Polyketide synthase-based malonyl-CoA biosensor for natural compounds biosynthesis in bacteria

양동수, 이상엽†
한국과학기술원
(leesy@kaist.ac.kr†)

Here we report repurposing a polyketide synthase as a colorimetric malonyl-CoA biosensor applicable in three industrially important bacteria: Escherichia coli, Pseudomonas putida, and Corynebacterium glutamicum. As RppA converts malonyl-CoA into red-colored flaviolin, strains with enhanced malonyl-CoA accumulation were identifiable by the colorimetric screening of cells showing increased red color. Fourteen knockdown gene targets were identified that generally enhanced malonyl-CoA level in E. coli, after screening 1,858 synthetic small regulatory RNA library. These knockdown gene targets were applied to successfully enhance production of two polyketide (6-methylsalicylic acid and aloesone) and two phenylpropanoid (resveratrol and naringenin) compounds to 440.3, 30.9, 51.8 and 103.8 mg/L, respectively. [This work was supported by the Technology Development Program to Solve Climate Changes on Systems Metabolic Engineering for Biorefineries (NRF-2012M1A2A2026556 and NRF-2012M1A2A2026557) and by the Intelligent Synthetic Biology Center through the Global Frontier Project (2011-0031963) of the Ministry of Science and ICT (MSIT) through the NRF of Korea.]