

Yining ZHU

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EDUCATION

Johns Hopkins University 07/2021 – 09/2025

- Ph.D. in Biomedical Engineering

Duke University 08/2024 – 09/2024

- Visiting Research Scholar in Biomedical Engineering

Johns Hopkins University 08/2019 – 05/2021

- M.S.E. in Biomedical Engineering

Sichuan University 09/2015 – 06/2019

- B.S. in Pharmacy

PUBLICATIONS

† Denotes equal contribution * Denotes corresponding author

(30 peer-reviewed journal publications in total; [Google Scholar](#))

First author publications:

- **Y Zhu**†, ZC Y†, S L†, *et al.*, HQ Mao*. An mRNA lipid nanoparticle-incorporated nanofiber-hydrogel composite for cancer immunotherapy. *Nature Communications*, 2025.
- X Lu†, **Y Zhu**†, *et al.*, HQ Mao*. Optimized lipid nanoparticles for efficient T cell targeting intracellular delivery of genome editing proteins. *Science Advances*, 2025.
- C Wei†, **Y Zhu**†*, *et al.*, SC Murphy*, HQ Mao*. Systemic trafficking of mRNA lipid nanoparticle vaccine following intramuscular injection generates potent tissue-specific T cell response. *BioRxiv*, 2025. (*Nature Biomedical Engineering*, in revision)
- X Liu†, **Y Zhu**†, *et al.*, HQ Mao*. Post-assembly Stabilization of Lipid Nanoparticles Enhances the Delivery Efficiency and Efficacy of mRNA Vaccines. *BioRxiv*, 2025. (*Nature Chemical Engineering*, in revision)
- **Y Zhu**†, S Cai†, *et al.*, KW Leong*, HQ Mao*. Optimization of lipid nanoparticles for gene editing of the liver via intraduodenal delivery. *Biomaterials*, 2024.
- J Ma†, **Y Zhu**†, *et al.*, SX Sun*, HQ Mao*. Tuning extracellular fluid viscosity for enhanced transfection efficiency in genetic cell engineering. *Nature Chemical Engineering*, 2024.
- **Y Zhu**, *et al.*, SC Murphy*, HQ Mao*. Screening for lipid nanoparticles that modulate the immune activity of helper T cells towards enhanced antitumour activity. *Nature Biomedical Engineering*, 2023.
- **Y Zhu**, *et al.*, SC Murphy*, HQ Mao*. Multi-step screening of DNA/lipid nanoparticles and co-delivery with siRNA to enhance and prolong gene expression. *Nature Communications*, 2022.
- Y Hu†, **Y Zhu**†, *et al.*, HQ Mao*. Size-controlled and shelf-stable DNA particles for production of lentiviral vectors. *Nano Letters*, 2021.
- **Y Zhu**, *et al.*, X Sun*. Albumin-biomaterialized nanoparticles to synergize phototherapy and immunotherapy against melanoma. *Journal of Controlled Release*, 2020.
- J Lin†, **Y Zhu**†, *et al.*, HQ Mao*. Imidazolium Lipid-based Nanoparticles Enable Effective mRNA Delivery and Cellular Immune Response. (*Materials Today*, in revision)

Selective collaborative publications:

- B Torkzaban, **Y Zhu**, *et al.*, J Collier*. Use of poly adenosine tail mimetics to enhance mRNA expression from genes associated with haploinsufficiency disorders. *Molecular Therapy Nucleic Acids*, 2025.
- L Cheng, **Y Zhu**, *et al.*, HQ Mao*. Machine learning elucidates design features of plasmid deoxyribonucleic acid lipid nanoparticles for cell type-preferential transfection. *ACS nano*, 2024.
- W Chen, **Y Zhu**, *et al.*, J He*. Potentiating the systemic immunity by bacteria-delivered STING activation in a tumor microenvironment. *Advanced Functional Materials*, 2023.

- Z Guo, **Y Zhu**, *et al.*, X Sun*. Rapid development of a subunit nano-vaccine against drug-resistant *Pseudomonas aeruginosa* with effective cross-protection. *Nano Today*, 2022.
- J Xue, **Y Zhu**, *et al.*, X Sun*. Nanoparticles with rough surface improve the therapeutic effect of photothermal immunotherapy against melanoma. *Acta Pharmaceutica Sinica B*, 2022.
- A Greco, L Cheng, KD Goodier, **Y Zhu**, *et al.*, HQ Mao*. Adipocyte-selective mRNA lipid nanoparticles for cell programming with machine learning analysis. *Journal of Controlled Release*, 2025.
- ZC Yao, YH Yang, J Kong, **Y Zhu**, *et al.*, HQ Mao*. Biostimulatory micro-fragmented nanofiber-hydrogel composite improves mesenchymal stem cell delivery and soft tissue remodeling. *Small*, 2022.
- S Bai, H Jiang, Y Song, **Y Zhu**, *et al.*, X Sun*. Aluminum nanoparticles deliver a dual-epitope peptide for enhanced anti-tumor immunotherapy. *Journal of Controlled Release*, 2022.
- W Chen, Z Guo, **Y Zhu**, *et al.*, X Sun*. Combination of bacterial-photothermal therapy with an anti-PD-1 peptide depot for enhanced immunity against advanced cancer. *Advanced Functional Materials*, 2020.
- X Ke, L Shelton, Y Hu, **Y Zhu**, *et al.*, HQ Mao*. Surface-functionalized PEGylated nanoparticles deliver messenger RNA to pulmonary immune cells. *ACS Applied Materials & Interfaces*, 2020.
- Y Hu, B Eder, J Lin, S Li, **Y Zhu**, *et al.*, HQ Mao*. Liter-scale manufacturing of shelf-stable plasmid DNA/PEI transfection particles for viral vector production. *Molecular Therapy Methods & Clinical Development*, 2024.
- C Li, X Chen, X Luo, H Wang, **Y Zhu**, *et al.*, X Sun. Nanoemulsions target to ectopic lymphoids in inflamed joints to restore immune tolerance in rheumatoid arthritis. *Nano Letters*, 2020.
- Z Guo, F Wu, C Guo, R Hu, Y Ou, **Y Zhu**, S Luo, Y Song, P He, C He, Y Xu, *et al.*, X Sun*. Metalloparticle-Engineered Pickering Emulsion Displaying AAV-Vectored Vaccine for Enhancing Antigen Expression and Immunogenicity Against Pathogens. *Advanced Materials*, 2025.

Reviews:

- W Chen, **Y Zhu**, *et al.*, X Sun*. Path towards mRNA delivery for cancer immunotherapy from bench to bedside. *Theranostics*, 2024.
- W Chen, **Y Zhu**, *et al.*, X Sun*. Advances in Salmonella Typhimurium-based drug delivery system for cancer therapy. *Advanced Drug Delivery Reviews*, 2022.
- S Huang, **Y Zhu**, *et al.*, Z Zhang*. Recent advances in delivery systems for genetic and other novel vaccines. *Advanced Materials*, 2022.

PATENTS

- **Y Zhu**, C Wei, H Mao. Lipid nanoparticles with integrated glycolipid adjuvant to promote tissue-specific cellular immunity. US Provisional Patent Application; Filed 2/18/2025.
- **Y Zhu**, C Wei, D Yu, H Mao. Lipid nanoparticle formulations capable of migrating to systemic organs following intramuscular administration. US Provisional Patent Application; Filed 1/28/2025.
- **Y Zhu**, X Lu, H Mao. Composition screening of lipid nanoparticle for intracellular delivery of gene-editing proteins. PCT/US2025/023531; Filed 4/7/2025.
- **Y Zhu**, C Wei, J Ma, H Mao, *et al.* A mRNA lipid nanoparticle incorporated nanofiber-hydrogel composite to generate a local immunostimulatory niche for immunotherapy. PCT/US2025/023530; Filed 4/7/2025.
- **Y Zhu**, J Ma, H Mao, *et al.* Composition of media with defined fluid viscosity for enhancing intracellular delivery of nanoparticles and viral vectors, and methods of use. PCT/US2024/039036; Filed 7/22/2024.
- **Y Zhu**, H Mao, *et al.* Compositions of Lipid Nanoparticles for Plasmid DNA Delivery to the Liver and Methods for Preparing the Same. PCT/US2023/016938; Filed 3/30/2023.
- **Y Zhu**, Y Hu, H Mao. Methods for preparation of plasmid DNA/lipid particles with defined size for in vitro and in vivo transfection. PCT/US2023, 18/546,221; Filed 8/11/2023.
- **Y Zhu**, Y Hu, H Mao. Composition of shelf-stable plasmid DNA/PEI particles with defined sizes for virus production and method for preparation of the same. PCT/US2023, 18/546,222, Filed 8/11/2023.
- **Y Zhu**, Y Hu, H Mao. Methods for preparation of shelf-stable plasmid DNA/polycation particles with defined sizes for cell transfection. PCT/US2022, 18/261,944; Filed 7/18/2023.

CONFERENCE PRESENTATIONS

- **Zhu Y, Ma J, et al., Mao HQ.** Enhancing Cell Transfection Efficiency via Modulation of Extracellular Fluid Viscosity. *Society of Biomaterials Annual Meeting and Exposition*. 2025. **Oral Presentation.**
- **Zhu Y, Yao Z-C, Li S, et al., Mao HQ.** mRNA lipid nanoparticle-incorporated nanofiber-hydrogel composite generates a local immunostimulatory niche for cancer immunotherapy. *Society of Biomaterials Annual Meeting and Exposition*. 2025. **Oral Presentation & Student Travel Achievement Recognition (STAR) award.**
- **Zhu Y, Yao Z-C, Li S, et al., Mao HQ.** Engineering A Biomaterials-based Lymphoid Niche for mRNA Lipid Nanoparticle Cancer Vaccines. *Biomedical Engineering Society Annual Meeting*. 2024. **Oral Presentation.**
- **Zhu Y, Yao Z-C, Li S, et al., Mao HQ.** A mRNA lipid nanoparticle incorporated nanofiber-hydrogel composite generates a local immunostimulatory niche for cancer immunotherapy. *American Society of Gene & Cell Therapy Annual Meeting*. 2024. **Oral Presentation & Meritorious Abstract Travel Award.**
- **Zhu Y, Ma J, Shen R, Vuong I, Mao HQ.** Lipid Nanoparticle Composition Shapes Immune Response to mRNA Vaccine and Potency of Anticancer Immunity. *Society of Biomaterials Annual Meeting and Exposition*. 2023. **Oral Presentation & Student Travel Achievement Recognition (STAR) award.**
- **Zhu Y, Ma J, Shen R, Vuong I, Mao HQ.** Compositional Optimization of mRNA Lipid Nanoparticles to Modulate Th1/Th2 Immune Activation Profile and Potentiate Anticancer Immunity. *American Society of Gene & Cell Therapy Annual Meeting*. 2023. **Poster Presentation.**
- **Zhu Y, Shen R, Vuong I, Hu Y, Mao HQ.** Multi-step Screening and Composition Optimization of Lipid Nanoparticles for Liver-targeted Plasmid DNA Delivery. *Society of Biomaterials Annual Meeting and Exposition*. 2022. **Oral Presentation.**

AWARDS & HONORS

- **Siebel Scholar, Siebel foundation, US** 2025/09
- **Student Travel Achievement Recognition (STAR) award, Society for Biomaterials, US** 2025/04
- **Meritorious Abstract Travel Award, American Society of Gene & Cell Therapy, US** 2024/05
- **The Hans J. Prochaska Research Award, Johns Hopkins University, US** 2024/04
- **Student Travel Achievement Recognition (STAR) award, Society for Biomaterials, US** 2023/04
- **Outstanding Graduates Award in Sichuan Province (1/153), Sichuan Province, China** 2019/05
- **National Scholarship (1/153), Ministry of Education of China** 2016/10; 2017/10; 2018/10
- **Top 100 Students Award (among 57,000 students at SCU), Sichuan University, China** 2017/10
- **Outstanding Chairman of the Student Union (Top 10), Sichuan University, China** 2017/10
- **‘Tang Lixin’ Scholarship, Sichuan University, China (60 among 57,000 students at SCU)** 2018/10

PROFESSIONAL MEMBERSHIPS

- **Society for Biomaterials** 2021 – Present
- **American Society of Gene & Cell Therapy** 2021 – Present
- **Biomedical Engineering Society** 2024 – Present

RESEARCH EXPERIENCE

- **Engineered Lipid Nanoparticles and Microgel Matrix to Program Th1/Th2 Immune Response** 09/2022 – Present
Graduate research assistant *Mentor: Dr. Hai-Quan Mao, JHU*
 - Developed mRNA lipid nanoparticle (LNP) formulations capable of eliciting dual or biased Type 1 T helper (Th1) and/or Type 2 T helper (Th2) immune responses.
 - Engineered mRNA LNP-loaded microgels as an immunostimulatory niche in vivo to recruit and transfect host immune cells and potentiate antigen-specific immune responses.
 - Demonstrated efficacy and safety of these new LNP-based vaccine platforms in murine cancer models.
 - Discovered immune activation mechanism for these new LNP-based vaccine platforms.
- **Development of a liver-targeting, plasmid DNA-loaded lipid nanoparticles as a malaria vaccine** 10/2021 – Present
Graduate research assistant *Mentor: Dr. Hai-Quan Mao, JHU*

- Developed a high-throughput screening system to optimize the formulation of lipid nanoparticles for improving delivery efficiency of DNA-loaded nanoparticles to hepatocytes.
 - Evaluated capability of DNA-loaded nanoparticles with varied compositions to maintain stability within the gastrointestinal tract, penetrate the mucus layer and target the liver for pDNA expression.
 - Investigated *in vivo* antigen expression after oral administration of DNA LNPs.
 - Developing a therapeutic nucleic acid vaccine against malaria.
- **Shelf-stable DNA/PEI complex particles with controlled size for reproducible and scalable production of lentiviral vectors** 09/2019 – 09/2021
Graduate research assistant *Mentor: Dr. Hai-Quan Mao, JHU*
 - Illustrated that the size and kinetic stability of pDNA/PEI complex particles are critical factors determining the transfection efficiency in production of viral vectors for gene therapy.
 - Developed a novel methodology to obtain stable pDNA/PEI complex particles with controlled size and kinetic stability using the flash nanocomplexation (FNC) technique.
 - Discovered the size-dependent intracellular delivery mechanisms of cellular uptake and endosomal escape for the size-controlled pDNA/PEI complex particles.
 - Generated pDNA/PEI complex particles with different sizes at high concentrations that are suitable for applications in bioreactors at production scale.

TEACHING EXPERIENCE

- **EN.580.109.12 | Introduction to Nanomedicine** 01/2023, 01/2024
JHU Intersession Course Instructor
 Introduced and offered a comprehensive view of nanomedicine, including the physical and chemical basis of biomaterials in the nano-size range, bio-interactions governing efficacy and side effects, conventional and advanced design strategies to overcome biological barriers, and examples in diverse applications.
- **EN.580.453 | Immunoengineering: Principles and Applications** 09/2024 – 12/2024
JHU Teaching Assistant
 Offered insightful explanations and practical demonstrations in class, fostering a collaborative learning environment that supported students in mastering the fundamental principles of immunoengineering.
- **EN.580.642 | Tissue Engineering** 09/2022 – 12/2022
JHU Teaching Assistant
 Provided insightful explanations and practical demonstrations in classes. Helped create a collaborative learning environment to assist students in learning the fundamental principles in tissue engineering.

LEADERSHIP & PROFESSIONAL SERVICES

- **Lab Manager**, Mao Laboratory, Johns Hopkins University 2021/09 – Present
 - Managing laboratory operations, study planning, and organization of supplies, resource optimization.
- **Peer Health Navigators**, Johns Hopkins University 2023/09 – 2024/09
 - PHNs are trained in supportive listening and equipped with knowledge about the health and wellness resources available at University Health Services and within the community.
 - Providing support for accessing timely and culturally appropriate health care and offer supportive listening and health coaching for students seeking mental health assistance.
- **Intern Pharmacist**, West China Hospital, Sichuan University 2018/07 – 2018/08
 - Covered drug supply and dispensing, production and quality control of hospital pharmaceutical preparations, and clinical pharmacy practice.
- **President, Student Union of West China School of Pharmacy**, Sichuan University 2015/05 – 2018/05
 - Led one of the largest student associations in the school with over 130 members; managed operation, regulations, and planning/organization of over 60 student activities.
 - Recognized as a top 10 among 36 of student unions in West China School of Pharmacy in 2017.
- **Journal Reviewer**
 - Serve as reviewers for *Biomaterials*, *Journal of Controlled Release*, *Cancer Nanotechnology*, *Pharmaceutical Research*, *Bioengineering & Translational Medicine*, *Journal of Drug Delivery Science and Technology*, *Journal of Liposome Research*, *Scientific Reports*, *Discover Chemistry*, *Journal of Nanobiotechnology*.