Systems metabolic engineering of *Escherichia coli* for enhanced production of L-phenylalanine

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L-phenylalanine is an essential amino acid and building blocks for the low-calorie sweetener aspartame. The market size of L-phenylalanine has been gradually increased by considerable demand for the aspartame, food additives and pharmaceutical industry.
In this study, we developed *E. coli* strain able to overproduce L-phenylalanine by systems metabolic engineering: (1) Substrate utilization engineering for moderating the rate of substrate uptake; (2) Overexpression of enzymes to increase the precursor availability and to improve the carbon flow through the shikimate pathway; (3) Gene deletion to prevent loss of carbon flow towards competing pathway; (4) Gene deletion to alleviate the tight regulation of tyrR regulon; (5) Enhancing the efflux of phenylalanine to shift equilibrium towards phenylalanine synthesis.
In the flask cultivation, the engineered *E. coli* cell was grown well and much enhanced production of phenylalanine could be achieved compared with parent host as well as other phenylalanine-overproducing strain.