineering*, 62, 322-329. doi:10.1016/j.ymben.2020.10.003.



A schematic diagram for 2'-FL production.