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Production of myo-inositol from glucose by a novel trienzymatic cascade of polyphosphate glucokinase, inositol 1-phosphate synthase and inositol monophosphatase

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ABSTRACT

myo-Inositol (inositol) is important in the cosmetics, pharmaceutical and functional food industries. Here, we report a novel pathway to produce inositol from glucose by a trienzymatic cascade system involving polyphosphate glucokinase (PPGK), inositol 1-phosphate synthase (IPS) and inositol monophosphatase (IMP). The system contained three highly active enzymes, AspPPGK from *Arthrobacter* sp. OY3WO11, TbIPS from *Trypanosoma brucei* TREU927, and EcIMP from *Escherichia coli*. A trienzymatic cascade reaction was implemented, and the conversion ratio from glucose to inositol reached 90%, which is promising for the enzymatic synthesis of inositol without ATP supplementation.

Keywords: myo-inositol, polyphosphate glucokinase, inositol-1-phosphate synthase, inositol monophosphatase, trienzymatic cascade

1. Introduction

myo-Inositol (inositol), also called cyclohexanehexol, is broadly distributed in mammalian cells, higher plants, fungi and some bacteria as an essential growth factor [1-3]. The metabolism of inositol and its derivatives has been extensively studied [4-5]. Inositol has been reported to be effective in treating depression, panic disorder, Alzheimer's disease, fatty liver and diabetes, as well as to be useful in pediatric respiratory depression syndrome [6-8]. Inositol is widely applied in the cosmetics industry to improve cell growth and prevent cell aging, the pharmaceutical industry as an adulterant, and the functional food industry as a nutritional supplement [9-11].