Dianjie Li

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Research interests Quantitative biology, bioenergetics, theoretical immunology, and system medicine

Education

Ph.D. in Condensed Matter Physics (Biophysics), Peking University, Beijing, China   Sep 2018 - Jul 2024

- Supervisor: Prof. Fangting Li

B.Sc. in Physics, Xiamen University, Fujian, China   Sep 2014 - Jun 2018

- Thesis: Double-edged Regulation Mechanism of RIP1 in Cell Death Signaling Pathways
- Supervisors: Prof. Jianwei Shuai and Prof. Chenxu Wu

Xiamen Foreign Language School, Xiamen, Fujian, China   Sep 2011 - Jun 2014

Publication

Journals

(* equally contribution)

[6] Z. Zhou*, **D. Li***, Z. Zhao*, S. Shi*, J. Wu*, J. Li, J. Zhang, K. Gui, Y. Zhang, and Q. Ouyang, Dynamical Modelling of Viral Infection and Cooperative Immune Protection in COVID-19 Patients, PLOS Computational Biology 19, e1011383 (2023).

[5] Y. Sun*, **D. Li***, C. Ni, Y. Ge, H. Qian, Q. Ouyang, and F. Li, ATP Hydrolysis Kinetics and Thermodynamics as Determinants of Calcium Oscillation in Pancreatic β Cells, Phys. Rev. Research 4, 043142 (2022).

[4] L. Xu*, **L. Dianjie***, Y. Xu, Z. Zonghao, Z. Shuang, Z. Jingpeng, H. Wuzhe, W. Fuqing, L. Fangting, and C. Guo-Qiang, Rapid Quantification of Polyhydroxyalkanoates Accumulated in Living Cells Based on Green Fluorescence Protein-Labeled Phasins: The qPHA Method, Biomacromolecules 23, 10, 4153–4166 (2022).

[3] Li, X.*, Zhong, C.-Q.*, Wu, R.*, Xu, X., Yang, Z.-H., Cai, S., Wu, X., Chen, X., Yin, Z., He, Q., **Li, D**., Xu, F., Yan, Y., Qi, H., Xie, C., Shuai, J., Han, J.. RIP1-dependent linear and nonlinear recruitments of caspase-8 and RIP3 respectively to necrosome specify distinct cell death outcomes, Protein Cell 12, 858–876 (2021)

[2] X. Wang*, J.-N. Han*, X. Zhang, Y.-Y. Ma, Y. Lin, H. Wang, **D.-J. Li**, T.-R. Zheng, F.-Q. Wu, and J.-W. Ye, Reversible Thermal Regulation for Bifunctional Dynamic Control of Gene Expression in Escherichia Coli, Nature Communications 12, 1411 (2021).

[1] K. Xiao, **D.-J. Li**, and C.-X. Wu, Theoretical Studies and Molecular Dynamics Simulations on Ion Transport Properties in Nanochannels and Nanopores, Chinese Physics B 27, 024702 (2018).

In Preparation

[3] **Dianjie Li**, et al. Virus-Immune Efficacy phase diagram as a general framework for predicting viral infection outcomes.

[2] **Dianjie Li**, et al. The functions of ATP and hydrolysis free energy in biochemical switches: promoting and restraining.

[1] De Zhao*, Teng Wang*, Jian Zhao*, **Dianjie Li***, et al. Nonequilibrium and nonlinear kinetics as key determinants for bistability in fission yeast G2-M transition.

Patents

[1] Immune efficacy and clinical relative immune efficacy in assessing individual vaccine response, CN115184614A (2023).

Research Experience

Dynamic modelling of SARS-CoV-2 infection, immune response and vaccine protection Jan 2021 - Present

- PhD project, collaborated with Zhengqing Zhou and supervised by Prof. Fangting Li
- Based on immunology, nonlinear dynamics and clinical data analysis, we established a dynamic model of COVID-19 infection and immune response.
- The model can simulate and predict the disease progression of different patients.
- A quantitative index (**immune efficacy ϵ**) for comprehensive **evaluation of immunity** were proposed.
- A method for **predicting vaccine efficacy** were proposed, which may help accelerate vaccine research and assist doctors in carrying out personalized treatment.

Roles of ATP and hydrolysis free energy (ΔG) in cellular signal transduction Sep 2018 - Feb 2022

- PhD project, supervised by Prof. Fangting Li
- A dynamic model of calcium signal transduction in pancreatic β cells was constructed to analyze the nonlinear effect of ATP hydrolysis free energy on insulin release process.
- Relation between network structures and critical roles of ATP/ΔG in yeast cell cycle regulation network.

An efficient and low-cost method to monitor cellular PHA contents Jan 2019 - Jun 2022

- Collaborated with Dr. Xu Liu and supervised by Prof. Guo-Qiang Chen.
- A fast, efficient, and low-cost real-time monitoring method for the content of intracellular polyhydroxyalkanoates (PHA) was proposed, which can help optimize PHA production strategies and reduce production costs.

Double-edged Regulation Mechanism of RIP1 in Cell Death Signaling Pathways Oct 2017 - Jun 2018

- BSc thesis, Supervised by Prof. Jianwei Shuai and Prof. Xiang Li

Talks & Presentations

Aug 2023 **17th annual Q-Bio 2023 Conference**, Shenzhen, China, *Poster: ATP Hydrolysis Kinetics and Thermodynamics as Determinants of Calcium Oscillation in Pancreatic β Cells* **(Best Poster Award)**

Jul 2023 **7th China Conference on Statistical Physics and Complex Systems**, Kunming, China, *Contributed Talk: ATP Hydrolysis Kinetics and Thermodynamics as Determinants of Calcium Oscillation in Pancreatic β Cells*

Nov 2022 **Renji Hospital's "Ji Ji Yi Tang" Academic Forum**, Online, *Invited Talk: Dynamics of SARS-CoV-2 and host immunity in infection and vaccine protection*

Jul 2021 **National Vaccine and Serum Institute's "Exploring Science & Science Exploration" Academic Forum**, Beijing, China, *Invited Talk: Mathematical models of virus infection and immune response: from influenza, AIDS to COVID-19*

Aug 2016 **2016 Cambridge Academic Development Seminar**, Cambridge, UK, *Group Presentation*

Teaching

2019 Teaching Assistant, Introduction to biophysics, Peking University.

Selected Awards and Honors

2023 President's Scholarship (PhD), Peking University

2023 Best Poster Award at the 17th annual Q-Bio 2023 Conference

2023 The Second Prize Scholarship, Center for Quantitative Biology, Peking University

2018 Outstanding Graduates, Xiamen University

2017 Honorable Mention in Mathematical Contest in Modeling

2015 China National Scholarship

Skills

- Programing Languages: Famaliar with Python and Matlab, with a focus on solving Ordinary Differential Equations (ODEs), training deep learning models, and data analysis/visualization.

- Experimental skills: Have some experience in time-lapse fluorescence microscopy obervations using microfluidics.