

Co-utilization of Galactose and Glucose by Engineered E.coli

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Galactose is one of promising carbohydrate which constitutes a major sugar of red seaweeds. However, galactose metabolism requires more enzymatic steps (Leloir pathway) to enter the glycolytic pathway compared to simple glucose metabolism. This reduces both uptake and assimilation rates of galactose. Additionally, CCR regulates the expression of genes encoding for enzymes involved in the catabolism of galactose including transport and utilization in the presence of glucose. Therefore, rebuilding galactose metabolism is required to enhance the galatose utilization rates as well as to simultaneously utilize galactose with glucose. In this study, Leloir pathway of galactose metabolism was rebuilt in Escherichia coli to remove CCR and to amplify the utilization rate. Each gene encoding pathway enzymes was expressed under the control of synthetic parts including promoters, 5'-untranslated regions (5'-UTR), and terminators as re-organized single operon in chromosome. The engineered strain showed both enhanced galactose utilization rate and capability to simultaneously assimilate galactose and glucose.