Madeline J. Lee

ORCID: 0000-0001-5039-6806 | (651)-235-1612 | mjanelee@stanford.edu | She/Her

Education

DOCTOR OF PHILOSOPHY | MAY 2024 (EXPECTED) | STANFORD UNIVERSITY

· Field of Study: Immunology
· Advisor: Dr. Catherine Blish

BACHELOR OF ARTS | MAY 2019 | WASHINGTON UNIVERSITY IN ST. LOUIS

· Major: Biology

Publications

* Denotes co-first author

PEER-REVIEWED RESEARCH ARTICLES

· <u>**Lee MJ**</u>, et al. **SARS-CoV-2 escapes direct NK cell killing through Nsp1-mediated downregulation of ligands for NKG2D**. Cell Rep. 2022;41(13):111892. doi:10.1016/j.celrep.2022.111892

· Wilk AJ*, <u>**Lee MJ***</u>, Wei B*, Parks B*, et al. **Multi-omic profiling reveals widespread dysregulation of innate immunity and hematopoiesis in COVID-19**. J Exp Med. 2021 Aug 2;218(8):e20210582. doi: 10.1084/jem.20210582. Epub 2021 Jun 15. PMID: 34128959; PMCID: PMC8210586.

· Hao Y, Hao S, Andersen-Nissen E, Mauck WM 3rd, Zheng S, Butler A, <u>**Lee MJ**</u>, Wilk AJ, Darby C, Zager M, Hoffman P, Stoeckius M, Papalexi E, Mimitou EP, Jain J, Srivastava A, Stuart T, Fleming LM, Yeung B, Rogers AJ, McElrath JM, Blish CA, Gottardo R, Smibert P, Satija R. **Integrated analysis of multimodal single-cell data**. Cell. 2021 Jun 24;184(13):3573-3587.e29. PubMed Central ID: PMC8238499.

· Wagner JA, Wong P, Schappe T, Berrien-Elliott MM, Cubitt C, Jaeger N, <u>**Lee M**</u>, Keppel CR, Marin ND, Foltz JA, Marsala L, Neal CC, Sullivan RP, Schneider SE, Keppel MP, Saucier N, Cooper MA, Fehniger TA. **Stage-Specific Requirement for Eomes in Mature NK Cell Homeostasis and Cytotoxicity**. Cell Rep. 2020 Jun 2;31(9):107720. PubMed Central ID: PMC7265846.

· George AF, Luo X, Neidleman J, Hoh R, Vohra P, Thomas R, Shin MG, <u>**Lee MJ**</u>, Blish CA, Deeks SG, Greene WC, Lee SA, Roan NR. **Deep Phenotypic Analysis of Blood and Lymphoid T and NK Cells From HIV+ Controllers and ART-Suppressed Individuals**. Front Immunol. 2022 Jan 27;13:803417. doi: 10.3389/fimmu.2022.803417. PMID: 35154118; PMCID: PMC8829545.

REVIEW ARTICLES

· <u>**Lee MJ**</u>, Blish CA. **Defining the role of natural killer cells in COVID-19**. Nat Immunol. 2023 Jul 17. doi: 10.1038/s41590-023-01560-8

· Ratnasiri K*, Wilk AJ*, <u>**Lee MJ***</u>, Khatri P, Blish CA. **Single-cell RNA-seq methods to interrogate virus-host interactions**. Semin Immunopathol. 2022 Nov 21:1–19. doi: 10.1007/s00281-022-00972-2. Epub ahead of print. PMID: 36414692; PMCID: PMC9684776.

MANUSCRIPTS IN PREPARATION

· <u>**Lee MJ**</u>, et al. **NK cell-monocyte crosstalk underlies NK cell activation in severe COVID-19**. In preparation. 2023.

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Fellowships and Grants

· **Ruth L. Kirschstein National Research Service Award Individual Predoctoral Fellowship (F31 AI172319-01)** – National Institute of Allergy and Infectious Disease, National Institutes of Health | Bethesda, MA | Dec. 2022 - May 2025
  o Application awarded an impact score of 15 on first submission; scored in the top 1% of applications received during that cycle
  o Successfully completed all three proposed aims of the proposal within 2 years
· **Washington University in St. Louis | St. Louis, MO | Apr. 2018 – Aug. 2018 –** Biology Summer Undergraduate Research Fellowship (BioSURF); $4,000

Presentations

· **Cell Symposium: Viruses in Health and Disease | Sitges, Spain | Mar. 2023 | Poster** – "Interrogating the natural killer cell response to COVID-19: SARS-CoV-2 modulates ligands for NK cell receptors & escapes NK cell killing"
· **ITI Human Immune Monitoring Technology and Bioinformatics Conference | Stanford, CA | Mar. 2023 | Poster** – "Interrogating the natural killer cell response to COVID-19: Natural killer cells as a determinant of coronavirus replication and pathogenicity"
· **Stanford Immunology Scientific Conference | Monterey, CA | Jan. 2023 | Oral Presentation** – "Interrogating the natural killer cell response to COVID-19: SARS-CoV-2 modulates ligands for NK cell receptors & escapes NK cell killing"
· **Fred Hutch Immunology Graduate Student Symposium | Seattle, WA | Sep. 2022 | Oral Presentation** – "Interrogating the natural killer cell response to COVID-19"
· **NK2022 | Bonita Springs, FL | May 2022 | Poster** – "Interrogating the natural killer cell response to COVID-19: SARS-CoV-2 modulates ligands for NK cell receptors & escapes NK cell killing"
· **Midwinter Conference of Immunology | Monterey, CA | Jan. 2022 | Poster** – "Assessing the impact of COVID-19 on NK cells"
· **2017 iGEM Jamboree | Boston, MA | Nov. 2017 | Oral Presentation** – "Increasing Resistance to UV-B Radiation in Cyanobacteria"
· **Washington University Undergraduate Research Symposium | St. Louis, MO | Nov. 2018 | Poster –** "Examining the memory-like responses of natural killer cells following activation by mature dendritic cells"

Honors and Awards

· **Best Poster (Graduate Student)** – ITI Human Immune Monitoring Technology and Bioinformatics Conference | Stanford, CA | Mar. 2023
· **Gold Medal** – 2017 iGEM Giant Jamboree | Boston, MA | Nov. 2017
· **Nomination, Best Environmental Project** – 2017 iGEM Giant Jamboree | Boston, MA | Nov. 2017
· **Nomination, Best Original Hardware** – 2017 iGEM Giant Jamboree | Boston, MA | Nov. 2017
· **Dean's List (FL 2015, SP 2016, SP 2017, SP 2018)** – Washington University in St. Louis

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Research Experience

BLISH LAB | STANFORD UNIVERSITY | DOCTORAL CANDIDATE | MAR. 2020 - MAY 2024
- Characterized interactions between NK cells and monocytes in COVID-19 using both computational and experimental approaches (Lee et al, *in preparation* 2023)
- Identified and published a novel mechanism by which SARS-CoV-2 evades killing by healthy NK cells (Lee et al., *Cell Rep* 2022)
- Performed general virology work with SARS-CoV-2 in a BSL3 setting, including generating viral stocks, performing plaque assays, infecting lung epithelial cell lines, inactivating virus, and performing flow cytometry under BSL3 conditions
- Designed and carried out the CyTOF arm of a large, trimodal immune profiling studying that assessed peripheral immunity in COVID-19 patients (Wilk, Lee, Wei, Parks et al., *J Exp Med* 2021)
- Collaborated with Dr Rahul Satija at NYU to validate cell type annotations in version 4 of the Seurat package (Hao et al., *Cell* 2021)
- Performed CyTOF on NK cell and PBMC samples from HIV-infected infants and utilized statistical techniques including LASSO regressions to identify immune correlates of HIV reservoir size
- Generated high-titer stocks of lentiviral pseudotyped SARS-CoV-2 for use in a BSL2+ setting and utilized these stocks to infect various cell types, including corneal tissue and lung spheroids
- Assisted in the collection of CyTOF data on fixed whole blood samples from a large cohort of COVID-19-positive donors and performed both unsupervised and supervised analyses on this data to identify novel immune markers of fatal COVID-19

SHIZURU LAB | STANFORD UNIVERSITY | ROTATION STUDENT | JAN. 2020 - MAR. 2020
- Studied T cell reconstitution in mice following bone marrow transplants performed under various conditioning regimen
- Performed techniques such as tail bleeds, retro-orbital injections, and bone marrow transplantation on mice

BLISH LAB | STANFORD UNIVERSITY | ROTATION STUDENT | SEP. 2019 - DEC. 2019
- Profiled the NK cells and PBMC of HIV-infected infants via Mass Cytometry Time-of-Flight (CyTOF) with the goal of identifying immune correlates of viral reservoir size
- Performed BSL2+ work with HIV-infected samples

FEHNIGER LAB | WASHINGTON UNIVERSITY | UNDERGRADUATE RESEARCHER | AUG. 2017 - MAY 2019
- Examined the responses of NK cells following co-culture with mature dendritic cells using a variety of experimental techniques including flow cytometry and ELISA
- Assisted other lab members with research projects, including investigating the role of transcription factor *Eomes* in NK cell development, which involved both mouse models and human cell culture (Wagner et al., *Cell Rep* 2020)
- Performed additional wet lab techniques such as fluorescence-activated cell sorting, mouse organ harvesting and processing, and isolation of various cell types from human leukoreduction system chambers

WASHINGTON UNIVERSITY IN ST. LOUIS IGEM TEAM | JAN. 2017 – DEC. 2018
- Collaborated with peers and professionals to develop an original biological engineering research project
- Engineered and tested novel UV-radiation resistance systems in *E. coli* and *Synechocystis*

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- Performed wet lab techniques including PCR, gel electrophoresis, transformation, restriction digestion, and minipreparation
- Earned a gold medal as well as nominations for Best Environmental Project and Best Hardware in the 2017 iGEM competition, which included over 300 teams (nominations are given to the top 5 teams in each award category)
- Managed the fundraising and budgeting of a total amount of over $30,000

Teaching and Mentorship

- **Teaching Assistant | Advanced Immunology II** | Immunol 202 | Stanford University | Spring 2022
- **Teaching Assistant | Translational Immunology** | Immunol 095 | Stanford University | Spring 2021
- Lab mentees:
    - **Anthony Cort** | PSTP student | Blish Lab | Spring 2023 - Spring 2024
    - **Xariana Vales-Torres** | Rotation student | Blish Lab | Fall 2022
    - **Andrea Gutierrez** | Undergraduate | SSRP-Amgen Scholars Program| Blish Lab | Summer 2022

Relevant Skills

- Proficient in R
    - Proficient in processing and analysis of high-dimensional immunological data, including analysis of CyTOF and single-cell RNA-sequencing data
- Familiar with Unix, Java, and HTML
- Proficient with FlowJo

Relevant Coursework

- **Advanced Immunology I** | Immunol 201 | Stanford University
- **Advanced Immunology II** | Immunol 202 | Stanford University
- **Advanced Immunology III** | Immunol 203 | Stanford University
- **Tumor Immunology** | Immunol 275 | Stanford University
- **Computational Immunology** | Immunol 206 | Stanford University
- **Modern Statistics for Modern Biology** | Stanford University
- **Introduction to Probability and Statistics for Clinical Research** | Epi 258 | Stanford University
- **Immunology** | L41 | Biol 424 | Washington University in St. Louis
- **Immunology Laboratory** | L41 | Biol 4241 | Washington University in St. Louis
- **Cellular Biology** | L41 | Biol 334 | Washington University in St. Louis
- **R Workshop in Biology** | L41 | Biol 3100 | Washington University in St. Louis
- **Introduction to Biochemistry** | U29 | Bio 426 | Washington University in St. Louis
- **Organic Chemistry I/II** | L07 | Chem 261 / 262 | Washington University in St. Louis
- **Calculus II/III** | L24 | Math 132 / 233 | Washington University in St. Louis

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Service

OVERCOMING IMPOSTER SYNDROME WORKSHOP LEADER | STANFORD UNIVERSITY | 2021-2024

· Developed a 1-hour workshop for Biosciences graduate students at Stanford that focused on recognizing and dealing with imposter feelings in graduate school
· Led this workshop multiple times over the course of several years for various groups of graduate students, including through the Stanford Biosciences Student Association (SBSA), the Immunology Graduate Program, and the Stanford ADVANCE Summer Institute

CALCULUS II TUTOR | WASHINGTON UNIVERSITY | AUG. - DEC. 2016, AUG. – DEC. 2018

· Led a group of eight to ten Calculus II students through difficult sets of practice problems for two hours weekly as a part of the Peer-Led Team Learning program
· Developed and implemented new and successful leadership strategies with other student tutors