Qing Tang, Ph.D.

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PROFILE

I am a microbiologist with expertise in microbiology, biochemistry, and innate immunology. I use multi-disciplinary approaches to investigate bacterial signal transduction mechanisms, bacterial stress responses, and bacterial pathogenesis. I have revealed unappreciated host-pathogen interaction mechanisms during *Listeria monocytogenes* and *Staphylococcus aureus* infections.

EDUCATION & RESEARCH

University of Texas at Arlington 01/2024-present
Assistant professor, Department of Biology

University of Washington (Seattle, WA) 03/2023-12/2023
Acting instructor, Department of Microbiology

University of Washington (Seattle, WA) 02/2018-02/2023
Postdoctoral Fellow, Department of Microbiology
Project: C-di-AMP signaling in *S. aureus*
Advisor: Joshua J. Woodward, Ph.D.

Huazhong Agricultural University (Wuhan, China) 07/2011-06/2017
Ph.D., Microbiology
Dissertation: The regulatory mechanism of metabolism and infection by signal molecules in Gram-positive bacterial pathogens
Advisor: Jin He, Ph.D.

University of Washington (Seattle, WA) 10/2015-01/2017
Visiting graduate student, Department of Microbiology
Project: C-di-AMP signaling in *S. aureus*
Advisor: Joshua J. Woodward, Ph.D.

Hubei University of Technology (Wuhan, China) 09/2007-07/2011
B.S., Bioengineering
Advisor: Jianguo Lin, Ph.D.

RESEARCH EXPERIENCE

Bacterial signal transduction

Regulatory mechanisms of biotin metabolism in *Mycobacteria*: Biotin is essential for bacterial central metabolism and also critical for rapid phagosome escape of some pathogens. Bacteria have evolved diversified mechanisms to tightly control biotin metabolism. In this project, I identified a TetR family transcription factor BioQ in *M. smegmatis* which acted as a transcriptional repressor of biotin synthesis genes, thus defining a new mechanism for bacterial biotin metabolism.

Cyclic dinucleotide signaling in bacteria

C-di-GMP signaling in *Bacillus thuringiensis*: Cyclic diguanylate (c-di-GMP) is a ubiquitous second messenger that regulates diverse cellular processes in bacteria by binding to various protein or riboswitch effectors. In this project, I identified a c-di-GMP riboswitch and characterized its role in regulating the physiology and virulence of *B. thuringiensis.*

C-di-AMP signaling in *M. smegmatis*: Cyclic diadenylate (c-di-AMP) is a second messenger conserved in most gram-positive bacteria and some archaea. It is essential for many bacteria under standard growth conditions. Through binding to specific protein and riboswitch receptors, c-di-AMP regulates a wide variety of physiological functions.

This project characterized the c-di-AMP metabolic pathway in *M. smegmatis* and elucidated the regulatory role of c-di-AMP in the cell wall synthesis.

Cyclic dinucleotide signaling in host-pathogen interactions

C-di-AMP signaling in *S. aureus*: C-di-AMP is a conserved microbial signature for innate immune detection of several bacterial. During infection, c-di-AMP produced by bacterial pathogens elicits host immune response by binding and activating Stimulator of interferon genes (STING). This project characterized that anti-folate antibiotic treatment elicits a robust production of c-di-AMP of several Firmicutes. The elevated c-di-AMP induces an enhanced immune response by activating the STING signaling cascade and establishes a paradigm for respiratory exacerbations and reduced lung function caused by infection with *S. aureus* thymidine-dependent small colony variants in patients with pediatric cystic fibrosis.

Kvβ2 and the host response to cyclic dinucleotides: Cyclic dinucleotides elicit host immune responses during infection. Several cytosolic pattern recognition receptors including STING, DDX41, and RECON that detect cyclic dinucleotides have been recently identified. This project identified a novel cyclic dinucleotide binding protein Kvβ2 (β subunit of voltage-dependent potassium channels). I am currently working on elucidating the role of Kvβ2 in recognizing bacterial cyclic dinucleotides and restricting bacterial infections.

SELECTED PUBLICATIONS

1. **Qing Tang**, Mimi R. Precit, Maureen K. Thomason, Fariha Ahmed-Qadri, Adelle P. McFarland, Daniel J. Wolter, Lucas R. Hoffman, Joshua J. Woodward. Thymidine starvation promotes c-di-AMP dependent inflammation during infection. Cell Host Microbe. 2022 Jul 13;30(7):961-974.e6.

2. Ling Yan*, **Qing Tang***, Zeyuan Guan, Ping Yin, Tingting Zou, Jin He. Structural insights into operator recognition by BioQ in biotin synthesis pathway. Biochim Biophys Acta Gen Subj. 2018 Sep;1862(9):1843-1851. (*co-first author)

3. **Qing Tang**, Kang Yin, Hongliang Qian, Youwen Zhao, Wen Wang, Shan-Ho Chou, Yang Fu, and Jin He. Cyclic di-GMP contributes to adaption and virulence of *Bacillus thuringiensis* through a riboswitch-regulated collagen adhesion protein. Sci Rep. 2016 Jul 6; 6:28807.

4. **Qing Tang**, Yuncao Luo, Chao Zheng, Kang Yin, Maria Kanwal, Xinfeng Li, Jin He. Functional Analysis of a c-di-AMP-specific Phosphodiesterase MsPDE from *Mycobacterium smegmatis*. Int J Biol Sci. 2015 May 30;11(7):813-24. eCollection 2015.

5. **Qing Tang**, Xinfeng Li, Tingting Zou, Huimin Zhang, Yingying Wang, Rongsui Gao, Zhencui Li, Jin He, Youjun Feng. *Mycobacterium smegmatis* BioQ defines a new regulatory network for biotin metabolism. Mol Microbiol. 2014 Oct 7. doi: 10.1111/mmi.12817.

ADDITIONAL PUBLICATIONS

1. WenYin, Li Zhu, Hui Xu, **Qing Tang**, Yingxin Ma, Shan-Ho Chou, Jin He. Bio-hybrid nanoarchitectonics of nanoflower-based ELISA method for the detection of *Staphylococcus aureus*. Sensors and Actuators B: Chemical. 1 September 2022, 132005.

2. Xinfeng Li, Fang Chen, Xiaoyu Liu, Jinfeng Xiao, Binda T. Andongma, **Qing Tang**, Xiaojian Cao, Shan-Ho Chou, Michael Y. Galperin, Jin He. *Mycobacterial* CarD defines a novel mechanism of response to starvation stress. eLife. 2022;11:e73347.

3. See-Yeun Ting, Esteban Martínez-García, Shuo Huang, Savannah K Bertolli, Katherine A Kelly, Kevin J Cutler, Elizabeth D Su, Hui Zhi, **Qing Tang**, Matthew C Radey, Manuela Raffatellu, S Brook Peterson, Víctor de Lorenzo, Joseph D Mougous. Targeted depletion of bacteria from mixed populations by programmable adhesion with antagonistic competitor cells. Cell Host Microbe. 2020 Aug 12;28(2):313-321.

4. Xinfeng Li, Han Mei, Fang Chen, **Qing Tang**, Zhaoqing Yu, Xiaojian Cao, Binda T Andongma, Shan-Ho Chou, Jin He. Transcriptome landscape of *Mycobacterium smegmatis*. Front Microbiol. 2017 Dec 18; 8:2505.

5. Maria Kanwal Ali, Xinfeng Li, **Qing Tang**, Xiaoyu Liu, Fang Chen, Jinfeng Xiao, Muhammad Ali, Shan-Ho Chou, Jin He. Regulation of inducible potassium transporter KdpFABC by KdpD/KdpE two-component system in *Mycobacterium smegmatis*. Front Microbiol. 2017 Apr 24; 8:570.

6. Hang Zhou, Cao Zheng, Jianmei Su, Bo Chen, Yang Fu, Yuqun Xie, **Qing Tang**, Shan-Ho Chou, Jin He. Characterization of a natural triple-tandem c-di-GMP riboswitch and application of the riboswitch-based dual-fluorescence reporter. Sci Rep. 2016 Feb 19; 6:20871.

7. Han Mei, **Qing Tang**, Yaxi Wang, Jieping Wang, Jin He. Insights into sRNA genes regulated by two-component systems in the *Bacillus cereus* group. Current Bioinformatics, 2015, 10(4): 56-468(13).

8. Shumeng Zhang, Jieping Wang, Yale Wei, **Qing Tang**, Maria Kanwal, Jin He. Heterologous expression of VHb can improve the yield and quality of biocontrol fungus *Paecilomyces lilacinus*, during submerged fermentation. J Biotechnol. 2014 Oct 10; 187:147-53.

9. Jieping Wang, Han Mei, Hongliang Qian, **Qing Tang**, Xiaocui Liu, Ziniu Yu, Jin He. Expression profile and regulation of spore and parasporal crystal formation-associated genes in *Bacillus thuringiensis*. J Proteome Res. 2013 Dec 6;12(12):5487-501.