Biosynthesis of ethylene glycol from lignocellulosic biomass

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Ethylene glycol (EG) is a chemical commonly used as a polymer precursor, as well as antifreezing agent and coolant. The commercial production of EG is currently limited to fossil resources; no biosynthesis route from renewable biomass has been delineated. Herein we report an EG biosynthesis route from co-fermentation of glucose and D-xylose, which are the two most abundant sugars in lignocellulosic feedstocks. This route consists of four reactions: D-xylose→D-xylonate→2-dehydro-3-deoxy-pentonate→Glycoaldehyde→EG. Four enzymes able to catalyze each reaction were identified and their activities were confirmed. Assembling of this route was performed in an engineered Escherichia coli, and laboratory scale fermentation results demonstrated that this strain can produce around 10 g/L of EG from the mixture of 10 g/L glucose and 40 g/L D-xylose. This work was supported by Priority Research Centers Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2012-0006693).