

Lee Bei Shi

Email: beishi.lee2@uzh.ch

PROFILE

Microbiologist with 6 years of experience in mycobacterial energy metabolism and drug discovery research. Published 12 articles in peer-reviewed journals. Key findings from my doctoral study contributed to the field's understanding of the role energy metabolism plays in classical anti-TB drugs, as well as validated a complex in the bacterial oxidative phosphorylation pathway as a drug target. As an independent worker and effective communicator, I work well with international collaborators on research projects. My academic interest is in systems biology in the context of microbiology and antimicrobial resistance.

ORCID: 0000-0003-1104-9486

EDUCATION

Doctor of Philosophy

Nanyang Technological University, Singapore
School of Biological Sciences

Aug 2017 – Mar 2022

Bachelor of Science (Honours) in Biological Sciences

Nanyang Technological University, Singapore
CN Yang Scholars Programme
First Class Honours

Aug 2013 – Jun 2017

EMPLOYMENT

Postdoctoral Scientist

Supervisor: Prof. Dr. Michael Berney
Department of Public and Global Health
Epidemiology, Biostatistics, and Prevention Institute
University of Zürich, Switzerland

March 2024 - Present

Postdoctoral Research Fellow

Supervisor: Associate Professor Michael Berney
Department of Microbiology and Immunology
Albert Einstein College of Medicine, United States

Dec 2022 – March 2024

Postdoctoral Guest

Epidemiology, Biostatistics and Prevention Institute
University of Zürich, Switzerland

Oct 2023 – March 2024

Visiting Research Fellow

Host: Sesquicentennial Distinguished Professor Gregory M. Cook
Department of Microbiology
University of Otago, New Zealand

Apr 2023 – Jul 2023

Postdoctoral Research Fellow

Supervisor: Associate Professor Kevin Pethe
Lee Kong Chian School of Medicine
Nanyang Technological University, Singapore

Mar 2022 – Dec 2022

RESEARCH EXPERIENCE

Mapping the metabolome landscape of *M. tuberculosis* using CRISPRi 2022 – current

- Constructed an *Mtb* strain library (624 target genes) of essential gene knockdown using inducible CRISPRi technology
- Developed a high throughput culturing workflow for *Mtb*

Studying the influence of metal ions on the potency of oxidative phosphorylation (OXPHOS) inhibitors 2021 – 2022

- Explored the effect of copper and zinc ions on the *in vitro* efficacies of bedaquiline and Q203 by checkerboard assays and kill kinetic experiments

Evaluating a small molecule from a commercial library as an anti-TB drug 2020 – 2022

- Identified a hit from a small molecule library using ATP depletion as a readout
- Utilised methods such as transcriptomics and genetic engineering to understand its interaction with Q203

Characterising a cytochrome *bd* oxidase inhibitor against *Mycobacterium tuberculosis* 2018 – 2020

Published in EMBO Molecular Medicine (first author) in 2020

- Designed a whole-cell library screen to identify potential inhibitors against the cytochrome *bd* oxidase
- Characterised the mechanism of action of a putative inhibitor by measuring oxygen consumption, quantifying synergy, conducting bactericidal assays, and selecting for resistant mutants
- Developed and optimised oxygen consumption assays using the Seahorse XFe96 platform and MitoXpress® reagent to measure oxygen respiration in mycobacteria
- Validated the cytochrome *bd* oxidase as an attractive target for therapeutic development

Understanding the effect of energy metabolism inhibitors on antibiotic-induced death in mycobacteria 2017 – 2018

Published in the Journal of Biological Chemistry (first author) in 2018

- Established that anti-TB drugs isoniazid and moxifloxacin deregulate bacterial energy metabolism
- Demonstrated that the addition of respiratory inhibitors suppressed the energy-deregulating signatures of isoniazid and moxifloxacin and interfered with their early bactericidal activities

Studying the metabolic breakdown of toxic compounds by anaerobic microbial consortia in wastewater 2013 – 2014

CN Yang Undergraduate Research Attachment

- Isolated anaerobic antibiotic-tolerant bacterial strains capable of antibiotic degradation
- Assisted in the identification of genetic diversity in consortia involved in pentachlorophenol degradation
- Carried out anaerobic bioreactor maintenance through routine COD measurements

TEACHING EXPERIENCE

Research Mentor in Kevin Pethe Lab 2017 – 2021

- Trained undergraduate students as well as new lab members in lab safety and aseptic techniques
- Mentored five undergraduate students and oversaw the progress of their projects over 3 months to 1 year
 - Exploring intracellular ATP depletion as a predictor of bactericidal potency
 - Elucidating the role of the mycobacterial cytochrome *bd* in ROS protection
 - Characterisation of a preliminary hit from LOPAC library screen
 - Characterizing NAD(P) transhydrogenases in mycobacteria by gene knockdown and knockout
 - Construction of *ahpC* genetic knockout in *M. abscessus* to study its role in isoniazid sensitivity

Graduate Mentor in CY1500 Research Methodology 2017 – 2020

- Collaborated with a team of 10 mentors to formulate the course syllabus – wrote and reviewed lecture materials, curated reading materials for students
- Mentored 10-16 freshmen each year in introducing scientific research and research writing
- Facilitated discussions about philosophy of science and relevance of science in current events
- Critiqued and provided constructive feedback on students' writing

Teaching Assistant in BS2002 Microbiology 2017 – 2018

- Facilitated tutorial sessions to discuss the application of concepts to real-world questions
- Reviewed tutorial and assessment questions

AWARDS/SCHOLARSHIPS

Awards

Lee Kuan Yew Gold Medal	2017
Dean's List Award	2016 – 2017
Dean's List Award	2014 – 2015
Dean's List Award	2013 – 2014

Scholarships

Nanyang President's Graduate Scholarship	2017 – 2021
ASEAN Undergraduate Scholarship	2013 – 2017
ASEAN Secondary One Scholarship (High School and Junior College)	2007 – 2012

SKILLS

Technical qualifications: Biosafety Level 3 competency certification, RCULAC certification for mouse work, First Aid and AED certified, certification for Fire Emergency Response in Buildings (company Emergency Response Team)

Laboratory techniques: bacteria culturing, screening assay development and validation, *in vitro* characterisation (growth, ATP, O₂, viability assays), plasma membrane vesicle assays, nucleic acid extractions, transcriptomics, western blot, cell line maintenance, cytotoxicity assay, macrophage infection, molecular cloning (gene knockout, knockdown, transformation)

IT: Proficient in Microsoft Office (Excel, Word, Powerpoint), Geneious, GraphPad Prism; Galaxy platform

Languages: Proficient in English, Mandarin, and Malay