

Systems metabolic engineering

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As our concerns on environmental problems are increasing, there has been much interest in developing bio-based systems for the production of chemicals, fuels, and materials from renewable resources. Microorganisms isolated from nature are often employed for this purpose, but their efficiencies of producing desired products are rather low. Thus, their phenotypes have been improved by random mutagenesis and selection. During the last couple of decades, metabolic engineering has been established and applied for more efficient and rational design and development of microbial strains producing these products. We are now observing another paradigm shift in developing industrial microorganisms based on the recent advances in systems biology and synthetic biology, which are enabling us to approach biological and biotechnological problems at systems level with designer's concept. It is now becoming possible to perform systems metabolic engineering. In this lecture, I will present the general strategies for systems metabolic engineering with several example products such as amino acids, diamines, and biopolymers. [This work was supported by the Korean Systems Biology Research Grant, and World Class University program of the MEST through NRF.]