

세미나 초록

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발표 주제	Strategies for Enhancing Metabolic Efficiency through Cofactor Remodeling
발표 내용	<p>Optimizing cofactor supply is a critical determinant of metabolic efficiency and product yield in microbial cell factories. Cellular metabolism depends on the balanced availability of reducing equivalents (NADH/NADPH), energy carriers (ATP), and one-carbon donors (THF derivatives, SAM) that support biosynthetic fluxes. This presentation highlights systematic strategies for enhancing cofactor utilization through metabolic and enzymatic remodeling. We introduce representative approaches such as cofactor-specific enzyme engineering, transhydrogenase pathway optimization, and cofactor regeneration systems using formate which is generated from C1 gas. Case studies are discussed for two amino acid production systems: (1) L-lysine, where reinforcement of the pentose phosphate pathway, malic enzyme, and transhydrogenase modules increases intracellular NADPH regeneration and improves carbon flux toward the aspartate pathway; and (2) L-methionine, where strengthening of the tetrahydrofolate (THF)-linked one-carbon cycle and methionine synthase modules enhances the methyl-donor (5-methyl-THF/SAM) pool, enabling efficient methylation and product accumulation. Together, these examples demonstrate how cofactor remodeling—integrating enzyme specificity control, redox balance tuning, and dynamic regulation—serves as a pivotal strategy to maximize bioproduction efficiency and metabolic robustness in engineered microorganisms.</p>