

Department: School of Biotechnology

Professional field: Synthetic biology and Metabolic Engineering

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## Profile

Dr. Cai holds a B.S. degree in Bioengineering and Ph. D. degree in Biochemical Engineering from East China University of Science and Technology (ECUST). From 2009 to 2010, he worked as a joint Ph.D. student in School of Chemistry in University of Bristol, UK. In 2011, Dr. Cai joined the faculty of School of Biotechnology in ECUST and worked as a postdoc and lecturer until 2014, and then promoted to associate professor in School of Biotechnology in ECUST. In 2019, he was promoted to be a Ph.D. supervisor. He was granted by Shanghai Rising-Star Program, Young Talents Cultivation Program in ECUST, Shanghai Innovative Research Funding for Postgraduate Student, Yuanzhi Plan in School of Biotechnology, Fundamental Research Funds for the Central Universities, National Natural Science Foundation of China, National High Technology Research and Development Program, National Major Scientific and Technological Special Project for Significant New Drugs Development.

Dr. Cai has authored or co-authored more than 40 research articles (more than 30 for first or corresponding author), published in high profile journals in applied biotechnology and biochemistry such as *Metab Eng*, *J Biol Chem*, *Sci rep*, *J. Biotechnol*, *Microb Cell Fact*, *Bioresour Technol*. He also filed more than 14 patents, with six of them already issued. He was also invited as reviewer for some known journals in applied microbiology and biotechnology such as *Microb Cell Fact*, *Appl Microbiol Biotechnol*, *Biotechnol Lett*, *FEMS Yeast Res*, *Appl Biochem Biotechnol*, *Biochem Eng J*. He is committee member for Division of Marine Microbiology of Chinese Society for Microbiology (2016-2021), Division of Marine Biochemistry and Molecular Biology of Chinese Society for Biochemistry and Molecular Biology (2016-2020), Young Committee of China Marine Drug Ph.D. Forum of Division of Marine Drug of Chinese Society for Medical (2015-2019).

## Research Field

1. Synthetic biology and metabolic engineering for production of pharmaceuticals: Genetically modify native metabolic networks or reassemble biosynthetic pathway in heterologous chassis cells; Improve titre of pharmaceuticals by static control, biosensor design and dynamic control, and systematic metabolic engineering.
2. Molecular design on novel chassis cells: Clarify transcriptional regulation mechanism of methylotrophic yeast; Reconstruct transcriptional regulation networks to relieve carbon source and precursor repression; Balance biosynthetic pathway and develop high efficient hosts; which are used for biosynthesis of pharmaceuticals.
3. Fermentation for production of pharmaceuticals: Fungal fermentation for pharmaceuticals covering morphological regulation, metabolic regulation, bioprocess design and optimization, and fermentation scale-up.

## Research results and selected published papers

Selected publications (\*Corresponding author):

1. Liu Y, Bai C, Liu Q, Xu Q, Qian Z, Peng Q, Yu J, Xu M, Zhou X, Zhang Y, Cai M\*. Engineered ethanol-driven biosynthetic system for improving production of acetyl-CoA derived drugs in Crabtree-negative yeast. *Metab Eng*. 2019, 54: 275-284.
2. Xu Q, Bai C, Liu Y, Song L, Tian L, Yan Y, Zhou J, Zhou X, Zhang Y, Cai M\*. Modulation of acetate utilization in *Komagataella phaffii* by metabolic engineering of tolerance and metabolism. *Biotechnology for Biofuels*. 2019, 12:61.
3. Liu Y, Tu X, Xu Q, Bai C, Kong C, Liu Q, Yu J, Peng Q, Zhou X, Zhang Y, Cai M\*. Engineered monoculture and co-culture of methylotrophic yeast for de novo production of monacolin J and lovastatin from methanol. *Metab Eng*. 2017, 45:189-199.
4. Wang X, Wang Q, Wang J, Bai P, Shi L, Shen W, Zhou M, Zhou X, Zhang Y, Cai M\*. Mit1 transcription factor mediates methanol signaling and regulates alcohol oxidase 1 promoter in *Pichia pastoris*. *J Biol Chem*. 2016, 291:6245-6261.
5. Wang J, Wang X, Shi L, Qi F, Zhang P, Zhang Y, Zhou X\*, Song Z\*, Cai M\*. Methanol-independent protein expression by AOX1 promoter with trans-acting elements engineering and glucose-glycerol-shift induction in *Pichia pastoris*. *Sci Rep*. 2017, 7:41850.
6. Xue Y, Kong C, Shen W, Bai C, Ren Y, Zhou X, Zhang Y, Cai M\*. Methylotrophic yeast *Pichia pastoris* as a chassis organism for polyketide synthesis via the full citrinin biosynthetic pathway. *J Biotechnol*. 2017, 242:64-72.
7. Zhang X, He H, Yin Y, Zhou W, Cai M\*, Zhou X, Zhang Y. A light-dark shift strategy derived from light-responded metabolic behaviors for polyketides production in marine fungus *Halorosellinia* sp.. *J Biotechnol*. 2016, 221:34-42.
8. Gao L, Cai M\*, Shen W, Xiao S, Zhou X, Zhang Y. Engineered fungal polyketide biosynthesis in *Pichia pastoris*: a potential excellent host for polyketide production. *Microb Cell Fact*. 2013, 12:77.
9. Yu Z, Cai M\*, Hu W, Zhang Y, Zhou J, Zhou X, Zhang Y. A cyclin-like protein, ClgA, regulates development in *Aspergillus nidulans*. *Res Microbiol*. 2014, 165:462-467.
10. Zhou W, Cai M\*, Zhou J, Jiang T, Zhou J, Wang M, Zhou X\*, Zhang Y. Nutrition and bioprocess development for efficient biosynthesis of an antitumor compound from marine-derived fungus. *J Ind Microbiol Biotechnol*. 2013, 40:1131-1142.