Synthesis and accumulation of aromatic aldehyde derived compounds in yeast

Abstract: Aldehydes are widely involved as the key intermediates for synthesis of alkane as biofuels, artemisinic acid, alkaloids such as morphine and codeine, many other high-value drug precursors of α-hydroxyacids and amino alcohols. However, *Saccharomyces cerevisiae* prefers alcoholic fermentation, which poses a huge problem for the accumulation of aldehyde intermediates. In the present study, a sensor-regulated synthetic circuit was devised to dynamically modulate sugar phosphorylation in achieving reduced alcoholic fermentation. The Crabtree-negative budding yeast preferably utilized glucose in a nonfermentative manner with significantly reduced amounts of fusel alcohols, and also allowed increased synthesis and accumulation of aldehyde-derived compounds. Taken together, we envision that the synthetic Crabtree-negative yeast factory would be of great interest for many biomanufacturing applications in the future.

Key words: Aldehyde, dynamic regulation, sugar phosphorylation, *Saccharomyces cerevisiae*

Brief Biography

Dr. Jifeng YUAN obtained his Ph.D. at Nanyang Technological University in 2012. Prior to joining Xiamen University, Dr. Jifeng YUAN worked as research fellow at National University of Singapore and Agency for Science, Technology and Research from 2012 to 2018. His group is currently interested in developing green, sustainable, and cost-effective biosynthesis of high-value pharmaceutical intermediates, fragrance and flavors, fine chemicals and natural products from renewable feedstocks. By employing synthetic biology and metabolic engineering principles, his group focuses on engineering and devising efficient microbial cell factory for chemical productions. More specifically, it aims to a) develop pathway reconstruction technology and cascade biotransformation; b) dynamically regulate the pathway activity via synthetic genetic circuits; c) develop high-throughput screening approaches for directed evolution of proteins; and d) elucidate the biosynthetic pathway for natural products.

Brief CV

Name: Jifeng YUAN

Title: Professor
Institution: State Key Laboratory for Cellular Stress Biology, Innovation Center for Cell Signaling Network School of Life Sciences, Xiamen University
Address: C220, School of Life Sciences, Xiamen University, 361102
Email: jfyuan@xmu.edu.cn

Education and Professional Career:

2018 to date: Professor, School of Life Sciences, Xiamen University

2017 – 2018: Research fellow, National University of Singapore

2016 – 2017: Research fellow, Agency for Science, Technology and Research, Singapore

2012 – 2016: Research scientist, Temasek laboratories, National University of Singapore

2008 – 2012: Ph.D., Nanyang Technological University, Singapore

Research Interests:

Synthetic Biology, Metabolic Engineering, Biotransformation

Selected publications:

1. Jifeng Yuan#*, Chi-Bun Ching*. Metabolic Engineering. 2016,38:303-308.
2. Wen Xu#, Jifeng Yuan#*, Shuiyun Yang*, Chi-Bun Ching, Jiankang Liu. ACS Synthetic Biology. 2016,5(12):1404-1411.
3. Jifeng Yuan#*, Chi-Bun Ching. ACS Synthetic Biology. 2015,4:23-31.
4. Jifeng Yuan#*, Chi-Bun Ching. Biotechnology and Bioengineering. 2014,111(3):608-17.
5. Jifeng Yuan#*, Chi-Bun Ching*. Microbial Cell Factories. 2015,14:38.
6. Jifeng Yuan#*, Xue Chen, Pranjul Mishra, Chi-Bun Ching*. Applied Microbiology and Biotechnology. 2017,101(1):465-474.
7. Jifeng Yuan#*, Pranjul Mishra, Chi-Bun Ching. Journal of Industrial Microbiology and Biotechnology. 2017,44(1):107-117.
8. Jifeng Yuan#*, Pranjul Mishra, Chi-Bun Ching. Journal of Biotechnology. 2016,239:90-97.
9. Jifeng Yuan#, Benedict Ryan Lukito, Zhi Li*. ACS Synthetic Biology. 2019,16;8(8):1801-1808
10. Yang Zhang#*, Jifeng Yuan, Liejin Guo. International Journal of Hydrogen Energy. 2019, accepted