

# Yunlong Cao

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## EDUCATION

2014–2019	Harvard University	Department of Chemistry and Chemical Biology	Ph.D., Chemistry
	Advisor: Xiaoliang Sunney Xie		
2010–2014	Zhejiang University	Chu Kochen Honors College	B.S., Physics

## ACADEMIC APPOINTMENTS

2023 – Present	Peking University   Assistant Professor
2024 – Present	Peking-Tsinghua Center for Life Sciences   Principal Investigator
2020 – Present	Beijing Changping Laboratory   Principal Investigator
2019 – 2023	Biomedical Pioneering Innovation Center, Peking University   Research Associate

## AWARDS & HONORS

2023	Beijing Outstanding Young Talent Award (ZhongGuanCun Award)
2023	The Coalition for Epidemic Preparedness Innovations (CEPI) Scientific Advisory Committee
2023	WHO Technical Advisory Group on COVID-19 Vaccine Composition
2023	China's top 10 scientific advances in 2022
2023	China's top 10 advances in life sciences in 2022
2022	Nature's "Ten people who helped shape science in 2022" (Nature's 10)
2022	National Excellent Young Scientists Fund of China
2022	MIT Technology Review Innovators Under 35 China (TR35 China)

## Selected Publications

NO.1	2024	Nature	A. Yisimayi <sup>#</sup> , W. Song <sup>#</sup> , J. Wang <sup>#</sup> , F. Jian <sup>#</sup> , Y. Yu <sup>#</sup> , X. Chen <sup>#</sup> , Y. Xu <sup>#</sup> , S. Yang, X. Niu, T. Xiao, J. Wang, L. Zhao, H. Sun, R. An, N. Zhang, Y. Wang, P. Wang, L. Yu, Z. Lv, Q. Gu, F. Shao, R. Jin, Z. Shen, X. S. Xie, Y. Wang & <b>Y. Cao*</b> , <i>Repeated Omicron exposures override ancestral SARS-CoV-2 immune imprinting</i> . <i>Nature</i> 625: 148–156. (2024). Citation: 32. (Highlighted by Visan, I., "Immune imprinting", <i>Nature Immunology</i> )
NO.2	2023	Nature	

**Y. Cao**<sup>#</sup>, F. Jian<sup>#</sup>, J. Wang<sup>#</sup>, Y. Yu<sup>#</sup>, W. Song<sup>#</sup>, A. Yisimayi, J. Wang, R. An, X. Chen, N. Zhang, Y. Wang, P. Wang, L. Zhao, H. Sun, L. Yu, S. Yang, X. Niu, T. Xiao, Q. Gu, F. Shao, X. Xiao, Y. Xu, R. Jin, Z. Shen, Y. Wang\* & X. S. Xie\*, *Imprinted SARS-CoV-2 humoral immunity induces convergent Omicron RBD evolution. Nature* 614: 21-529. (2023). **Citation: 457. (Related commentary: “How your first brush with COVID warps your immunity”, *Nature*)**

**NO.3 2022 Nature**

**Y. Cao**<sup>#</sup>, A. Yisimayi<sup>#</sup>, F. Jian<sup>#</sup>, W. Song<sup>#</sup>, T. Xiao<sup>#</sup>, L. Wang<sup>#</sup>, S. Du<sup>#</sup>, J. Wang<sup>#</sup>, Q. Li<sup>#</sup>, X. Chen<sup>#</sup>, Y. Yu<sup>#</sup>, P. Wang, Z. Zhang, P. Liu, R. An, X. Hao, Y. Wang, J. Wang, R. Feng, H. Sun, L. Zhao, W. Zhang, D. Zhao, J. Zheng, L. Y, C. Li, N. Zhang, R. Wang, X. Niu, S. Yang, X. Song, Y. Chai, Y. Hu, Y. Shi, L. Zheng, Z. Li, Q. Gu, F. Shao, W. Huang, R. Jin, Z. Shen\*, Y. Wang\*, X. Wang\*, J. Xiao\* & X. S. Xie\*, *BA.2.12.1, BA.4 and BA.5 escape antibodies elicited by Omicron infection. Nature* 608: 593-602. (2022). **Citation: 1027. (Related commentary: “Neutralization susceptibility of Omicron lineages”, *Nature Reviews Immunology*)**

**NO.4 2022 Nature**

**Y. Cao**<sup>#</sup>, J. Wang<sup>#</sup>, F. Jian<sup>#</sup>, T. Xiao<sup>#</sup>, W. Song<sup>#</sup>, A. Yisimayi<sup>#</sup>, W. Huang<sup>#</sup>, Q. Li, P. Wang, R. An, J. Wang, Y. Wang, X. Niu, S. Yang, H. Liang, H. Sun, T. Li, Y. Yu, Q. Cui, S. Liu, X. Yang, S. Du, Z. Zhang, X. Hao, F. Shao, R. Jin, X. Wang\*, J. Xiao\*, Y. Wang\* & X. S. Xie\*, *Omicron escapes the majority of existing SARS-CoV-2 neutralizing antibodies. Nature*. 602: 657-663. (2022). **Citation: 1502. (Related commentary: “Omicron, the great escape artist”, *Nature Reviews Immunology*)**

**NO.5 2022 Cell**

Z. Cui<sup>#</sup>, P. Liu<sup>#</sup>, N. Wang<sup>#</sup>, L. Wang<sup>#</sup>, K. Fan<sup>#</sup>, Q. Zhu<sup>#</sup>, K. Wang<sup>#</sup>, R. Chen, R. Feng, Z. Jia, M. Yang, G. Xu, B. Zhu, W. Fu, T. Chu, L. Feng, Y. Wang, X. Pei, P. Yang, X. S. Xie, L. Cao\*, **Y. Cao**\*, X. Wang\*, *Structural and functional characterizations of infectivity and immune evasion of SARS-CoV-2 Omicron. Cell*. 185(5): 860-871. (2022). **Citation: 322**

**NO.6 2020 Cell**

**Y. Cao**<sup>#</sup>, B. Su<sup>#</sup>, X. Guo<sup>#</sup>, W. Sun<sup>#</sup>, Y. Deng<sup>#</sup>, L. Bao<sup>#</sup>, Q. Zhu, X. Zhang, Y. Zheng, C. Geng, X. Chai, R. He, X. Li, Q. Lv, H. Zhu, W. Deng, Y. Xu, Y. Wang, L. Qiao, Y. Tan, L. Song, G. Wang, X. Du, N. Gao, J. Liu, J. Xiao, X. Su, Z. Du, Y. Feng, C. Qin\*, C. Qin\*, R. Jin\*, X. S. Xie\*, *Potent Neutralizing Antibodies against SARS-CoV-2 Identified by High-Throughput Single-Cell Sequencing of Convalescent Patients' B Cells. Cell*. 182, 73-84.e16 (2020). **Citation: 1175 (Top 10 most cited articles from Cell in 2020; Related commentary: “Need for Speed: From Human SARS-CoV-2 Samples to Protective and Efficacious Antibodies in Weeks”, *Cell*)**

## Other Publications

**NO.1 2024 Emerging Microbes & Infections**

S. Yang<sup>#</sup>, Y. Yu<sup>#</sup>, F. Jian, A. Yisimayi, W. Song, J. Liu, P. Wang, Y. Xu, J. Wang, X. Niu, L. Yu, Y. Wang, F. Shao, R. Jin, Y. Wang, **Y. Cao**\*, *Antigenicity assessment of SARS-CoV-2 saltation variant BA.2.87.1. Emerging Microbes & Infections* (2024). <https://doi.org/10.1080/22221751.2024.2343909>

**NO.2 2024 The Lancet Infectious Diseases**

S. Yang<sup>#</sup>, Y. Yu<sup>#</sup>, Y. Xu, F. Jian, W. Song, A. Yisimayi, P. Wang, J. Wang, J. Liu, L. Yu, X. Niu, J. Wang, Y. Wang, F. Shao, R. Jin, Y. Wang, **Y. Cao**\*, *Fast evolution of SARS-CoV-2 BA.2.86 to JN.1 under heavy immune pressure. The Lancet Infectious Diseases* 24(2):e70-e72 (2024).

**NO.3 2023 PLoS Pathogens**

F. Jian<sup>#</sup>, L. Feng<sup>#</sup>, S. Yang<sup>#</sup>, Y. Yu<sup>#</sup>, L. Wang, W. Song, A. Yisimayi, X. Chen, Y. Xu, P. Wang, L. Yu, J. Wang, L. Liu, X. Niu, J. Wang, T. Xiao, R. An, Y. Wang, Q. Gu, F. Shao, R. Jin, Z. Shen, Y. Wang, X. Wang\*, **Y. Cao**\*, *Convergent evolution of SARS-CoV-2 XBB lineages on receptor-binding domain 455–456 synergistically enhances antibody evasion and ACE2 binding. PLoS Pathogens* 19(12):e1011868 (2023).

**NO.4 2023 Proceedings of the National Academy of Sciences**

**Y. Cao**<sup>#</sup>, Y. Bai<sup>#</sup>, T. Yuan<sup>#</sup>, L. Song, Y. Fan, L. Ren, W. Song, J. Peng, R. An, Q. Gu, Y. Zheng, X. S. Xie\*,

Single-cell bisulfite-free 5mC and 5hmC sequencing with high sensitivity and scalability. *Proceedings of the National Academy of Sciences* 120(49): e2310367120 (2023).

**NO.5 2023 The Lancet Infectious Diseases**

S. Yang<sup>#</sup>, Y. Yu<sup>#</sup>, F. Jian, W. Song, A. Yisimayi, X. Chen, Y. Xu, P. Wang, J. Wang, L. Yu, X. Niu, J. Wang, T. Xiao, R. An, Y. Wang, Q. Gu, F. Shao, R. Jin, Z. Shen, Y. Wang, **Y. Cao\***, *Antigenicity and infectivity characterization of SARS-CoV-2 BA.2.86. The Lancet Infectious Diseases* 23(11):e457-e459 (2023).

**NO.6 2023 Nature Ecology & Evolution**

W. Ma, H. Fu, F. Jian, **Y. Cao\***, M. Li\*, *Immune evasion and ACE2 binding affinity contribute to SARS-CoV-2 evolution. Nature Ecology & Evolution* 7: 1457-1466 (2023).

**NO.7 2023 The Lancet Regional Health**

X. Chen, Y. Xu, Y. Xie, W. Song, Y. Hu, A. Yisimayi, S. Yang, F. Shao, L. Geng, Y. Wang, H. Gao, Y. Shi, S. Zhang, R. Jin, Z. Shen\*, **Y. Cao\***, *Protective effect of plasma neutralization from prior SARS-CoV-2 Omicron infection against BA.5 subvariant symptomatic reinfection. The Lancet Regional Health* 33:100758 (2023).

**NO.8 2023 The Lancet Infectious Diseases**

C. Yue, W. Song, L. Wang, F. Jian, X. Chen, F. Gao, Z. Shen, Y. Wang, X. Wang\*, **Y. Cao\***, *ACE2 binding and antibody evasion in enhanced transmissibility of XBB.1.5. The Lancet Infectious Diseases* 23(3):278-280 (2023).

**NO.9 2022 Cell Reports**

**Y. Cao\***<sup>#</sup>, F. Jian<sup>#</sup>, Z. Zhang<sup>#</sup>, A. Yisimayi<sup>#</sup>, X. Hao<sup>#</sup>, L. Bao<sup>#</sup>, F. Yuan, Y. Yu, S. Du, J. Wang, T. Xiao, W. Song, Y. Zhang, P. Liu, R. An, P. Wang, Y. Wang, S. Yang, X. Niu, Y. Zhang, Q. Gu, F. Shao, Y. Hu, W. Yin, A. Zheng, Y. Wang, C. Qin\*, R. Jin\*, X. Xiao\* & X. S. Xie\*, *Rational identification of potent and broad sarbecovirus-neutralizing antibody cocktails from SARS convalescents. Cell Reports* 41(12): 111845 (2022).

**NO.10 2022 Cell Host & Microbe**

**Y. Cao\***<sup>#</sup>, W. Song<sup>#</sup>, L. Wang<sup>#</sup>, P. Liu<sup>#</sup>, C. Yue<sup>#</sup>, F. Jian<sup>#</sup>, Y. Yu, A. Yisimayi, P. Wang, Y. Wang, Q. Zhu, J. Deng, W. Fu, L. Yu, N. Zhang, J. Wang, T. Xiao, R. An, J. Wang, L. Liu, S. Yang, X. Niu, Q. Gu, F. Shao, X. Xiao, B. Meng, R. K. Gupta, R. Jin, Y. Wang, X. S. Xie\* & X. Wang\*, *Characterization of the enhanced infectivity and antibody evasion of Omicron BA.2.75. Cell Host & Microbe* 30(11): 1527-1539. (2022).

**NO.11 2022 The Lancet Infectious Diseases**

F. Jian<sup>#</sup>, Y. Yu<sup>#</sup>, W. Song, A. Yisimayi, L. Yu, Y. Gao, N. Zhang, Y. Wang, F. Shao, X. Xiao, Y. Xu, R. Jin, Y. Wang, X. S. Xie\* & **Y. Cao\***, *Further humoral immunity evasion of emerging SARS-CoV-2 BA.4 and BA.5 subvariants. The Lancet Infectious Diseases* 22(11): 1535-1537. (2022).

**NO.12 2022 Cell Research**

H. Zheng<sup>#</sup>, **Y. Cao\***<sup>#</sup>, X. Chen<sup>#</sup>, F. Wang, Y. Hu, W. Song, Y. Chai, Q. Gu, Y. Shi, Y. Feng, S. Liu, Y. Xie, X. S. Xie, W. Jiang, Z. Shen\*, *Disease profile and plasma neutralizing activity of post-vaccination Omicron BA.1 infection in Tianjin, China: a retrospective study. Cell Research* 32: 781-784. (2022).

**NO.13 2022 Cell**

L. Qu<sup>#</sup>, Z. Yi<sup>#</sup>, Y. Shen<sup>#</sup>, L. Lin, F. Chen, Y. Xu, Z. Wu, H. Tang, X. Zhang, F. Tian, C. Wang, X. Xiao, X. Dong, L. Guo, S. Lu, C. Yang, C. Tang, Y. Yang, W. Yu, J. Wang, Y. Zhou, Q. Huang, A. Yisimayi, S. Liu, W. Huang, **Y. Cao**, Y. Wang, Z. Zhou, X. Peng, J. Wang, X. S. Xie, W. Wei\*, *Circular RNA vaccines against SARS-CoV-2 and emerging variants. Cell* 185(10): 1728-1744. (2022).

**NO.14 2022 Clinical Infectious Diseases**

K. K. To, X. Li, D. C. Lung, J. D. Ip, W. Chan, A. W. Chu, C. C. Yip, J. H. Chen, R. W. Poon, H. Tsoi, R. W. Lai, W. To, L. Ren, M. Li, **Y. Cao**, X. S. Xie, D. Jin, K. Yuen\*, *False Coronavirus Disease 2019 Cases due to Contamination by Inactivated Virus Vaccine. Clinical Infectious Diseases* 74: 1485-1488. (2022).

**NO.15 2022 Cell Research**

**Y. Cao\***<sup>#</sup>, X. Hao<sup>#</sup>, X. Wang<sup>#</sup>, Q. Wu<sup>#</sup>, R. Song, D. Zhao, W. Song, Y. Wang, A. Yisimayi, W. Wang, W. Zhang, J. Du, H. Yu\*, X. S. Xie\*, R. Jin\*, *Humoral immunogenicity and reactogenicity of CoronaVac or ZF2001 booster after two doses of inactivated vaccine. Cell Research* 32: 107-109. (2022).

**NO.16 2021 Cell Research**

S. Du<sup>#</sup>, P. Liu<sup>#</sup>, Z. Zhang<sup>#</sup>, T. Xiao, A. Yisimayi, W. Huang, Y. Wang, **Y. Cao\***, X. S. Xie\*, J. Xiao\*, *Structures of*

SARS-CoV-2 B.1.351 neutralizing antibodies provide insights into cocktail design against concerning variants. *Cell Research* 31: 1130-1133. (2021).

**NO.17 2021 Cell Research**

**Y. Cao**<sup>\*,#</sup>, A. Yisimayi<sup>#</sup>, Y. Bai<sup>#</sup>, W. Huang<sup>#</sup>, X. Li<sup>#</sup>, S. Du<sup>#</sup>, T. Yuan<sup>#</sup>, R. An, J. Wang, T. Xiao, W. Ma, L. Song, Y. Li, X. Li, W. Song, J. Wu, S. Liu, X. Li, Y. Zhang, B. Su, X. Guo, Z. Zhang, Y. Wei, C. Gao, Y. Dou, X. Xu, N. Zhang, Y. Zhang, R. Shi, R. Jin, Y. Ma, B. Lu, Y. Feng<sup>\*</sup>, C. Qin<sup>\*</sup>, Y. Wang<sup>\*</sup>, J. Xiao<sup>\*</sup>, X. S. Xie<sup>\*</sup>, *Humoral immune response to circulating SARS-CoV-2 variants by inactivated and RBD-subunit vaccines. Cell Research* 31: 732–741. (2021).

**NO.18 2020 Cell**

S. Du<sup>#</sup>, **Y. Cao**<sup>\*,#</sup>, Q. Zhu<sup>#</sup>, P. Yu<sup>#</sup>, F. Qi<sup>#</sup>, G. Wang, X. Du, L. Bao, W. Deng, H. Zhu, J. Liu, J. Nie, Y. Zheng, H. Liang, R. Liu, S. Gong, H. Xu, A. Yisimayi, Q. Lv, B. Wang, R. He, Y. Han, W. Zhao, Y. Bai, Y. Qu, X. Gao, C. Ji, Q. Wang, N. Gao, W. Huang, Y. Wang, X. S. Xie<sup>\*</sup>, X. Su<sup>\*</sup>, J. Xiao<sup>\*</sup>, C. Qin<sup>\*</sup>, *Structurally Resolved SARS-CoV-2 Antibody Shows High Efficacy in Severely Infected Hamsters and Provides a Potent Cocktail Pairing Strategy. Cell*. 183, 1013-1023.e13 (2020).

**NO.19 2020 Molecular Cell**

C. Chen, J. Li, L. Di, Q. Jing, P. Du, C. Song, J. Li, Q. Li, **Y. Cao**, X. S. Xie, A. R. Wu<sup>\*</sup>, H. Zeng<sup>\*</sup>, Y. Huang<sup>\*</sup>, J. Wang<sup>\*</sup>, *MINERVA: A Facile Strategy for SARS-CoV-2 Whole-Genome Deep Sequencing of Clinical Samples. Molecular Cell* 80: 1123-1134.e4 (2020).

**NO.20 2013 Optics Express**

Hazen P. Babcock<sup>#</sup>, Jeffrey R. Moffitt<sup>#</sup>, **Yunlong Cao**, Xiaowei Zhuang<sup>\*</sup>, *Fast compressed sensing analysis for super-resolution imaging using L1-homotopy. Optics Express* 21: 28583-28596 (2013).

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## INVITED PRESENTATIONS

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- 15th HOPE Meeting with Nobel Laureates (2024)
- CAMS Oxford Institute (COI) seminar series at University of Oxford (2024)
- 5th CSI/JSI/KAI Joint Symposium on Immunology (2024)
- Emerging Microbes & Infections (EMI) Symposium 2023
- 70 years of DNA Double Helix: Celebration of Breakthroughs in Life Science on the Occasion of Changping Laboratory's 3rd Anniversary (2023)
- The 5th International Forum on Single Cell Omics (2023)
- The Variants and Vaccines Working Group of the Massachusetts Consortium on Pathogen Readiness (MassCPR) monthly seminar (2023)
- VRD Seminar Series for Pfizer (2023)
- The 2nd International Frontier Research and Innovation Forum on Coronavirus (RIFC 2023)
- HKMA CME Hybrid Symposium on COVID-19 (2023)
- The 20th Chinese Biophysics Congress (2023)
- Immunology Forum for Moderna (2023)
- Program in Cellular and Molecular Medicine (PCMM) 2023 Seminar Series (2023)
- The 4th International Forum on Single Cell Omics (2022)

● **WHO Technical Advisory Group on SARS-CoV-2 Virus Evolution (TAG-VE) (2022)**

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**PATENTS**

- **An antibody against SARS-CoV-2 variants and its applications.** **ZL2021109075520**
- **Library preparation for cfDNA methylation sequencing and application.** **ZL202210365172.3**
- **A monoclonal antibody against SARS-CoV-2 and its applications.** **ZL202010177710.7**
- **Methods of Amplifying DNA to Maintain Methylation Status.** **WO/US2020/0063213**