NATIONAL INSTITUTE OF CHEMISTRY

RESEARCH DOMAINS: Biotechnology

INDUSTRIES: Second generation bio-ethanol

ENHANCING LIGNO-CELLULOSE CONVERSION INTO BIO-FUELS BY GENETICALLY MODIFIRED YEAST

Industrial plants and traffic largely depend on exploitation of fossil fuels, however due to the global heating renewable energy sources are becoming more important. Bio-ethanol production from plant biomass is a promising option. Yeast *Saccharomyces cerevisiae* is appropriate microorganism for that because it is resistant to high ethanol concentrations. Unfortunately, *S. cerevisiae* is unable to metabolize pentose sugars that are abundantly present in plant material. Therefore, a lot of effort was invested in engineering genetically modified yeast.

Technology

Until now, heterologous genes encoding the early part of xylose and arabinose assimilation were introduced in yeast, followed by the modifications of the pentose phosphate pathway. However, no genetic modifications of the last part of bio-ethanol formation (glycolysis) have been conducted so far. We were first to show that metabolic flow through glycolysis can be deregulated by modifying the key regulatory enzyme of glycolysis, 6-phosphofructo-1-kinase. By removing the C-terminus of the enzyme, it retained activity, but became resistant to feed-back inhibition. Recombinant yeast with highly active shorter fragments as the only genetic modification was able to grow on pentose sugars and produce fermentative products, particularly 2-phenylethanol.

Main advantages

By combining previously engineered yeast strains developed for bio-ethanol production with the gene that deregulates glycolytic pathway, the following advantages might be achieved:

- Faster conversion of pentose sugars into bio-ethanol.
- Higher efficiency of bio-ethanol production from lingo-cellulose materials.
- Production of other fermentable products, such as 2-phenolethanol.

Key words

Ligno-cellulose, bio-ethanol, *Saccharomyces cerevisiae*, 6-phosphofructo-1-kinase, glycolysis

TYPE OF COOPERATION
Technology licensing opportunities

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