

Curriculum Vitae

GAELEN D. GUZMAN, PhD

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PERSONAL STATEMENT

I am a molecular biologist with specialty in host-pathogen interactions during *Mycobacterium tuberculosis* infection. My interests are in science communication, data analysis and visualization, and science communication. I have extensive experience in one-on-one mentorship and project management,

As a recent PhD graduate of Dr. Fikadu Tafesse's lab, as I believe that Dr. Tafesse's mentorship has provided me a unique opportunity to learn a panoply of experimental techniques and to practice rigorous scientific thought. Among the most powerful lessons I've learned from Dr. Tafesse is the need for collaboration in scientific research – his is a lab which openly works with many institutions globally to address questions of significant public health interest.

My dissertation project was focused on unraveling the manners in which host sphingolipids influence the progression of *Mycobacterium tuberculosis* infection, a body of knowledge which may lead to valuable insights toward translational medicine. As a postdoctoral fellow in the same lab, my ongoing work seeks to finalize several omics projects that near publication and I hope to develop invaluable career skills such as mentorship, teaching, and data visualization.

EDUCATION

Oregon Health and Science University

PhD in Molecular Microbiology and Immunology

Portland, OR

Sept 2017 - Feb 2024

Relevant coursework:

- Structure and function of Biological Molecules
- Molecular Biophysics and Bioinformatics
- Bioregulation
- Genetic Mechanisms
- Molecular Cell Biology
- Introduction to Immunology
- Advanced Immunology
- Host-Pathogen Interactions
- Advanced Virology
- Molecular and Cellular Approaches to Disease
- Principles and Practices of Data Visualization
- Perspectives in Pulmonary Medicine

Massachusetts Institute of Technology

Bachelor of Science in Biology

Cambridge, MA

Sept 2010 - June 2014

Relevant coursework:

- Introductory biology
- Genetics
- Immunology
- Organic Chemistry
- General Biochemistry
- Molecular Cell Biology
- Human Physiology
- Molecular Basis of Infectious Disease
- Virus-Host Interactions
- Experimental Molecular Biology
- Development and Evolution
- Introductory Python
- Experimental Biology and Communication

Experience

Oregon Health and Science University

Dissertation work with Dr. Fikadu Tafesse

Portland, OR

March 2018 – Feb 2024

- Under the mentorship of Dr. Tafesse, I designed a series of research goals that will culminate in a dissertation focused on the identification and characterization of sphingolipid-mediated mechanisms of host-pathogen interaction in the context of the intracellular pathogen *Mycobacterium tuberculosis*.
- My research goals were designed both to answer novel questions regarding the roles of sphingolipids in pathogenic contexts, as well as to maximize my technical training. I plan to employ and gain expertise in fluorescence microscopy, lipidomics and thin layer chromatography, and phenotypic assays and screens using novel biochemical tools.
- In this research experience, I received training in confocal microscopy (and subsequently, in image analysis), in CRISPR/Cas9 genomic editing, flow cytometry, Biosafety Level 3 laboratory practices, and bacterial and viral infections. Additionally, I gained extensive experience in writing in preparing two primary authorship research articles and three review/methods articles, as well as in data visualization using R.
- As a member of this lab, I regularly presented my preliminary results to group meetings, as well as presented my work in poster form at several meetings and conferences (listed below).

- Among the most fulfilling and exciting components of this experience, I trained and mentored three graduate students and two research assistants – from direct guidance on experimental design and technique to project management.

Oregon Health and Science University

Pre-dissertation rotation with Dr. Tim Nice

Portland, OR

March – April 2018

- In a four-week rotation in the lab of Dr. Nice, I worked to characterize the differences between viral particles released from infected host cells as individual solvated units in comparison to viral particles released in apoptotic vesicles during the programmed cell death of the host.
- To this end, we employed an in vivo mouse model as well as an in vitro microglial cell model, and performed infections using murine norovirus. The two norovirus strains MNV-CW3 and MNV-CR6 produce divergent pathologies in host cells, with MNV-CW3 trending towards acute infection and apoptotic cell death (thereby releasing viral particles packaged within apoptotic vesicles), and MNV-CR6 trending towards chronic infection and non-inflammatory release of individual viral particles. These norovirus strains allow for a unique comparison between related viruses that produce differing types of infectious units.
- In this rotation, I gained experience in the collection of intestinal cells from norovirus-infected mice, ultracentrifugation for virus purification and density segregation, flow cytometry on the BD LSR-Fortessa instrument, and quantitative plaque-forming assays.

Broad Institute Proteomics Platform

Research Associate II with Dr. Monica Schenone

Cambridge, MA

March 2014 – July 2017

- Performed proteomic experiments in collaboration with numerous Broad, MIT, Cambridge (UK), and Harvard laboratories, as well as Cambridge (MA)-based pharmaceutical companies including Pfizer, Bayer, and AstraZeneca.
- Applied quantitative proteomics and data-dependent mass spectrometry to elucidate the proteomic interaction partners of target proteins and small molecules in order to better understand the underlying mechanisms of and identify therapeutic options for diseases such as Alzheimer's Disease, Inflammatory Bowel Disease, Type 2 Diabetes, and Myocardial Infarction.
- Independently managed over eighty-five experiments through sample preparation, mass spectrometric analysis, and data interpretation. Also assisted in the training and education of numerous new members of the interaction proteomics team and collaborative partners.
- Presented experimental results at group meetings and collaborative meetings, as well as in poster form at the First and Second Annual Broad RA/TS poster sessions (2015 and 2016) and at the 2016 Broad Retreat (abstracts listed below).
- Techniques of specialty include protein purification, isobaric labeling (Stable Incorporation of Labeled Amino acids in Cell culture, isobaric Tagging for Relative and Absolute Quantitation, and Tandem Mass Tagging), HPLC use and maintenance, Thermo Fisher Q Exactive+ use and maintenance, and statistical data analysis and interpretation.

Massachusetts Institute of Technology

MIT Course 7.16 – Senior Project Lab

Cambridge, MA

Sept 2013 – Dec 2013

- Partnered with a peer to perform an independent study on the role of Ubiquitination in the activation of NEMO, a regulator of the NFκB immunological pathway. NEMO misregulation is responsible for numerous chronic immune diseases such as autoinflammation, dermatitis, Parkinson's disease, and large B-cell lymphoma.
- Independently designed experimental methodology, with particular focus on human tissue culture, transient transfection, fluorescence imaging, and immunodetection and immunoprecipitation.
- Compiled experimental results into figures and authored a formal paper and presentation.

Massachusetts Institute of Technology

MIT Undergraduate Research Opportunity Project

Cambridge, MA

Feb 2012 – Aug 2013

- Through these semester-long internships, I worked in the laboratory of Dr. Hidde Ploegh, where I obtained hands-on experience in various research techniques involving molecular biology, immunology, virology, and biochemistry.
- Assisted post-doctorates and fellows in designing and executing numerous projects including:
 - Cloning and purifying orphan cytokines and chemokines in order to identify their relevant binding partners. Through this project, I gained experience in bacterial and yeast protein expression systems, as well as experience in protein purification through HPLC.
 - Producing a column-based flow-through method for Sortase mediated fluorophore-protein conjugation. In the course of this project, I gained experience performing and assessing the effectiveness of chemical and biochemical reactions.
 - Calculating the mutation rates (via cDNA sequencing) of influenza virus particles after passage through B-cells that produce antibodies against hemagglutinin. Using this method, studied immune evasion mechanisms of the influenza virus. This project afforded me experience in mammalian tissue culture, gene sequencing, and genetic analysis.

AWARDS, HONORS, AND GRANT APPOINTMENTS

- *Promising Scholars Award; March 2017*
 - Awarded by the OHSU School of Medicine and Center for Diversity and Inclusion, directed towards scholars who show great potential to contribute to the intellectual richness and diversity of the OHSU student community.
- *Graduate Fellow – Early Independence Fellowship Award; July 2017*
- A unique opportunity at OHSU, designed to give promising graduate students enhanced flexibility both in research scope and access to cross-disciplinary mentorship. This award provides stipend and tuition support independent of faculty grants, and is annually renewable up to four years.
- *Henry Collins Foundational Fellowship; July 2018*
 - An OHSU Department of Molecular Microbiology and Immunology-funded award that provides stipend and tuition support and allows students to participate in the departmental T32 training activities.
- *T32 Graduate Fellow – Program in Enhanced Research Training; August 2018*
 - An NIH-sponsored training grant available to 2nd year students in the OHSU PMCB program. This one-year fellowship provides a unique curriculum and mentorship experience that is designed to give career-driven students opportunities for scientific and professional development. In the years following the fellowship, students act as mentors in support of incoming awardees. This award grants stipend and tuition support independent of the OHSU School of Medicine and faculty grants.
- *T32 Graduate Fellow – Pulmonary and Critical Care Medicine; July 2022*
 - An NIH-sponsored training grant supporting graduate students and postdocs studying fields relevant to pulmonary or critical care medicine. This program provides in-depth didactic sessions on the mechanisms of pulmonary function and care in addition to career-driven training opportunities. This award grants stipend and tuition support.
- *Sears Microbiology Fellowship Award; April 2023*
 - Departmental travel award supporting my travel to the International Ceramide Conference in Charleston, NC, USA.
- *Award for Excellent Talk by a Trainee – International Ceramide Conference; April 2023*
- *Rittenberg Meritorious Travel Award; September 2023*
 - Departmental travel award supporting travel to the 2024 FEBS Special Meeting on Sphingolipid Biology
- *Award for Best Question – Sphingolipid Biology FEBS Special Meeting; October 2023*

PROFESSIONAL SKILLS

Laboratory techniques/skills: Bio Safety Level 3 technique, mammalian tissue culture, *in vitro* bacterial & viral infections, CRISPR gene editing, transfection & transduction, confocal and fluorescence microscopy, flow cytometry, thin layer chromatography, phagocytosis & viability assays, quantitative proteomics & lipidomics sample preparation.

Software and Data analysis: R (tidyverse, ggplot, plotly, shiny), Quarto Markdown, LaTeX, Microsoft suite, FIJI/ImageJ, Adobe Illustrator, Graphpad PRISM, FloJo, ZEN Imaging Software, Xcalibur.

PRIMARY AUTHORSHIP PUBLICATIONS

- Guzman, G., Tafesse, F. G. (2023) Systematic analysis of the sphingomyelin synthase family in *C. elegans*. Preprint on BioRxiv <https://doi.org/10.1101/2023.07.25.550547>.
- Guzman, G., Farley, S. E., Creek, C., Tafesse, F. G. (2023) Genetic tools for studying the roles of sphingolipids in viral infections. *Methods in Molecular Biology*, ISBN 9781071628942 (Book chapter). https://doi.org/10.1007/978-1-0716-2895-9_1.
- Niekamp, P*, Guzman, G.*, Leier, H. C., Rashidfarrokhi, A., Richina, V., Pott, F., Barisch, C., Holthuis, J. C. M. M., and Tafesse, F.G. (2021). Sphingomyelin Biosynthesis Is Essential for Phagocytic Signaling during Mycobacterium tuberculosis Host Cell Entry. *MBio*, 12(1), 1–19. <https://doi.org/10.1128/mBio.03141-20> (*co-first authorship)
- Guzman, G., Niekamp, P., and Tafesse, F. G. (2020). The Squeaky Yeast Gets Greased: The Roles of Host Lipids in the Clearance of Pathogenic Fungi. *Journal of Fungi*, 6(1), 19. <https://doi.org/10.3390/jof6010019>.
- Guzman, G., and Tafesse, F. G. (2020). Visualization and Quantification of Phagocytosis by Neutrophils (pp. 141–148). https://doi.org/10.1007/978-1-0716-0154-9_1.

NON-PRIMARY AUTHORSHIP PUBLICATIONS

- Zhu, Q.M., Hsu, Y.H., Lassen, F.H., MacDonald, B., Stead, S., Malolepsza, E., Kim, A., Li, T., Mizoguchi, T., Schenone, M., Guzman, G., Tanenbaum, B., ... Lage, K. (2024) Protein interaction networks in the vasculature prioritize genes and pathways underlying coronary artery disease. *Communications Biology*, 7, 87. <https://doi.org/10.1038/s42003-023-05705-1>.

- Bates T., McBride S., Leier H., Guzman, G., Lyski Z., Schoen D., Winders B., Lee J., Lee D., Messer W., Curlin M., Tafesse F.G. (2022). Vaccination before or after SARS-CoV-2 infection leads to robust humoral response and antibodies that effectively neutralize variants. *Science Immunology*, 7(68). <https://doi.org/10.1126/sciimmunol.abn8014>.
- Mohanan, V., Nakata, T., Desch, A. N., Lévesque, C., Boroughs, A., Guzman, G., ... Xavier, R. J. (2018). C1orf106 is a colitis risk gene that regulates stability of epithelial adherens junctions. *Science*, 359(6380), 1161–1166. <https://doi.org/10.1126/science.aan0814>.
- Hung, V., Lam, S. S., Udeshi, N. D., Svinkina, T., Guzman, G., Mootha, V. K., ... Ting, A. Y. (2017). Proteomic mapping of cytosol-facing outer mitochondrial and ER membranes in living human cells by proximity biotinylation. *eLife*, 6. <https://doi.org/10.7554/eLife.24463>.
- Rusu, V., Hoch, E., Mercader, J. M., Florez, J. C., Jacobs, S. B. R., Guzman, G., ... Lander, E. S. (2017). Type 2 Diabetes Variants Disrupt Function of SLC16A11 through Two Distinct Mechanisms. *Cell*, 170(1), 199–212.e20. <https://doi.org/10.1016/j.cell.2017.06.011>.
- Graham, D. B., Lefkovith, A., Deelen, P., de Klein, N., Varma, M., Boroughs, A., Guzman, G., ... Xavier, R. J. (2016). TMEM258 Is a Component of the Oligosaccharyltransferase Complex Controlling ER Stress and Intestinal Inflammation. *Cell Reports*, 17(11), 2955–2965. <https://doi.org/10.1016/j.celrep.2016.11.042>.

Contributed Presentations

- Guzman, G., Griffith, A., Garcia, M., Trank-Greene, M., Tafesse, F.G. “Exploring the role of sphingolipids during *emphMycobacterium tuberculosis* infection.” Short talk at the 2023 FEBS Special Meeting: Sphingolipid Biology, the Dawn of a New Era. Funchal, Portugal. Oct 8, 2023.
- Guzman, G., Griffith, A., Garcia, M., Trank-Greene, M., Tafesse, F.G. “Sphingolipids: A double-edged sword in the defense against *emphMycobacterium tuberculosis*.” Poster presentation at the 2023 International Ceramide Conference. Charleston, NC. Apr 16, 2023.
- Guzman, G., Niekamp, P., Tafesse, F.G. “Sphingolipids: A double-edged sword in the defense against *emphMycobacterium tuberculosis*.” Poster presentation at the following two meetings: American Association of Immunologists IMMUNOL-OGY2022. Portland, OR. May 6-10, 2022; Microbiology and Immunology Departmental Retreat. Welches, OR. Oct 13-15, 2022.
- Guzman, G., Niekamp, P., Tafesse, F.G. “Sphingomyelin biosynthesis is critical during the phagocytic uptake of *emphMycobacterium tuberculosis*.” OHSU Research Week 2019. Portland, OR. May 13, 2019.
- Guzman, G., Niekamp, P., Tafesse, F.G. “Host sphingolipids in the phagocytic uptake of *Mycobacterium tuberculosis*.” Poster presented at the 3rd Annual PacTB Symposium. Portland, OR. Mar. 21, 2019.
- Guzman, G., Niekamp, P., Tafesse, F.G. “Investigating the dependencies of intracellular bacteria on host sphingolipids.” Sept. 2018. Abstract selected for presentation at the following three meetings: the American Society for Microbiology Northwest Conference, at the OHSU campus in Portland, OR on Oct. 6, 2018; the 4th Annual International Workshop on the Molecular Medicine of Sphingolipids, at the Weizmann Institute of Science in Ein Gedi, Israel on Oct. 16, 2018; and the OHSU Molecular Microbiology and Immunology Departmental Retreat in Portland, OR on Nov. 11, 2018.
- Guzman, G., Schenone, M., Rillahan, C., Bradshaw, B., Carr, S., de Jager, P. “Identifying the interactors of Alzheimer’s Disease factor CD33 using quantitative proteomics.” Nov. 2016. Poster presentation given at: the 2nd Annual Broad RA/TS Poster Session, at the Broad Institute of MIT and Harvard, Nov. 29, 2016; and the Broad Retreat, Dec. 12, 2016.
- Guzman, G., Schenone, M., Graham, D., Carr, S. “Identifying a novel role of Protein Tmem258 through Quantitative Mass Spectrometry.” Nov. 2015. Poster presentation given at: the 1st Annual Broad RA/TS Poster Session, at the Broad Institute of MIT and Harvard, Nov. 14, 2015.

Community Engagement and Leadership

FSILG, Theta Xi

Vice President of Theta Xi Fraternity

Boston, MA

Sept 2012 – May 2013

- Organized, co-facilitated, and kept minutes at all chapter meetings in a fraternity of 44 members. Lead numerous committees, including the chapter Judicial Committee and By-Laws Revision Committee. Organized two chapter retreats and facilitated numerous communication-promoting activities.
- Regularly organized volunteering opportunities with Red Cross donation centers, and coordinated fraternity volunteer days with Habitat for Humanity.

Graduate Researchers United

Contract Action Team, member

Union Steward

Portland, OR

Dec 2019 – June 2022

Jan 2020 – Jan 2022

- Assisted in labor organizing for card signing, rallies, and contract ratification.
- Served as union steward for two years, wherein I submitted several grievances on behalf of Graduate Researchers suffering from contract violations.
- Collaborated with other graduate students at OHSU to draft contract language which will codify and expand student benefits, protect students from abuse by departmental and advisory faculty, and represent students with grievances in cases of abuse and harassment.