Liang Sun, Ph.D. (with EB2 NIW and EB1A I-140 approvals)

Postdoctoral Research Associate, Aug 2020-Present
Principal Investigator: Dr. Chris Todd Hittinger
Great Lakes Bioenergy Research Center, University of Wisconsin-Madison
Research focus: Study the evolution and regulation of yeast metabolism with advanced synthetic biology, comparative genomics, phylogenetics, and multi-omics techniques
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SKILLS

Yeast Metabolic Engineering (model and nonconventional); Synthetic Biology; Multiplex Genome Engineering; CRISPR-library Screening; Adaptive Laboratory Evolution; Fermentation; Bioreactor; Downstream Bioproduct Extraction &Purification; Instrumental Analysis (HPLC, GC-MS, LC-MS); Microscopy; Multi-omics (Whole Genome Sequencing, RNA sequencing, Proteomics, Metabolomics); Bioinformatics; Phylogenomics; Machine Learning

EDUCATION

University of Illinois, Urbana-Champaign (UIUC), Carl R. Woese Institute for Genomic Biology, Center for Advanced Bioenergy and Bioproducts Innovation, 2016-2020

- Doctor of Philosophy in Food Science and Human Nutrition (Mentor: Dr. Yong-Su Jin)
- Thesis: “Engineering yeast to synthesize high-value natural products from plant cell wall”

China Agricultural University (CAU), 2014-2016

- Master of Engineering in Food Biotechnology (Mentor: Dr. Guo-Liang Yan, Dr. Chang-Qing Duan)
- Thesis: “Enhanced production of β-carotene in recombinant *Saccharomyces cerevisiae* by inverse metabolic engineering”

Beijing Forestry University (BJFU), 2010-2014

- Bachelor of Engineering in Food Science and Engineering (Mentor: Dr. Shan-Zhi Lin)
- Thesis: “Effects of exogenous fatty acids on growth and β-carotene biosynthesis in recombinant *Saccharomyces Cerevisiae*”

PUBLICATIONS

22. **Sun, L.**, Zhang, G.-C., Kong, I.-I., Park, S., Cate, J., and Jin, Y.-S.* 2023 (under review). Enhanced xylodextrin metabolism and bioconversion of autohydrolysates in *Saccharomyces cerevisiae* through rational and evolutionary engineering. *Bioresource Technology*.
21. **Sun, L.**, Wang, Y.-R., Sun, Z.-Q., Zhang, G.-C., Xia, P.-F., and Jin, Y.-S.* 2023 (in preparation for *Metabolic Engineering*). Repurposing phosphite dehydrogenase as a NADH regenerator for metabolic engineering in *Saccharomyces cerevisiae*.
20. Seo, S.-O., Kim, H., Lane, S., **Sun, L.**, Yavuz, M., Blaschek, H., Jin, Y.-S.* 2023 (under review). A dilemma of ethanol-free isobutanol production by engineered yeast: a promiscuous activity of ketoisovalerate decarboxylase with pyruvate. *Applied and Environmental Microbiology.*
19. **Sun, L.**, David, K., Wolters, J., Karlen, S., Gonçalves, C., Opulente, D., LaBella, A., Groenewald, M., Zhou, X., Shen, X., X., Rokas, A., Hittinger, C. * Functional and evolutionary integration of a fungal gene with a bacterial operon. *bioRxiv*, https://doi.org/10.1101/2023.11.21.568075
18. Wan, W., Li, W., **Sun, L.**, Liu, H. *, Xia, X. * 2023. Effects of freeze-thaw cycles on in-vitro digestive properties of myofibrillar protein in mirror carp (*Cyprinus carpio L.*), based on protein degradation, oxidation, and structural properties. *Food Chemistry*, 436, 137662
17. Nuerjiang, M., Bai, X., **Sun, L.**, Wang, Q., Xia, X. *, Li, F. * 2023. Size effect of fish gelatin nanoparticles on the mechanical properties of collagen film based on its hierarchical structure. *Food Hydrocolloids*, 108931.
16. Lee, J. W., Bhagwat, S. S., Kuanyshev, N., Cho, Y. B., **Sun, L.**, Lee, Y. G., ... & Jin, Y. S. (2023). Rewiring yeast metabolism for producing 2, 3-butanediol and two downstream applications: Techno-economic analysis and life

cycle assessment of methyl ethyl ketone (MEK) and agricultural biostimulant production. *Chemical Engineering Journal*, *451*, 138886.

15. Lee, Y.-G., Ju, Y, **Sun, L.**, Jin, Y.-S.*, Kim, S.R.* 2022. Acetate-rich cellulosic hydrolysates and their bioconversion by yeast. *Biotechnology and Bioprocess Engineering. 1-10.*
14. Lee, Y.-G., Kim, C., **Sun, L.**, Lee, T.-H., Jin, Y.-S.* 2021. Selective production of retinol by engineered *Saccharomyces cerevisiae* through the expression of retinol dehydrogenase. *Biotechnology and Bioengineering.* 1-12.
13. **Sun, L.**, Lee, J.-W., Yook, S., Lane, S., Sun, Z.-Q., and Jin, Y.-S.* 2021. Complete and efficient conversion of plant cell wall hemicellulose into high-value bioproducts by engineered yeast. *Nature Communications*. *12,* 4975.
12. **Sun, L.**, and Jin, Y.-S.* 2020. Xylose assimilation for the efficient production of biofuels and chemicals by engineered *Saccharomyces cerevisiae*. *Biotechnology Journal.* 2000142.
11. **Sun, L**, Atkinson, C., Lee, Y.-G., and Jin, Y.-S.* 2020. High-level β-carotene production from xylose by engineered *Saccharomyces cerevisiae* without overexpression of a truncated *HMG1* (*tHMG1*). *Biotechnology and Bioengineering. 117*, 3522.
10. Cheng, M.-S., **Sun, L. (co-first)**, Jin, Y.-S., Dien, B., and Singh, V.* 2020. Production of xylose enriched hydrolysate from bioenergy sorghum and its conversion to β-carotene using an engineered *Saccharomyces cerevisiae*. *Bioresource Technology. 308*, 123275.
9. **Sun, L.**, Kwak, S., and Jin, Y.-S.* 2019. Vitamin A production by engineered *Saccharomyces cerevisiae* from xylose via two-phase *in situ* extraction. *ACS Synthetic Biology. 8*, 2131–2140.
8. Zhang, L., **Sun, L.**, Yi, H., Wang, S., Han, J., Liu, N., Zhang, S., and Zhang, L.* 2019. Comparative proteome analysis of *Streptomyces mobaraensis* under MgCl2 stress shows proteins modulating differentiation and transglutaminase biosynthesis. *Food Research International. 121*, 622–632.
7. Bu, X., **Sun, L.**, Shang, F., and Yan, G.* 2017. Comparative metabolomics profiling of engineered *Saccharomyces cerevisiae* leads to a strategy that improving β-carotene production by acetate supplementation. *PLOS ONE 12*, e0188385.
6. Sun, Y., **Sun, L. (co-first)**, Shang, F., and Yan, G.* 2016. Enhanced production of β-carotene in recombinant *Saccharomyces cerevisiae* by inverse metabolic engineering with supplementation of unsaturated fatty acids. *Process Biochemistry*. *51*, 568–577.
5. Liu, P., **Sun, L.**, Sun, Y., Shang, F., and Yan, G.* 2016. Decreased fluidity of cell membranes causes a metal ion deficiency in recombinant *Saccharomyces cerevisiae* producing carotenoids. *Journal of Industrial Microbiology and Biotechnology. 43*, 525–535.
4. **Sun, L.**, Shang, F., Duan, C., and Yan, G.* 2015. Reduction of fatty acid flux at low temperature led to enhancement of β-carotene biosynthesis in recombinant *Saccharomyces cerevisiae*. *Korean Journal of Chemical Engineering. 32*, 1354–1360.
3. Wang, Y., Lan, Y., **Sun, L.**, Zhu, B, He, F, Wang, J.* 2015. Effect of Extended Harvest on the Quality of 'Merlot' Grapes. *Acta Agriculturae Boreali-occidentalis Sinica*. 07, 84-91. (In Chinese)
2. Fan, Z., Xu, Q., Zhu, R., Chen, P., **Sun, L.**, Wang, J.* 2013. Effect of different blanching conditions on banana browning. *Science and Technology of Food Industry*. 16, 318-325. (In Chinese)
1. Fan, Z., **Sun, L.**, Zhu, R., Chen, P., Xu, Q., Wang, J.-Z.*, Zhang, C. 2013. Study on optimization of enzymatic hydrolysis process parameters by response surface methodology in preparing banana juice with liquid compound enzyme. *Science and Technology of Food Industry*. 20, 203-207. (In Chinese)

PRESENTATIONS

8. **Sun, L.**, Hittinger, C.T. 2023. Dissecting a horizontally acquired metabolic regulator in the oleochemical cell factory *Starmerella bombicola*. Invited Talk. GLBRC Annual Science Meeting, Geneva, USA.
7. **Sun, L.**, and Jin, Y.-S. 2022. Complete and efficient conversion of plant cell wall hemicellulose into high-value bioproducts by engineered yeast. Invited Talk. SIMB Annual Meeting. San Francisco, CA, USA.
6. **Sun, L.**, Hittinger, C.T. 2022. Functional investigation of a horizontally-acquired bacterial operon in a sophorolipid-producing yeast. Poster Presentation. SIMB Annual Meeting. San Francisco, CA, USA.
5. **Sun, L.**, Hittinger, C.T. 2021. Evolutionary and functional investigation of novel pathways in yeasts. Invited Talk.

Evolution Seminar Series, UW-Madison, USA

4. **Sun, L.**, Hittinger, C.T. 2021. Functional and evolutionary investigation of a novel pathway in Lipomycetaceae family yeasts. Poster Presentation. GLBRC Annual Science Meeting, Online, USA.
3. **Sun, L.**, and Jin, Y.-S. 2019. Complete and efficient microbial conversion of hemicellulose fractions into valuable chemicals. Invited Talk. *Switchgrass V International Conference*. Champaign, IL, USA.
2. **Sun, L.**, Kwak, S., and Jin, Y.-S. 2019. Vitamin A production by engineered *Saccharomyces cerevisiae* from xylose via two-phase *in situ* extraction. ePoster Presentation. IFT19 Annual Meeting. New Orleans, LA, USA.
1. **Sun, L.**, Atkinson, C., and Jin, Y.-S. 2019. High-level β-carotene production from xylose by engineered *Saccharomyces cerevisiae*. Poster Presentation. IFT19 Annual Meeting. New Orleans, LA, USA.

HORNORS AND AWARDS

- Henry D. and Donna E. Strunk scholarship merit award, UIUC, 2018-9
- Kathryn VanAken Burns Memorial Fund merit award, UIUC, 2016-7, 2017-8
- Outstanding Graduates, CAU, 2016
- First Prize Scholarship for Academic Excellence & COFCO Scholarship, CAU, 2015
- Second Prize Scholarship for Academic Excellence, CAU, 2014
- Second Prize Scholarship for Outstanding Student, BJFU, 2012-3
- Merit Student & Second Prize Scholarship for Outstanding Student, BJFU, 2011

TEACHING AND MENTORING

- Teaching Assistant. *Communicating Evolutionary Biology*, Biology/Genetics 522, UW-Madison, Spring 2021
- Mentoring two undergraduate students Peiqi Zhang (current PhD student at Carnegie Mellon University), Ira Wang (current PhD student at WUSTL) and a master student Ziqiao Sun (current PhD student at Cornel University) in research projects, UIUC, 2018-9
- Mentoring a PhD rotating student Harrison Estes in a research project, UW-Madison, Fall 2023

EDITORIAL AND REVIEWING

- Review Editor for Frontiers in *Bioengineering and Biotechnology*; Review Editor for Frontiers in *Molecular Biosciences*; Guest Editor for *Nutrients*
- Reviewed 37 times for 17 SCI journals: *Critical Reviews in Biotechnology*; *Scientific Reports*; *Biotechnology and Bioengineering*; *Frontiers in Microbiology*; *Journal of Applied Microbiology*; *Applied Biochemistry and Biotechnology*; *Biochemical Engineering Journal*; *Process Biotechnology*; *Nutrients*; *Food Chemistry: X*; *Food Science and Human Wellness*; *Applied Engineering in Agriculture, Biological Engineering*; *Preparative Biochemistry and Biotechnology*; *Biotechnology Reports*; *Journal of Bioscience and Bioengineering*; *Genes*; *Fermentation*

WEB PAGE

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