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Effect of pH variation on the acetate "switch" and biomass growth in an *Escherichia coli* aerobic fermentation: global gene expression profiles analysis

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The objective of the present work is to gain a better understanding of pH response in *E. coli* cultures and how this response might impact acetate accumulation and biomass growth, in order to improve our understanding on the physiology and molecular mechanisms of the bacterium. In this work, batch fermentations in a 5dm^3 bioreactor system were conducted with *E. coli* K12 strain to study the effect of different transmembrane pH (pH 7.0, 7.5 and 8.0) on global gene expression before and after the changeover to acetate utilization. Transcriptional responses were analyzed by microarray technology. The results show that the metabolite profiles were clearly different. The highest cell concentration of 2.43 g/kg was obtained at pH 7.5, even though a higher concentration of acetate than for pH7.0 was found, possibly because of associated changes in the expression of several key genes or to a the lower ΔpH. The accumulation of the metabolic by-product acetic acid was highest at pH 8 operation (3.16 g/kg). In addition, small alterations in the pH of the medium had significant influence in the acetic acid concentration profiles and in cell growth. The present work showed that improvements in cell growth are not totally dependent on reduction of acetate accumulation and that a change of only 0.5 pH units induced considerable metabolic change. The integration of the information obtained provides a better understanding of how *E. coli* cells are able to adapt their metabolism to pH alterations.