

## ENGINEERING OF *KLEBSIELLA OXYTOCA* CAPABLE OF SIMULTANEOUS UTILIZATION OF MULTIPLE SUGARS FOR THE PRODUCTION OF 2, 3- BUTANEDIOL

Yong Jae Kim, Dept. of Chemical and Biomolecular Eng., KAIST, Korea

Ki Jun Jeong, Dept. of Chemical and Biomolecular Eng., KAIST, Korea

kjjeong@kaist.ac.kr

Yong Keun Chang, Dept. of Chemical and Biomolecular Eng., KAIST, Korea

ychang@kaist.ac.kr

From various biomasses such as lignocellulose and microalgae, many kinds of monosaccharides including glucose, galactose, xylose, mannose, ribose, rhamnose, and fucose can be obtained. Among them, galactose and xylose are the major carbon sources except for glucose in nature, and both sugars can serve as additive for the production of desired chemicals in the glucose-based fermentation. However, in many microorganisms, the glucose hampers utilization of galactose and xylose until depletion of glucose owing to Carbon Catabolite Repression (CCR) mechanism, which has been a big hurdle for the development of bioprocess utilizing multiple carbon sugars. Here, we developed *Klebsiella oxytoca* capable of simultaneous utilization of three sugars including glucose, galactose and xylose for the fermentative production of 2,3-butanediol which is a vital platform compound, used as liquid fuel and chemical raw material. To eliminate CCR and utilize multiple sugars, the phosphotransferase system (PTS) which is the main transporter for glucose was disrupted, in which cells could uptake glucose through alternative pathway and the transport system for other sugars could be activated. To verify the removal of CCR by disruption of PTS, the engineered strain was cultivated with two or three sugars and, we found that the simultaneous consumption of galactose and xylose was achieved although glucose consumption rate was decreased a little. At the time point of complete consumption of glucose, most galactose was also consumed and, about 30 % of xylose was consumed before glucose depletion. Under the simultaneous utilization of galactose and xylose along with glucose, 2,3-butanediol was also successfully produced as high as 0.3 g/g, which yield is similar as that in cultivation with glucose as a sole carbon source. To the best of our knowledge, this is the first example of CCR elimination in *K. oxytoca* and, we think that our strategy sheds new light on an engineering of *K. oxytoca* for commercial exploitation of biomass to produce value-added products.