

生物化学工程与技术

大肠杆菌及其耐乙酸突变菌的连续培养和代谢流比较

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摘要

在氮源限制基本培养基中连续培养大肠杆菌DH5 α 及其乙酸耐受突变株DA19。与DH5 α 相比, 突变株DA19降低了葡萄糖的消耗, 减少了乙酸和丙酮酸的生成, 提高了菌体关于葡萄糖的得率。利用物料平衡和代谢反应的化学计量关系, 分析了二者在比生长速率 0.13 h^{-1} 下的稳态代谢流分布。与DH5 α 相比, DA19的三羧酸循环流量高, 酵解途径的流量低, 从而减少了乙酸等副产物的分泌, 反映了能量代谢效率的明显提高。比较了二者异柠檬酸裂解酶、6-磷酸葡萄糖脱氢酶、磷酸果糖激酶、异柠檬酸脱氢酶和乙酸激酶的活性, 酶活变化与代谢流结果基本一致。

关键词

[大肠杆菌](#) [乙酸](#) [代谢流](#) [酶活](#)

分类号

Comparison of metabolic fluxes in *Escherichia coli* and its acetate-tolerant mutant in continuous culture

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Abstract

Escherichia coli DH5 α and its acetate-tolerant mutant DA19 were continuously cultured in nitrogen-limited defined media. Compared with DH5 α , DA19 showed improved growth yield due to decreased specific glucose consumption rate and formation of less acetic acid and pyruvate at a similar dilution rate. Based on mass balance and metabolic reaction stoichiometry, the metabolic flux distribution in DH5 α and DA19 at a dilution rate of 0.13 h^{-1} was calculated. Compared with DH5 α , DA19 had a higher flux of tricarboxylic acid cycle and a lower flux of Embden-Meyerhof-Parnas pathway so it decreased the secretion rate of by-products, such as acetate and pyruvate. This indicated that DA19 had higher efficiency in energy metabolism. The activities of isocitrate lyase, 6-phosphoglucose dehydrogenase, phosphofructokinase, isocitrate dehydrogenase and acetokinase were measured, and the difference of activities between the two strains were consistent with the difference of metabolic fluxes.

Key words

[Escherichia coli](#) [acetic acid](#) [metabolic flux](#) [enzyme activity](#)

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