Type Ⅲ PKS as an enzyme coupled malonyl-CoA biosensor for metabolic engineering in *Escherichia coli*

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In this study, we report the first establishment of a repurposed type Ⅲ polyketide synthase RppA as an enzyme coupled malonyl-CoA biosensor in *E. coli*. After confirming its functionality in *E. coli* by cerulenin titration, we constructed and applied the *E. coli* genome scale synthetic sRNA library in order to screen knockdown gene targets enabling increased malonyl-CoA pool. We also applied 9 overexpression gene targets identified through FVSEOF simulation. Thus, the screened 18 gene targets were applied for the increased production of 6-methylsalicylic acid (97.8 mg/L), resveratrol (51.8 mg/L), and naringenin (98.32 mg/L). The novel malonyl-CoA sensor developed through this study is a generalizable synthetic biological tool which will significantly promote the production of malonyl-CoA derived valuable natural products. (This work was supported by the Technology Development Program to Solve Climate Changes (Systems Metabolic Engineering for Biorefineries) of the Ministry of Science and ICT (MSIT) through the National Research Foundation of Korea (NRF-2012M1A2A2026556 and NRF-2012M1A2A2026557) and also by grants from Novo Nordisk Foundation Center for Biosustainability (21746))