

Production of gamma-butyrolactone by metabolic engineering using the combination of chemical and biological method

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γ -Butyrolactone (GBL) is an important C4 chemical due to its broad range of industrial applications. GBL can be produced through acid treatment of 4-hydroxybutyric acid (4-HB). Metabolic pathways were designed and constructed in succinic acid overproducing *M. succiniciproducens* LPK7 by the introduction of heterologous genes encoding succinyl-CoA synthetase, CoA-dependent succinate semialdehyde dehydrogenase, and either 4-HB dehydrogenase in LPK7 (p3S4CD) or succinate semialdehyde reductase in LPK7. Fed-batch cultures of LPK7 and LPK7 resulted in the production of 6.37 and 6.34 g/L of 4-HB, respectively. Finally, GBL was produced by acid treatment of the 4-HB obtained from the fermentation broth. This study demonstrates that 4-HB and potential other four carbon platform chemicals can be produced by engineering rumen bacterium *M. succiniciproducens*. [“This work was supported by the Technology Development Program to Solve Climate Changes on Systems Metabolic Engineering for Biorefineries from the Ministry of Science, ICT and Future Planning (MSIP) through the National Research Foundation (NRF) of Korea (NRF-2012-C1AAA001-2012M1A2A2026556).”]