

Pseudogene product YqiG is important for pflB expression and biohydrogen production in Escherichia coli BW25113

ABSTRACT

Pseudogenes in the *Escherichia coli* genome are assumed to be non-functional. In this study, Keio collection BW25113 Δ yqiG and YqiG-producing strain (BW25113/pCA24N-YqiG) were used to evaluate the importance of pseudogene yqiG in hydrogen metabolism. Our results show pseudogene protein YqiG was identified as an essential protein in the production of biohydrogen from glucose. The mutant yqiG decreased biohydrogen production from 37 $\mu\text{mol mg}^{-1}$ protein to 6 $\mu\text{mol mg}^{-1}$ protein compared to the wild-type strain, and glucose consumption was reduced by 80%. Through transcriptional analysis, we found that the yqiG mutation represses pflB transcription tenfold; pflB encodes pyruvate-formate lyase, one of the key enzymes in the anaerobic metabolism of *E. coli*. Moreover, production of YqiG stimulated glycolysis and increased biohydrogen productivity 1.5-fold compared to that of the wild-type strain. Thus, YqiG is important for the central glycolysis reaction and is able to influence hydrogen metabolism activity in *E. coli*.

Keyword: *Escherichia coli*; Biohydrogen; Pseudogene; Pyruvate-formate lyase (PflB); YqiG