Abstract

- 3-hydroxypropioinic acid (3-HP) can be produced from glycerol by glycerol dehydratase (GDHt) and 3-hydroxypropionaldehyde dehydratase (ALDH).
- When these enzymes are highly expressed from multi-copy plasmid(s), recombinant microorganisms can produce 3-HP efficiently. However, for industrial purposes, the enzymes should be expressed from the chromosome.
- In this study, using the recently-discovered novel promoter which is induced by the target product 3-HP, expression cassette for a GDHt was developed.
- The GDHt expression/activity, under both non-induced and induced conditions, could be varied in a wide range by proper combination of the gene expression control methods.

Introduction

3-HP production pathway

Glycerol dehydratase (GDHt)

The dha regulon of Klebsiella pneumonia

Functional form

Results

Effect of 5′UTR engineering

<table>
<thead>
<tr>
<th>Genes</th>
<th>Expression level (5′UTR strength)</th>
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</table>

Effect of tandem promoters

Effect of promoter engineering

mRNA expression and enzyme activity of chromosomal dhaB123-gdrAB cassette

Conclusions

- Inducible expression systems giving a wide range of GDHt activity.
- The best construction of each approach (tandem promoter and 5′UTR engineering) showing the highest GDHt activity.
- High expression of GDHt was observed when integrating into chromosome.

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