

Screening overproduction strains for value-added chemicals based on transcriptional and translational regulations

Yixin Huo

Professor
School of Life Science,
Beijing Institute of Technology
Room 749, Central Building, 5 South Zhongguancun Street,
Haidian District, Beijing 100081, P.R.China
Email: huoyixin@bit.edu.cn



Abstract

The translation of rare codons relies on their corresponding rare tRNAs, which could not be fully charged under amino acid starvation. Theoretically, disrupted or retarded translation caused by the lack of charged rare tRNAs can be partially restored by feeding or intracellular synthesis of the corresponding amino acids. Inspired by this assumption, we developed a screening or selection system for obtaining overproducers of a target amino acid by replacing its common codons with the corresponding synonymous rare alternative in the coding sequence of selected reporter proteins or antibiotic-resistant markers. Results showed that integration of rare codons could inhibit gene translations in a frequency-dependent manner. As a proof-of-concept, *Escherichia coli* strains overproducing L-leucine, L-arginine or L-serine were successfully selected from random mutation libraries. The system was also applied to *Corynebacterium glutamicum* to screen out L-arginine overproducers. This strategy sheds new light on obtaining and understanding overproduction strains for value-added chemicals.

Brief Biography

Prof. Yixin Huo is the Professor and Assistant Dean of College of Life Science in Beijing Institute of Technology. He is also appointed as the Vice Director of the Key Laboratory of Molecular Medicine and Biotherapy. He has long term experience with the transcriptional regulations on carbon and nitrogen metabolisms and on their biological fixations, and published papers in leading journals such as *Science*, *Nature Biotechnology*. He has been granted and applied multiple international and national patents, and had multi-year experiences in industry. Since 2018, he has published more than 10 SCI papers as first or corresponding author in reputational journal including *Nature Communications*, *Applied Microbiology and Biotechnology*, *Microbial Cell Factories*, *Engineering et al.*,

Brief CV

Yixin Huo, Ph.D.

School of Life Science, Beijing Institute of Technology

Education:

B.Sc. 1999 Microbiology, Nankai University, P.R.China

- Ph.D. 2005 Molecular Microbiology & Virology, Université Paris 7-Denis Diderot, France
Ph.D. 2005 Biochemistry and Molecular Biology, Peking University, P.R.China
(Exchange Ph.D. student, diploma awarded by two Universities separately)

Professional Career:

- 2018-current Assistant Dean, College of Life Science, Beijing Institute of Technology (BIT)
2019-current Vice director, Key Laboratory of Molecular Medicine and Biotherapy, BIT
2015-2018 Vice Chair, Department of Bioengineering, BIT
2015-current Professor, College of Life Science, BIT
2011-2015 Senior Research Scientist & Project Manager, Easel Biotechnologies
2015-current Adjunct Researcher, SIP-UCLA Institute for Technology Advancement
2008-2011 Postdoctoral Researcher, Department of Chemistry Engineering, UCLA
2006-2008 Postdoctoral Research Fellow, Department of Chemistry and Biochemistry, UCLA
2006-2006 Research Scientist, Peking University
2002-2005 CNOUS Research Fellow, Pasteur Institute
2000-2002 Research Assistant, Peking University

Research Interests:

1. Microbial Production of Biofuels and Bioproducts
2. Metabolic Engineering
3. Protein Engineering

Selected publications

1. Zheng, B.#, Ma, X.#, Wang, N., Ding, T., Guo, L., Zhang, X., Yang, Y., Li, C., **Huo, Y.X.*** (2018) *Nature Communications*. 9(1):3616
2. Zhang, J., Yang, F.Y., Yang, Y.P., **Huo, Y.X.*** (2019) *Microb Cell Fact.* DOI: 10.1186/s12934-019-1109-x
3. Yu, H., Wang, N., Huo, W., Zhang, Y., Zhang, W., Yang, Y., Chen, Z.*, **Huo, Y.X.*** (2019) *Microb Cell Fact.* 18(1):30
4. Chen, Z., Zhao, L., Ru, J., Yu, S., Yu, H., Ren, H., Zhang, Y., Zhang, W., Lin, F., **Huo, Y.X.*** (2019) *J Biotechnol.* doi: 10.1016/j.jbiotec.2019.06.002
5. **Huo, Y.X.**, Zheng, B., Wang, N., Yang, Y.P., Liang, X.X., Ma, X.Y.*(2019) *JovE* (in press)
6. Ma, X.Y., Liang, X.X., **Huo, Y.X.*** (2019) *Engineering.* (accepted)
7. Huang, C., Ding, T., Wang J., Wang, X., Guo, L., Wang, J., Zhu, L., Bi, C., Zhang, X., Ma, X.Y., **Huo, Y.X.*** (2019) *Appl Microbiol Biotechnol.* (accepted)
8. **Huo, Y.X.**, Ren, H., Yu, H., Zhao, L., Yu, S., Yan, Y. and Chen, Z.* (2018) *Appl Microbiol Biotechnol.* 102(23):10005-10015
9. **Huo, Y.X.**, Guo, L. & Ma, X.Y.* (2018) *Appl Microbiol Biotechnol.* 102(6): 2929–2940
10. Yu, Y., Chang, P., Yu, H., Ren, H., Hong, D., Li, Z., Wang, Y., Song, H., **Huo, Y.X.*** and Li, C.* (2018) *ACS Synth Biol.* 7 (10): 2391–2402