A Novel Enzymatic Pathway for the Conversion of Levulinic Acid to γ-Valerolactone

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The utilization of cellulosic biomass for the production of fuels and chemicals is one of the most interesting issues in industrial biotechnology. Levulinic acid can be obtained from cellulosic biomass and converted to useful forms of chemical products. γ-Valerolactone is a versatile compound which can be used as bio-fuels, solvents and precursors of carbon-based chemicals. Lots of reports have been published describing the conversion of levulinic acid to 4-valerolactone. However, most of the methods are based on chemical catalysis which requires harsh conditions with high temperature and pressure, and no enzymatic reaction schemes have been reported so far. In this study, two-step biocatalytic conversion of levulinic acid to γ-valerolactone is designed by use of the engineered 3-hydroxybutyrated dehydrogenase and paraoxonase 1. The designed reaction was performed in one-pot system, and approximately 34% conversion of levulinic acid to γ-valerolactone could be achieved in 24h.

Key words: Levulinic acid, γ-Valerolactone, Cellulosic biomass, 3-Hydroxybutyrated dehydrogenase