Sensing the metabolites and cell population for metabolic engineering

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Natural metabolic control strategies have inspired the engineering of writing dynamic function into cellular regulatory network. Current challenge for dynamic control is lacking artificial dynamic function components in chassis, which requires the genetic parts to be tunable. Biosensor that are metabolite-responsive provides desired input-output relationships in synthetic dynamic metabolic control system in pathway engineering.

By rational, semi-rational design and irrational evolution of different biosensors, including transcription factor based biosensor and RNA type biosensor, we were able to obtain the biosensors that has different sensitivity. Combine with CrispRi or other effector, these biosensors not only enable us to regulate the metabolic pathways dynamically and tunable but also enable us to evolve the key enzymes and pathways towards desired products. In addition, quorum sensing that senses the cell population in the environments was also used to control the metabolic pathways using the AND gate and orthogonal design.

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Education

2001 Ph.D., Molecular Microbiology, University of Muenster, Germany.

1992 M.S., Microbiology, Shandong University, P.R. China.

1989 B.Sc., Microbiology, Shandong University, P.R. China.

Experience

2017- Joint Professor CAS Key Lab of Biobased Materials, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences.

2004 - Professor at State Key Laboratory of Microbial Technology, Prof. at National Glycoengieering Research Center.

2001-2003 Posdoc, Department of Bioprocess Technology, University of Chemnitz, Germany.

Research interest

Current research interest is focusing on metabolic engineering and synthetic biology of microorganisms. Specifically, these interest includes:

1) Developing the metabolic and biosynthetic methods or tools for the synthetic biology;

2) Investigations of the molecular mechanisms of stress response during the metabolic engineering and fermentation process in these micro-organisms;

3) Pathway engineering of micro-organisms towards the efficient production of useful bulk chemicals and value added compounds;

Keywords

Metabolic engineering, synthetic biology, high valued compounds

Publication (selected)

Qian Wang, Jiasheng Xu, Zhijie Sun, Yaqi Luan, Ying Li, Junshu Wang, Quanfeng Liang, Qingsheng Qi: *Engineering an in vivo EP-bifido pathway in Escherichia coli for high-yield acetyl-CoA generation with low CO 2 emission*. Metabolic Engineering 08/2018; 51., DOI:10.1016/j.ymben.2018.08.003

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Zhiyong Cui, Xin Jiang, Huihui Zheng, Qingsheng Qi, Jin Hou: *Homology-independent genome integration enables rapid library construction for enzyme expression and pathway optimization in Yarrowia lipolytica: CUI et al.*. Biotechnology and Bioengineering 11/2018;, DOI:10.1002/bit.26863

Peng Yang, Jing Wang, Qingxiao Pang, Fengyu Zhang, Junshu Wang, Qian Wang, Qingsheng Qi: *Pathway optimization and key enzyme evolution of N -acetylneuraminate biosynthesis using an in vivo aptazyme-based biosensor*. Metabolic Engineering 08/2017; 43., DOI:10.1016/j.ymben.2017.08.001

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Xinyuan He, Yan Chen, Quanfeng Liang, Qingsheng Qi: *An autoinduced AND-gate controlling metabolic pathway dynamically in response to microbial communities and cell physiological state*. ACS Synthetic Biology 12/2016; 6(3).,

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