

WUJI (TONY) CAO

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EDUCATION

Nov 2020 – Present ETH Zurich, Zurich, Switzerland
Ph. D. Candidate

Aug 2017 – Jun 2018 University of California, Berkeley, California, United States
M.S. Bioengineering, Translational Medicine

GPA: 3.8

Capstone Project: Directed Evolution of AAV Vector for Cystic Fibrosis Gene Therapy

Sep 2012 – Jun 2017 University of Waterloo, Waterloo, Ontario, Canada
B.A.Sc. Nanotechnology Engineering with Option in Life Science

GPA: 3.7, Graduated with Distinction

Capstone Project: Biodegradable filter for removal of caffeine from beverages

RESEARCH EXPERIENCE

Nov 2020 – Present ETH Zurich, Zurich, Switzerland
Graduate Research Assistant

- Developing vascularized and perfusable 3D *in vitro* tissue models for disease modelling

Oct 2018 – Sep 2020 Wyss Institute at Harvard University, Boston, MA, United States
Research Assistant IV

- Adapted human small intestine-on-chip and organoid models to study the molecular disease mechanisms of environmental enteropathy, and evaluated the efficacy of potential therapeutics
- Engrafted stool microbiota from preterm infants on intestine-on-chip to study the effect of gut microbiome on infant gut vulnerability and the development of necrotizing enterocolitis
- Developed preclinical SARS-CoV-2 infection model on human lung- and intestine-on-chips and tested the effectiveness of FDA-approved drugs against viral infection
- Performed various biological and imaging analyses: ELISA, IHC, ICC, qPCR, SEM, flow cytometry, cryopreservation and sectioning, electrophysiological measurements
- Isolated and maintained primary small intestinal organoid cultures

Sep 2017 – Jun 2018 4D Molecular Therapeutics, Emeryville, CA, United States
Human Cell and Disease Modelling Intern

- Conducted market research, IP analysis, FDA regulatory strategy, reimbursement planning, and international business development for 4DMT's cystic fibrosis gene therapy product
- Evaluated AAV vector transduction in various human primary airway cell cultures, validated cystic fibrosis *in vitro* models by characterizing cell markers using IHC, ICC, and flow cytometry
- Developed a fluorescent assay to measure intracellular chloride concentration and flux in various primary cell cultures

Jan 2016 – Aug 2016 Brigham and Women's Hospital, Harvard Medical School, Boston, MA, United States
Research Trainee

- Formulated a novel lipid-polymer hybrid nanoparticle (NP) platform for mRNA delivery and a mRNA-based cancer vaccine; characterized NPs using DLS, NTA, HPLC and TEM
- Designed and executed *in vitro* efficacy and cytotoxicity experiments on various cell lines
- Prepared cancer xenograft mouse models, performed PK/BioD studies, isolated various immune cells from mice and examined their activity using flow cytometry; performed toxicity studies using ELISA
- Demonstrated strong leadership and mentorship skills in training high school volunteers

Sep 2014 – May 2015 Institute of Functional Nano & Soft Materials, Soochow University, Suzhou, P. R. China
Visiting Student

- Independently designed and executed experiments synthesizing nickel-coated silicon nanowires as photocatalysts for photoelectrochemical water splitting
- Characterized various semiconductor nanomaterials using SEM, XRD, XPS, EDX, CV and EIS

Jan 2014 – Apr 2014 Waterloo Institute for Nanotechnology, University of Waterloo, Waterloo, ON, Canada
Research Assistant

- Synthesized PAMAM dendrimer-grafted cellulose nanocrystals (PAMAM-CNC) as a novel pH-responsive supramolecular complex with superior stability
- Fabricated Au-loaded PAMAM-CNCs as a sustainable catalyst with superior performance toward the reduction of 4-nitrophenol to 4-aminophenol

May 2013 – Aug 2013 Department of Chemical Engineering, University of Waterloo, Waterloo, ON, Canada
Research Assistant

- Formulated various thermoplastic starch composites for packaging and automobile applications
- Performed thermal analysis and mechanical testing of thermoplastic polymers using TGA, DSC, tensile and impact tests

VOLUNTEER EXPERIENCE

Apr 2010 – Apr 2014 FIRST Robotics Competition, FIRST Canada
Field Attendant

Oct 2010 – Jul 2013 Swim to Survive Program, Canadian Lifesaving Society
Swim Instructor

Sep 2010 – Mar 2011 The Food Bank of Waterloo Region

PUBLICATIONS

*bold indicates co-first author

- Bein, A., Fadel, C.W., Swenor, B., Cao, W., Powers, R.K., Camacho, D.M., Naziripour, A., Parsons, A., LoGrande, N., Sharma, S. and Kim, S., 2022. Nutritional deficiency in an intestine-on-a-chip recapitulates injury hallmarks associated with environmental enteric dysfunction. *Nature Biomedical Engineering*, pp.1-12.
- Si, L., Bai, H., Oh, C.Y., Zhang, T., Hong, F., Jiang, A., Ye, Y., Jordan, T.X., Logue, J., McGrath, M. and Belgur, C., 2021. Self-assembling short immunostimulatory duplex RNAs with broad spectrum antiviral activity. bioRxiv.

- Si, L., Bai, H., Rodas, M., Cao, W., Oh, C.Y., Jiang, A., Moller, R., Hoagland, D., Oishi, K., Horiuchi, S. and Uhl, S., 2021. A human-airway-on-a-chip for the rapid identification of candidate antiviral therapeutics and prophylactics. *Nature Biomedical Engineering*, 5(8), pp.815-829.
- Bein, A., Kim, S., Goyal, G., **Cao, W.**, Fadel, C., Naziripour, A., Sharma, S., Swenor, B., LoGrande, N., Nurani, A. and Miao, V.N., 2021. Enteric coronavirus infection and treatment modeled with an immunocompetent human intestine-on-a-chip. *Frontiers in Pharmacology*, 12.
- Xiong, F., Ling, X., Chen, X., Chen, J., Tan, J., Cao, W., Ge, L., Ma, M. and Wu, J., 2019. Pursuing specific chemotherapy of orthotopic breast cancer with lung metastasis from docking nanoparticles driven by bioinspired exosomes. *Nano Letters*, 19(5), pp.3256-3266.
- Islam, M.A., Firdous, J., Badruddoza, A.Z.M., Reesor, E., Azad, M., Hasan, A., Lim, M., Cao, W., Guillemette, S. and Cho, C.S., 2019. M cell targeting engineered biomaterials for effective vaccination. *Biomaterials*, 192, pp.75-94.
- Islam, M.A., Xu, Y., Tao, W., Ubellacker, J.M., Lim, M., Aum, D., Lee, G.Y., Zhou, K., Zope, H., Yu, M. and Cao, W., 2018. Restoration of tumour-growth suppression in vivo via systemic nanoparticle-mediated delivery of PTEN mRNA. *Nature Biomedical Engineering*, 2(11), pp.850-864.
- Jiang, H.L., Islam, M.A., Xing, L., Firdous, J., Cao, W., He, Y.J., Zhu, Y., Cho, K.H., Li, H.S. and Cho, C.S., 2017. Degradable polyethylenimine-based gene carriers for cancer therapy. *Topics in Current Chemistry*, pp.113-148.
- Chen, L., Cao, W., Grishkewich, N., Berry, R.M. and Tam, K.C., 2015. Synthesis and characterization of pH-responsive and fluorescent poly (amidoamine) dendrimer-grafted cellulose nanocrystals. *Journal of Colloid and Interface Science*, 450, pp.101-108.
- Chen, L., Cao, W., Quinlan, P.J., Berry, R.M. and Tam, K.C., 2015. Sustainable catalysts from gold-loaded polyamidoamine dendrimer-cellulose nanocrystals. *ACS Sustainable Chemistry & Engineering*, 3(5), pp.978-985.

POSTERS AND ABSTRACTS

- C.W. Fadel, A. Bein, W. Cao, B. Swenor, D.M. Camacho, K. Gregory, D. Breault, G. Goyal, R. Prantil-Baun, and D.E. Ingber, "Gut Interrupted: Modeling Microbiome-Dependent Modulation of Infant Intestinal Vulnerability," Wyss Institute 11th Annual Retreat, Nov 2019.
- A. Bein, C.W. Fadel, B. Swenor, W. Cao, D.M. Camacho, R. Prantil-Baun, D.E. Ingber, "Modelling Environmental Enteric Dysfunction on Chip," Wyss Institute 10th Annual Retreat, Nov 2018.
- W. Cao, S. Eicher, S. Leong, T.C. Yeh, "Cystic Fibrosis Gene Therapy," UC Berkeley – UC San Francisco Master of Translational Medicine Final Symposium, Jun 2018.
- M.A. Islam, Y. Xu, H. Zope, W. Cao, M. Mahmoudi, R. Langer, P.W. Kantoff, J. Shi, B.R. Zetter, O.C. Farokhzad, "Restoration of tumor suppression in vivo by systemic delivery of chemically-modified PTEN mRNA nanoparticles," *Journal of Clinical Oncology*, vol. 35 (15_suppl), pp.11582-11582, May 2017.

AWARDS AND HONORS

Bioengineering Department Award, University of California Berkeley	Aug 2017
Graduation with Distinction, University of Waterloo	Jun 2017
David Johnston International Experience Award	Jan 2016
Schlumberger-CelluForce Design Competition on Sustainable Nanomaterials, Second Prize	Nov 2015
University of Waterloo International Experience Award	Sep 2014
President's Scholarship, U of Waterloo	Sep 2012
AP Scholar with Honor	Jun 2012

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National Biology Scholar, U of Toronto National Biology Competition

Kitchener-Waterloo Optimist Club Youth Appreciation Award

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Apr 2012

Nov 2011