One-step production of aromatic polyesters by E. coli strains

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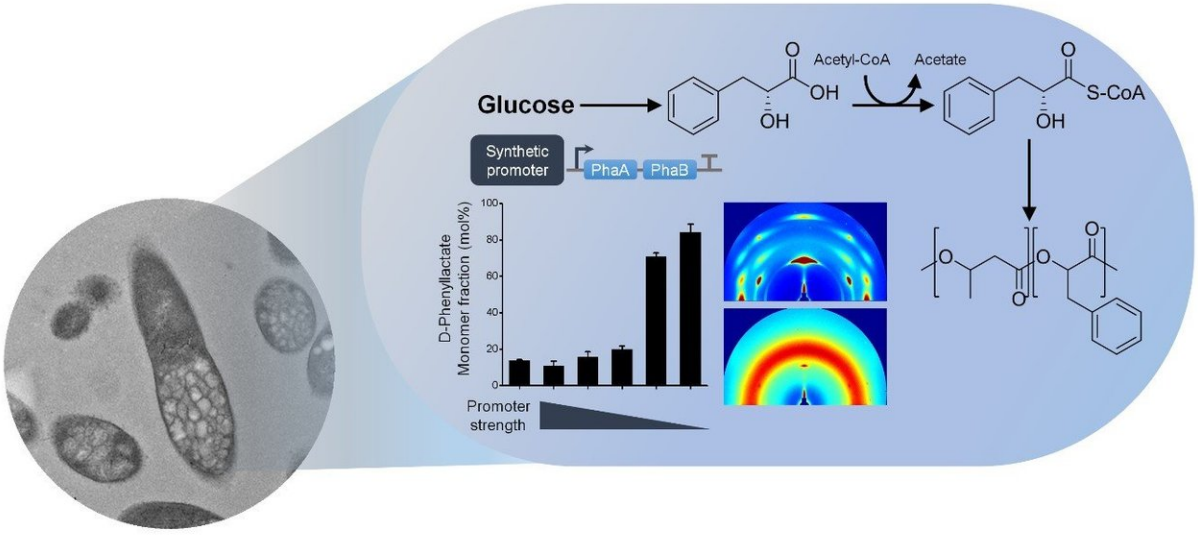

Biosynthesis of aromatic polyesters by metabolically engineered *E. coli*.This schematic diagram shows the overall conceptualization of how metabolically engineered *E. coli* produced aromatic polyesters from glucose. Credit: KAIST

KAIST systems metabolic engineers have defined a novel strategy for microbial aromatic polyesters production fused with synthetic biology from renewable biomass. The team of Distinguished Professor Sang Yup Lee of the Department of Chemical and Biomolecular Engineering produced aromatic polyesters from Escherichia coli (E. coli) strains by applying microbial fermentation, employing direct microbial

fermentation from renewable feedstock carbohydrates.

This is the first report to determine a platform strain of engineered E. coli capable of producing environmentally friendly aromatic polyesters. This engineered E. coli strain, if desired, has the potential to be used as a platform strain capable of producing various high-valued aromatic polyesters from renewable biomass. This research was published in *Nature Communications* on January 8.

Conventionally, aromatic polyesters boast solid strength and heat stability so that there has been a great deal of interest in fermentative production of aromatic polyesters from renewable non-food biomass, but without success.

However, aromatic polyesters are only made by feeding the cells with corresponding aromatic monomers as substrates, and have not been produced by direct fermentation from renewable feedstock carbohydrates such as glucose.

To address this issue, the team prescribed the detailed procedure for aromatic polyester production through identifying CoA-transferase that activates phenylalkanoates into their corresponding CoA derivatives. In this process, researchers employed metabolic engineering of E. coli to produce phenylalkanoates from glucose based on genome-scale metabolic flux analysis. In particular, the KAIST team made a modulation of gene expression to produce various aromatic polyesters having different monomer fractions.

The research team successfully produced aromatic polyesters, a non-natural polymer using the strategy that combines systems metabolic engineering and synthetic biology. They succeeded in biosynthesis of various kinds of aromatic polyesters through the system, thus proving the technical excellence of the environmentally friendly biosynthetic system

of this research. Furthermore, his team also proved the potential of expanding the range of aromatic polyesters from renewable resources, which is expected to play an important role in the bio-plastic industry.

Professor Lee said, "An eco-friendly and sustainable chemical industry is the key global agenda every nation faces. We are making a research focus to a biochemical industry free from petroleum dependence, and conducting diverse research activities to address the issue. This novel technology we are presenting will serve as an opportunity to advance the biochemical industry moving forward."

More information: Jung Eun Yang et al, One-step fermentative production of aromatic polyesters from glucose by metabolically engineered Escherichia coli strains, *Nature Communications* (2018). DOI: 10.1038/s41467-017-02498-w

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