

Carlos Ignacio Vazquez

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Current Position

Teaching Assistant, University of California Merced, Spring 2020- Fall 2022

Graduate Student Researcher, University of California Merced, Fall 2018-Spring 2025

Education

Ph.D. Quantitative and Systems Biology, University of California Merced, 2018-Expected May 2025

M.S. Quantitative and Systems Biology, University of California Merced, 2018-Expected Dec 2020

B.S. Bioengineering, University of California Merced, 2015-2018

Teaching

- Mentored undergraduate students conducting research for Wei Chun Chin Lab (2018-present)
- Trained undergraduate students to run several experiments such as Dynamic Light Scattering, ELLA (Enzyme Linked Lectin Assay), ELISA (Enzyme Linked Immunosorbent Assay) and Swelling Kinetics (2018-present)
- Instructed two sections of the laboratory course for introductory Biology (Bio 02 Lab) at UC Merced (Spring 2021)
- Taught three sections of Cell Biology (Bio 110 Discussion) at UC Merced (Fall 2020)
- Taught two sections of the laboratory course for introductory Biology (Bio 02 Lab) at UC Merced (Spring 2020)

Research Experience

Bioengineering Lab Graduate Research Conducted under Professor Wei Chun Chin, 2019-present

- Working with human lung adenocarcinoma cell line (A549), normal human bronchial epithelium cell line (BEAS2B), and primary tracheal epithelial cells (Bovine)
- Performing mucus swelling kinetics in presence of Juul E-cigarette liquid, Propylene Glycol, and Vegetable Glycerine through video-enhanced microscopy
- Quantifying hypersecretion in presence of Electronic Cigarette liquid using ELLA
- Implementing computer vision on video microscopy from swelling kinetics
- Worked with creating a paper based polypyrrole/graphene oxide composite based biosensor for detecting SARS-CoV2 Spike Antibody
- Culturing primary bovine bronchial epithelial cells at Airway Liquid Interface for mucociliary transport analysis
- Used liquid chromatography-mass spectrometry to assess changes in mucus proteome

Bioengineering Lab Graduate Research Conducted under Professor Wei Chun Chin, 2018-2019

Rock Dust and Nicotine effect on Mucin swelling and aggregation

- Worked with BEAS2B and A549 lung cell lines to assess the effect of nicotine and rock dust on mucin swelling and aggregation
- Performed kinetic swelling or Donnan swelling of mucus resolved optically through video-enhanced microscopy
- Performed ELLA to quantify hypersecretion in presence of nicotine and rock dust
- Carried out dynamic light scattering experiments on mucin aggregation in presence of nicotine and rock dust

Use liquid chromatography-mass spectrometry to characterize chemical leaching from coated and uncoated rock dust

Bioengineering Lab Research conducted under Dr. Wei-Chun Chin, Dr. Meng-Hsueh Chiu, 2017-2018

The effect of dispersant chemicals, used to treat the Gulf of Mexico oil spill, on the organic matter aggregation steps of the carbon cycle involving diatomic phytoplankton and oil degrading bacteria.

- Characterized various nanoparticles and exopolymeric secretions (EPS) after treating bacteria and diatoms with dispersant chemicals using a dynamic light scattering instrument.
- Performed Enzyme-Linked Immunosorbent Assay (ELISA) to quantify enzyme production of bacteria and diatoms under dispersant chemicals
- Performed Enzyme-Linked Lectin Assay (ELLA) to quantify metabolic response of bacteria and diatoms treated with dispersants chemicals
- Isolated and purified DNA extracted from bacteria and diatoms to
Normalize data obtained from ELLA and ELISA
- Created histograms from data obtained in ELISA, ELLA and DNA isolation with PRISM software

Professional Experience

Intern, Joint Genome Institute (JGI), Berkeley, CA, 2023

- Benchmarked sequence similarity tools using minhashing algorithms, which improved accuracy and speed of genetic data analysis.
- Leveraged Docker containers to run benchmark scripts on National Energy Research Scientific Computing Center (NERSC) High Performance Computing (HPC) system, ensuring consistent and reproducible computational environments.
- Proficiently utilized Bio-python for biological computation and data analysis, demonstrating strong coding skills and the ability to apply these in a genomics context.
- Employed shell commands for efficient manipulation and management of genomic data, demonstrating extensive knowledge and practical skills in Unix/Linux environments.
- Skills from this internship will be applied to determine tools to analyze proteomics profiles of mucus samples in my own research and use the High-Performance Computer at UC Merced known as the MERCED (Multi-Environment Research Computer for Exploration and Discovery) Cluster

Trainings

Scanning Electron Microscope, Confocal Microscope, Flow Cytometer, Collaborative Institutional Training Initiative Human Research, High Performance Computing

Additional Information

- Achieved PhD Candidacy (7/11/2020)
- Proficient in Python, UNIX
- Certifications: Blood Borne Pathogens, Biosafety, Radiation Safety (Machines), **Flow Cytometry**
- Project Smile Advisor for University of California Merced Chapter (Fall 2020-Spring 2020)
- Recipient of the Fred and Mitzie Ruiz Fellowship (Fall 2020)
- Recipient of the Central Valley Graduate Fellowship (Spring 2023)
- Recipient of the UC President's Pre-Professoriate Fellowship (Fall 2023 - Spring 2024)

Professional Presentations

20th Annual UC Systemwide Bioengineering Symposium Presentation: EFFECTS OF ROCK DUST PARTICLES AND NICOTINE ON AIRWAY MUCUS RHEOLOGICAL PROPERTIES, 2019

BIOE Young Investigator Symposium: EFFECTS OF ELECTRONIC CIGARETTE LIQUID COMPONENTS ON MUCUS RHEOLOGICAL PROPERTIES, 2022

Mucins in Health & Disease (17th International Meeting): IMPACT OF ELECTRONIC CIGARETTE LIQUID SOLVENTS ON MUCIN SWELLING KINETICS RELEASED FROM LUNG EPITHELIUM CELLS, 2024

Publications

Draft Manuscripts:

1. Vazquez, C.I., Chin, W.C. (2025) The Impact of Vegetable Glycerin and Propylene Glycol on the Calcium-Induced Calcium Release (CICR) Pathway and Mucus Secretion. Scientific Reports

Published Papers:

1. Chang, H.M., Zhang, Y., Hashimoto, C., Vazquez, C.I., Fang Y., Kumar P., Gadre, A., Li, C., Chin W.C. (2024). Sensitive Detection of SARS-CoV2 Spike Antibody by a Paper-based Polypyrrole/reduced Graphene Oxide Sensor. Biotechnology and Bioprocess Engineering
2. Vazquez, C. I., Chang, H. M., Chin, W. C. (2024). Dissolved Effluent organic matter assembly in presence of nano-plastic and NaCl. Science of the Total Environment

3. Chang, H. M., Vazquez, C. I., Shiu, R. F., & Chin, W. C. (2022). Temperature Effects on Effluent Microgel Formation. *Polymers*, 14(22), 4870.
4. Tsai, Y. Y., Vazquez, C. I., Shiu, R. F.*, Garcia, A. K., Le, C., Patel, P., ... & Chin, W. C. (2021). Effects of Rock Dust Particles on Airway Mucus Viscosity. *Biotechnology and Bioprocess Engineering*, 1-8. (* = authors with equal contribution)
5. Chen, C. S., Shiu, R. F., Hsieh, Y. Y., Xu, C., Vazquez, C. I., Cui, Y., ... & Chin, W. C. (2021). Stickiness of extracellular polymeric substances on different surfaces via magnetic tweezers. *Science of The Total Environment*, 757, 143766.
6. Shiu, R. F., Vazquez, C. I., Tsai, Y. Y., Torres, G. V., Chen, C. S., Santschi, P. H., ... & Chin, W. C. (2020). Nano-plastics induce aquatic particulate organic matter (microgels) formation. *Science of The Total Environment*, 706, 135681.1
7. Shiu, R. F., Vazquez, C. I., Chiang, C. Y., Chiu, M. H., Chen, C. S., Ni, C. W., ... & Chin, W. C. (2020). Nano-and microplastics trigger secretion of protein-rich extracellular polymeric substances from phytoplankton. *Science of the Total Environment*, 748, 141469.
8. Shiu, R. F., Chiu, M. H., Vazquez, C. I., Tsai, Y. Y., Le, A., Kagiri, A., ... & Sylvan, J. (2020). Protein to carbohydrate (P/C) ratio changes in microbial extracellular polymeric substances induced by oil and Corexit. *Marine Chemistry*, 103789.
9. Kamalanathan, M., Chiu, M. H., Bacosa, H., Schwehr, K., Tsai, S. M., Doyle, S., Yard, A., Mapes, S., Vazquez, C. I., & Sylvan, J., Santschi, P., Chin, W. C., Quigg, A. (2019). Role of polysaccharides in diatom *Thalassiosira pseudonana* and its associated bacteria in hydrocarbon presence. *Plant physiology*, pp-00301.
10. Chiu, M. H., Vazquez, C. I., Shiu, R. F., Le, C., Sanchez, N. R., Kagiri, A., ... & Xu, C. (2019). Impact of exposure of crude oil and dispersant (Corexit) on aggregation of extracellular polymeric substances. *Science of The Total Environment*, 657, 1535-1542.