Metabolic Engineering of *Escherichia coli* for 3-Hydroxypropionic Acid and Malonic Acid production via β-Alanine Route

이언희, 송찬우[1], 김제웅, 조인진, 이상엽†
KAIST; [1]GS Caltex
(leesy@kaist.ac.kr†)

For the production of industrially valuable chemicals, 3-hydroxypropionic acid (3-HP) and malonic acid (MA) using β-alanine (BA) route, *E. coli* was metabolically engineered. First, various downstream enzymes were screened to produce malonic semialdehyde (MSA). The *P. aeruginosa pa0132* (encoding BA pyruvate transaminase) was selected to generate MSA from BA. In order to produce 3-HP from MSA, *E. coli ydfG* gene (encoding MSA reductase) was introduced to the strain. The 3-HP titer was increased to 3.69 g/L in flask culture through additional overexpression of *sdhC* gene by replacing native promoter of *sdhC* gene with the *trc* promoter. For the production of MA, *E. coli ynel* was introduced into the strain. The MA titer was increased to 0.450 g/L in flask culture through additional deletion of the *ydfG* gene. Fed-batch culture of the final strain allowed production of 31.1 g/L 3-HP or 3.60 g/L MA from glucose. (This work was supported by the Technology Development Program to Solve Climate Changes on Systems Metabolic Engineering for Biorefineries from the Ministry of Science and ICT through the National Research Foundation (NRF) of Korea (NRF-2012M1A2A2026556 and NRF-2012M1A2A2026557)).