Metabolic Redesign of *E. coil* for Hydrogen Production by Activation of Pentose Phosphate Pathway

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H_2 is widely recognized as a clean and efficient energy resource in the future due to its high energy content per unit weight as well as CO_2-neutral by-product. Biological hydrogen production is less energy-intensive and environmentally benign process than other chemical or electrochemical-based processes. Anaerobic fermentation has advantages such as light source-independence and availability of various substrates (i.e. pure biomass or waste products). However, the theoretical hydrogen production yield per 1-mol glucose is limited to maximum 2-4 mol of H_2. In this study, we redesigned metabolic pathway of *Escherichia coli* to maximize the reducing power by activation of pentose phosphate pathway (PPP) for increasing hydrogen production as following strategies.

1) [FeFe]-hydrogenase system of *C. acetobutylicum* and Ferredoxin/NAD(P)H:Ferredoxin oxidoreductase genes were introduced into *E. coli* BL21(DE3) for hydrogen production and electron transfer.

2) *zwf* gene to drive metabolic flux into PPP and *glpX* gene in glucogenic pathway to complete activating cycle were overexpressed.