

# Pathway Analysis for Succinic acid Production of *Mannheimia succiniciproducens* and *Escherichia coli*

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## Abstract

*Mannheimia succiniciproducens* MBEL55E is a capnophilic gram-negative bacterium which efficiently produces succinic acid. In order to analyze metabolic pathways of *M.succiniciproducens*, we applied pathway analysis to the biochemical network of *M.succiniciproducens*, previously developed by our group. We then also analyzed the biochemical network of *Escherichia coli*, in the same way as above, in order to grasp the notable differences between these two organisms. In order to draw clear conclusions, we clustered the solutions of two microorganisms, and compared each other. Each of clusters showed characteristic yield of succinic acid and the number of solutions and clusters of *M.succiniciproducens* is greater than that of *E.coli*. The results manifested that *pckA* is the major factor of succinic acid promotion. This analysis can show the differences between networks of two organisms, and suggest efficient biochemical network design.

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**Keywords:** metabolic pathway analysis, *Mannheimia succiniciproducens*, *Escherichia coli*

## Figure

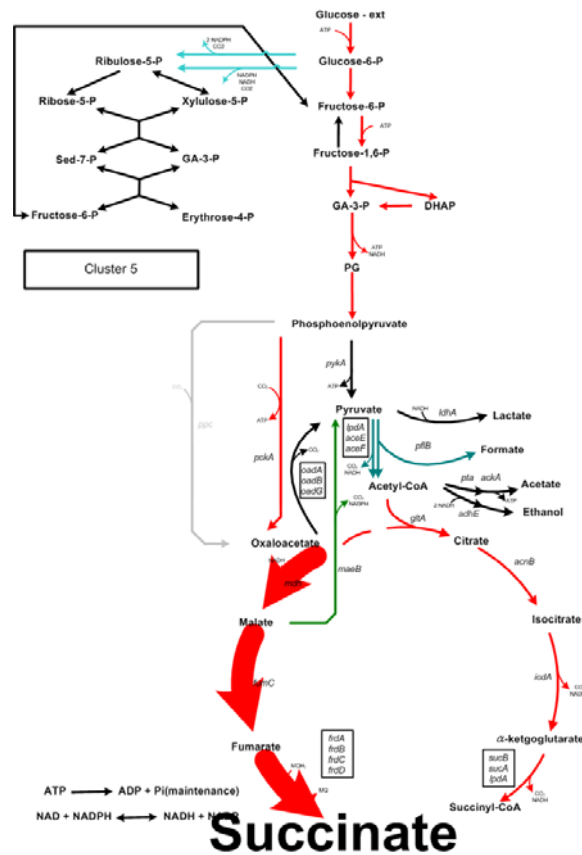


Figure 1. Pattern of simultaneous production modes of *M.succiniciproducens*

## References

- [1] Nielsen J and Villadsen J., Bioreaction Engineering Principles, *New York: Plenum press*, 1994.
- [2] Lee SY and Papoutsakis ET., Metabolic Engineering, *New York: Marcel Dekker*, 1999.
- [3] Lütke-Eversloh T and Stephanopoulos G., Combinatorial pathway analysis for improved L-tyrosine production in *Escherichia coli*: identification of enzymatic bottlenecks by systematic gene overexpression, *Metab Eng.*, 10:69-77, 2008.