

## Design and regulation of synthetic microbial communities to produce butanol by consolidated processing

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### Abstract

In recent years, the design and creation of synthetic microbial communities to perform complex bioprocesses such as the production of natural product synthesis, biorefinery, and bioremediation has attracted attention. However, our capacity to engineer microbial communities is in its infancy and there is still a need of investigating when communities are beneficial over monocultures, how to hack to different organisms to be co-cultured in optimal conditions and how to maximize metabolic fluxes between multiple cells. One field where these issues are starting to be studied is the production of cellulosic butanol by consolidated processing (CBP).

In this talk, I will introduce CBP-enabling microbial communities design and regulation via synthetic biology approaches. We developed a *Clostridium cellulovorans*-*Clostridium beijerinckii* consortium to produce butanol from cellulosic biomass with high titer by consolidated bioprocessing and then improved it by modular metabolic engineering. The engineered twin-clostridial consortia can produce 22.1 g/L of solvents (4.25 g/L acetone, 11.5 g/L butanol and 6.37 g/L ethanol) from alkali-extracted deshelled corn cobs (AECC). This titer of acetone-butanol-ethanol (ABE) approximates to that achieved from a starchy feedstock. Besides, we combined evolutionary engineering and genetic manipulation to improve low pH tolerance and butanol production in the synthetic microbial community of *Clostridium*. The developed twin-clostridial consortium serves as a promising platform for butanol production from lignocellulose by CBP.

### Brief Biography

Zhiqiang Wen is currently an assistant professor in School of Environmental and Biological Engineering, Nanjing University of Science & Technology. He earned his PhD in Biochemical engineering at Zhejiang University in 2008. After two years' postdoctoral training at Chinese Academy of Science (CAS), he joined Nanjing University of Science & Technology in 2016. His current research focuses on microbial genetic techniques development, synthetic biotechnology and metabolic engineering, as well as biorefinery, bioenergy and biosensor. He has authored more than 10 papers in the fields of microbial metabolic engineering, CRI SPR-Cas system development in *Clostridia*, *Yarrowia lipolytica*, and *Pseudomonas putida*.

## **Brief CV**

### **Zhiqiang Wen, Ph.D.**

School of Environmental and Biological Engineering, Nanjing University of Science & Technology

### **Education:**

B.S. Chemical Engineering, Zhengzhou University, China, 2008

Ph.D. Biochemical engineering, Zhejiang University, China, 2014

### **Professional Career:**

2014-2016: Chinese Academy of Science (CAS), China, Postdoctoral Fellow

2016-2016: University of Nottingham (UK), Visiting scholar

2016-Present: Nanjing University of Science & Technology, China, Assistant professor

### **Research Interests:**

1. Microbial genetic techniques development
2. Synthetic biotechnology and metabolic engineering
3. Biorefinery, bioenergy and biosensor

### **Selected publications**

1. Wen Z et al. *Appl Environ Microb*, 2019, 85 (7) e02560-18 (**Spotlight**).
2. Wen Z et al. *Metabolic engineering*, 2017, 39:38-48.
3. Wen Z et al. *Microbial Cell Factories*, 2014, 13: 92.
4. Wen Z et al. *Biotechnology Journal*, 2020, accepted.
5. Wen Z et al. *Microbial biotechnology*, 2019, doi:10.1111/1751-7915.13478.