Multi-product Trade-off Analysis of *E. coli* by Multiobjective Flux Balance Analysis

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Abstract

In this study, we developed a novel multiobjective linear programming (MOLP) strategy based on the noninferior set estimation (NISE) method (Solanki *et al.*, 1993), whereby Pareto solutions for the given set of conflicting objectives and corresponding flux distribution profiles are generated to understand how the internal fluxes are changed in the metabolic system. Furthermore, this MOLP approach was integrated as a new module into the program package, MetaFluxNet, which was developed for metabolic pathway construction and analysis (Lee *et al.*, 2003). As a result, this package enables users to implement the multi-product trade-off analysis as well as the single product optimization. The efficacy and efficiency of the approach were demonstrated by applying it to the *in silico* *E. coli* model. Consequently, multiple objectives such as the maximization of succinic acid production and the maximization of NADP were considered simultaneously. The result can provide new insight into the relationship among the measurements, the objective criteria and the possible solutions.

Keywords: Flux balance analysis; Multiobjective linear programming; Multi-product trade-off analysis, Systems biology

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