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Metabolic engineering of *Escherichia coli* for effective fermentation of mixed sugars

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The increasingly high price of fossil fuels and the awareness of global warming have urged to seek alternative fuels. Liquid fuels produced from renewable sources are of great potential. Plant-based biomass consisting of lignocellulose is, by far, the most abundant renewable source in nature. It involves lignin, hemicellulose, and cellulose. After hydrolysis, glucose and xylose are two major carbohydrates released from lignocellulose. Production of liquid fuels with microbes that utilize both glucose and xylose is recognized as a cost-effective process.

Escherichia coli strain is an industry-friendly bacterium with the ability of metabolizing various monosaccharides. Nevertheless, this bacterial strain has evolved to have a preference of glucose over other sugars (e.g. xylose). In this study, *E. coli* strain was engineered to co-ferment glucose and xylose by metabolic engineering. The metabolic pathways relevant to glucose and xylose metabolism were extensively manipulated, including (1) glucose transfer pathway, (2) xylose transport, (3) xylose utilization pathway, and (4) fermentative pathway of organic acids. To produce a liquid fuel, the heterologous pathway of ethanol was also reconstructed in *E. coli*. As a consequence, the resulting *E. coli* strain was illustrated to simultaneously consume glucose and xylose. Under the oxygen-limited condition, the engineered strain enabled to produce around 3% ethanol from mixed sugars (3% glucose plus 3% xylose) within 20 h. Overall, it indicates the success of this proposed approach to improving glucose and xylose metabolism in *E. coli*.

Key Word: Fermentation, Mixed sugars, Metabolic engineering.