Systems Biology Research Symposium
Oral Presentation Session

Grand Ballroom
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7:00-8:30pm

Rational Design of Microbial Chemical Factories

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Key features of Synthetic Biology include a focus on design and design principles, as well as the development of well-characterized and re-usable Parts. The field intersects with Metabolic Engineering in areas such as the design of novel pathways for product generation, in which enzymes may be considered as interchangeable Parts, and the improvement of those pathways for increased productivity. We have constructed a synthetic pathway for the production of glucaric acid, deemed a "top-value added chemical" from biomass, from glucose in *Escherichia coli*. Co-expression of the genes encoding *myo*-inositol-1-phosphate synthase (Ino1) from *Saccharomyces cerevisiae*, *myo*-inositol oxygenase (MIOX) from mouse, and uronate dehydrogenase (Udh) from *Pseudomonas syringae* led to production of glucaric acid. Flux towards glucaric acid is ultimately limited by MIOX, whose activity is dependent upon the concentration of *myo*-inositol, its substrate. To improve glucaric acid production, we have explored several options for increasing flux through the pathway, including the use of other enzyme Parts and the creation of synthetic scaffolds (Devices) to co-localize Ino1 and MIOX, thereby increasing the local concentration of *myo*-inositol. We will present results on the application of these scaffolds in various configurations to improve MIOX activity and glucaric acid productivity.

Key words: glucaric acid, MIOX, synthetic scaffolds