

The Analysis of Enzyme Activity and Transcription Induced by Electrochemical Reducing Equivalent

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We previously reported reduced neutral red (NR) by cathode enhanced butyrate production and decreased acetate production by *C. tyrobutyricum* in bioelectrochemical system (BES). Electrochemically reducing equivalent increased NADH-consuming product but still it was not clear how extracellular electron donor modified its metabolic pathway. We investigated activity change of enzyme related with butyrate, acetate production with or without electricity. NADH-dependent 3-hydroxybutyl-CoA dehydrogenase increased 2.3 times but acetate kinase decreased up to 0.4 times in BES (cathode poised at -400 mV vs Ag/AgCl) than in control. For the further study, we compared transcriptional differences between in these two conditions. The RNA was extracted after cell lysis and the level of transcription was analyzed by Illumina sequencing. 4Fe-4S ferredoxin, flavodoxin, iron-containing alcohol dehydrogenase were up-regulated. This study can understand how electrochemical reducing equivalent changes enzymes expression and its activity even though it was not fully analyzed yet.