Production of Polylactic Acid and its Copolymers by Metabolically Engineered *Escherichia coli*

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Polylactic acid (PLA) is a promising biomass-derived polymer, but is synthesized by a two-step process: fermentative production of lactic acid followed by chemical polymerization. Here we report production of PLA homopolymer and its copolymer, poly(3-hydroxybutyrate-co-lactate), by direct fermentation of metabolically engineered *E. coli*. Introduction of the heterologous metabolic pathways involving engineered propionate CoA-transferase and polyhydroxyalkanoate synthase allowed synthesis of PLA and P(3HB-co-LA) in *E. coli*. The metabolic pathways of *E. coli* were further engineered based on *in silico* genome-scale metabolic flux analysis. PLA homopolymer and P(3HB-co-LA) copolymers containing up to 70 mol% lactate could be produced up to 11 wt% and 46 wt% from glucose, respectively. This work was supported by LG Chem and by the Korean Systems Biology Research Project (20090065571) of the Ministry of Education, Science and Technology (MEST) through the National Research Foundation of Korea (NRF). Further supports by the World Class University Program (R32-2008-000-10142-0) of the MEST, LG Chem Chair Professorship, IBM SUR program, and Microsoft are appreciated.