Ernest Y. Lee, MD, PhD **Updated January 15, 2022**

CONTACT INFORMATION

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RESEARCH INTERESTS

Cutaneous immunology, infectious and autoimmune diseases, antimicrobial peptides, molecular biophysics, soft matter physics, bioinformatics, computational biology, machine learning

EDUCATION AND TRAINING

2+2 Dermatology Resident, UC San Francisco **2021 - 2024**

Internal Medicine Resident, Cedars-Sinai Medical Center **2020 - 2021**

MD, David Geffen School of Medicine, UCLA **2012 - 2020**

PhD, Bioengineering, UCLA **2014 - 2018**

- Molecular Cellular Tissue Therapeutics Track
- Research Advisor: Professor Gerard C.L. Wong, PhD
- Dissertation: "Discovery and Design of Multifunctional Membrane-Active and Immunomodulatory Peptides and Proteins"

BS with Honors, Physics, California Institute of Technology **2008 - 2012**

- Research Advisor: Professor Stephen L. Mayo, PhD

HONORS AND AWARDS

- Forbes 30 Under 30 in Science, 2021
- Emil Bogen Research Prize, David Geffen School of Medicine, UCLA, 2020
- Elected as a Member of Tau Beta Pi: The Engineering Honor Society, UCLA, 2020
- Elected as a Full Member of Sigma Xi: The Scientific Research Honor Society, UCLA, 2019
- Elected as Junior Member to AΩA, David Geffen School of Medicine, UCLA, 2019
- National Psoriasis Foundation Travel Grant, National Psoriasis Foundation, 2019
- Society for Investigative Dermatology Post-Doctoral Retreat Trainee Scholarship, Society for Investigative Dermatology, 2019
- Keystone Symposia Trainee Scholarship, Keystone Symposia on Molecular and Cellular Biology, 2019
- Edward K. Rice Outstanding Doctoral Student Award, UCLA Samueli School of Engineering, 2019
- Honors in Inpatient Internal Medicine, Ambulatory Internal Medicine, Family Medicine, Neurology, Psychiatry, Obstetrics/Gynecology, Pediatrics, and Dermatology Clinical Clerkships, David Geffen School of Medicine, UCLA, 2018 - 2019
- Department of Bioengineering Outstanding PhD Student Award, UCLA Samueli School of Engineering, 2018
- Peptide Therapeutics Foundation Travel Grant, Peptide Therapeutics Foundation, 2017
- NIH NIAMS T32 Dermatology Scientist Training Program Grant (T32AR071307), UCLA, 2017 - 2018
- National Psoriasis Foundation Travel Grant, National Psoriasis Foundation, 2017
- National Psoriasis Foundation Early Career Research Grant ($52,500), National Psoriasis Foundation, 2017 - 2018
- Doctoral Student Travel Grant, UCLA, 2017
- Department of Bioengineering Graduate Student Supplemental Fellowship, UCLA, 2017
- NIH NIGMS T32 Systems and Integrative Biology Training Program Grant (T32GM008185), UCLA, 2015 - 2016
- Hertz Foundation Graduate Fellowship Finalist, The Fannie and John Hertz Foundation, 2015
- NIH NIGMS T32 Systems and Integrative Biology Training Program Grant (T32GM008185), UCLA, 2014 - 2015
- 3rd Prize, UCLA Inventathon 2013, UCLA Business of Science Center, 2013

- NIH NIGMS T32 Medical Scientist Training Program Grant (T32GM008042), David Geffen School of Medicine at UCLA, 2012 - 2020
- Øistein and Rita A. Skjellum Summer Undergraduate Research Fellowship, Caltech, 2011
- Rose Hills Foundation Scholarship, Caltech, 2010 - 2011
- Spence Reese Scholarship in Medicine, Boys & Girls Clubs of Greater San Diego, 2008 - 2012

Research Experiences

Division of Dermatology, UCLA and Oregon Health & Science University, Los Angeles, CA and Portland, OR USA

Student Researcher, Mentor: Dr. Rajan P. Kulkarni, MD, PhD **2019 - 2020**

- Developed recommendations for the use of circulating "liquid biopsy" biomarkers predictive of clinical response to cancer immunotherapy in metastatic melanoma, as well as in non-small cell lung cancer and other solid tumors.

Division of Dermatology, Department of Medicine, UCLA, Los Angeles, CA USA

Student Researcher, Mentors: Dr. Kyle Cheng, MD & Dr. Daniel Bach, MD **2018 - 2020**

- Explored off-label uses for immunotherapies in dermatology.
- Reviewed recent advances in and opportunities for machine learning in personalized dermatology.
- Spearheaded an approved UCLA IRB as part of a multi-institution collaboration with the Department of Dermatology at the University of Pennsylvania (Dr. Robert Micheletti) and conducted patient surveys to study the long-term quality of life, psychological impact, and end organ damage in survivors of severe drug eruptions, including SJS/TEN and DRESS.

Student Researcher, Mentor: Dr. Vanessa Holland, MD **2019 - 2020**

- Wrote a case report on a unique case of ocular lichen planus manifesting as cicatricial conjunctivitis successfully treated with lifitegrast.

Department of Surgery, Cedars-Sinai Medical Center, Los Angeles, CA USA

Student Researcher, Mentor: Dr. Matthew B. Bloom, MD **2018 - 2020**

- Predicted heparin-induced thrombocytopenia in the surgical intensive care unit and analyzed trends in scooter-related trauma activations in the emergency room.

Department of Bioengineering, UCLA, Los Angeles, CA USA

Graduate Student, Mentor: Dr. Gerard C.L. Wong, PhD **2013, 2014 - 2018**

- Developed a machine learning-based prediction tool to design antimicrobial and membrane curvature-generating peptides and discover hidden membrane-restructuring activity in new and existing protein families.
- Used X-ray scattering to study the mechanism of negative Gaussian membrane curvature generation in lipid membranes by antimicrobial peptides, cell penetrating peptides, neuropeptides, histones, amyloids, viral fusion proteins, and mitochondrial-remodeling proteins.
- Identified unexpected receptor-independent antimicrobial activity in evolutionarily conserved endogenous neuropeptides relevant to defense against systemic infections.
- Discovered the structural basis of Toll-like receptor immunomodulation by nanocrystalline antimicrobial peptide-DNA and -dsRNA complexes in autoimmune diseases like lupus, psoriasis, and systemic sclerosis.
- Characterized the structures of neutrophil extracellular trap-based chromatin immune complexes relevant to TLR9 activation in cell death, autoimmune disease, and chronic inflammation.
- Conducted nanophotonic light-scattering simulations to predict three-dimensional trajectories of spinning bacteria in early biofilm formation, discovering new flagellum-driven surface motility modes.

Department of Physics, UCLA, Los Angeles, CA USA

Rotation Student, Mentor: Dr. Mayank R. Mehta, PhD **2014**

- Developed computational tools to analyze sharp wave-ripple events in the local field potential of neuronal recordings from rat hippocampi and investigated their role in coordinating learning and memory between cerebral hemispheres.

Department of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA USA

Undergraduate Researcher, Mentor: Dr. Stephen L. Mayo, PhD **2010 - 2012**

- Applied high-throughput screening to generate a thermodynamic stability database of the GB1 protein domain.
- Developed computational algorithms for large-scale quantitative analysis of experimental protein stability data to improve the thermodynamic stability calculations and predictions of protein design software.

Peer-Reviewed Publications

1. **Lee, E.Y.**, Lee, C.K., Schmidt, N.W., Jin, F., Lande, R., Curk, T., Frenkel, D., Dobnikar, J., Gilliet, M., Wong, G.C.L. A review of immune amplification via ligand clustering by self-assembled liquid-crystalline DNA complexes. *Adv Colloid Interface Sci*, 232: 17-24 (2016). DOI: 10.1016/j.cis.2016.02.003
   • Invited article for special issue "Polyelectrolytes"
2. Sankhagowit, S., **Lee, E.Y.**, Wong, G.C.L., Malmstadt, N. Oxidation of Membrane Curvature-Regulating Phosphatidylethanolamine Lipid Results in Formation of Bilayer and Cubic Structures. *Langmuir*, 32(10): 2450-2457 (2016). DOI: 10.1021/acs.langmuir.5b04332
3. Realegeno, S., Kelly-Scumpia, K.M., Dang, A.T., Lu, J., Teles, R., Liu, P.T., Schenk, M., **Lee, E.Y.**, Schmidt, N.W., Wong, G.C.L., Sarno, E.N., Rea, T.H., Ochoa, M.T., Pellegrini, M., Modlin, R.L. S100A12 Is Part of the Antimicrobial Network against *Mycobacterium leprae* in Human Macrophages. *PLoS Pathog*, 12(6): e1005705 (2016). DOI: 10.1371/journal.ppat.1005705
4. **Lee, E.Y.**, Fulan, B., Wong, G.C.L., Ferguson, A.L. Mapping membrane activity in undiscovered peptide sequence space using machine learning. *Proc Natl Acad Sci U S A*, 113(48): 13588-13593 (2016). DOI: 10.1073/pnas.1609893113
   • Received press coverage in multiple news outlets
5. Kaplan, A.*, Lee, M.W.*, Wolf, A.J., Limon-Tello, J., Becker, C.A., Ding, M., Murali, R., **Lee, E.Y.**, Liu, G.Y., Wong, G.C.L., Underhill, D.M. Direct Antimicrobial Activity of Interferon-β. *J Immunol*, 198(10): 4036-4045 (2017). DOI: 10.4049/jimmunol.1601226
   *Equal contribution
6. Tursi, S.A., **Lee, E.Y.**, Medeiros, N.J., Lee, M.H., Butter B., Galluccci S., Wilson, R.P., Wong, G.C.L., Tukel C. Bacterial amyloid curli acts as a carrier for DNA to elicit an autoimmune response via TLR2 and TLR9. *PLoS Pathog*, 13(4): e1006315 (2017). DOI: 10.1371/journal.ppat.1006315
7. De Anda, J.*, **Lee, E.Y.***, Lee, C.K.*, Bennett, R.R., Ji, X., Soltani, S., Harrison, M.C., Baker, A.E., Luo, Y., Chou, T., O'Toole, G.A., Armani, A.M., Golestanian, R., Wong, G.C.L. High-Speed "4D" Computational Microscopy of Bacterial Surface Motility. *ACS Nano*, 11(9): 9340-9351 (2017). DOI: 10.1021/acsnano.7b04738
   *Co-first authorship
8. Stolzenberg, E., Berry, D., Yang, D., **Lee, E.Y.**, Kroemer, A., Kaufman, S., Wong, G.C.L., Oppenheim, J., Sen, S., Fishbein, T., Bax, A., Harris, B., Barbut, D., Zasloff, M.A. A Role for Neuronal Alpha-Synuclein in Gastrointestinal Immunity. *J Innate Immun*, 9(5): 456-463 (2017). DOI: 10.1159/000477990
   • Highlighted in *Science* DOI: 10.1126/science.aan7025

- Highlighted in the *Journal of Innate Immunity* DOI: 10.1159/000479653
- *Journal of Innate Immunity* cover article, September 2017 Link

9. **Lee, E.Y.**, Lee, M.W., Fulan, B., Ferguson, A.L., Wong, G.C.L. What can machine learning do for antimicrobial peptides, and what can antimicrobial peptides do for machine learning? *Interface Focus*, 7(6): 20160153 (2017). DOI: 10.1098/rsfs.2016.0153
   - Invited article for special issue "Self-assembled peptides: from nanostructure to bioactivity"
10. Lee, M.W., **Lee, E.Y.**, Lai, G.H. Kennedy, N.W., Posey, A.E., Xian, W., Ferguson A.L., Hill, R.B., Wong, G.C.L. Molecular Motor Dnm1 Synergistically Induces Membrane Curvature To Facilitate Mitochondrial Fission. *ACS Cent Sci*, 3(11): 1156-1167 (2017). DOI: 10.1021/acscentsci.7b00338
    - Received press coverage in multiple news outlets and featured on the front page of the U.S. Department of Energy Office of Science website.
    - *ACS Central Science* cover article, November 2017 Link
11. **Lee, E.Y.**, Takahashi, T., Curk, T., Dobnikar, J., Gallo, R.L., Wong, G.C.L. Crystallinity of Double-Stranded RNA-Antimicrobial Peptide Complexes Modulates Toll-Like Receptor 3-Mediated Inflammation. *ACS Nano*, 11(12): 12145-12155 (2017). DOI: 10.1021/acsnano.7b05234
12. Takahashi, T., Kulkarni, N.N., **Lee, E.Y.**, Zhang, L-J., Wong, G.C.L., Gallo, R.L. Cathelicidin promotes inflammation by enabling binding of self-RNA to cell surface scavenger receptors. *Sci Rep*, 8(1): 4032 (2018). DOI: 10.1038/s41598-018-22409-3
13. Lee, C.K.*, De Anda, J.*, Baker, A.E., Bennett, R.R., Luo, Y., **Lee, E.Y.**, Keefe, J.A., Helali, J.S., Ma, J., Zhao, K., Golestanian, R., O'Toole, G.A., Wong, G.C.L. Multigenerational Memory and Adaptive Adhesion in Early Bacterial Biofilm Communities. *Proc Natl Acad Sci U S A*, 115(17): 4471-4476 (2018). DOI: 10.1073/pnas.1720071115
    *Equal contribution
    - Highlighted in *PNAS* DOI: 10.1073/pnas.1804084115
    - Highlighted in *Nature Physics* DOI: 10.1038/s41567-018-0119-7
    - Highlighted in C&EN News and Newsweek
14. **Lee, E.Y.**, Wong, G.C.L., Ferguson, A.L. Machine learning-enabled discovery and design of membrane-active peptides. *Bioorg Med Chem*, 26(10): 2708-2718 (2018). DOI: 10.1016/j.bmc.2017.07.012
    - Invited article for "Peptide Therapeutics" symposium-in-print
15. Lee, M.W., **Lee, E.Y.**, Wong, G.C.L. What can pleiotropic proteins in innate immunity teach us about bioconjugation and molecular design? *Bioconjug Chem*, 29(7): 2127-2139 (2018). DOI: 10.1021/acs.bioconjchem.8b00176
    - Invited article for special issue "Biomimetic Materials".
16. Lee, M.W., **Lee, E.Y.**, Ferguson, A.L., Wong, G.C.L. Machine Learning Antimicrobial Peptide Sequences: Some Surprising Variations on the Theme of Amphiphilic Assembly. *Curr Opin Colloid Interface Sci*, 38: 204-213 (2018). DOI: 10.1016/j.cocis.2018.11.003
    - Invited article for special issue "Biological Colloids"
17. **Lee, E.Y.**, Lee, M.W., Wong, G.C.L. Modulation of Toll-like receptor signaling by antimicrobial peptides. *Semin Cell Dev Biol* 88: 173-184 (2019). DOI: 10.1016/j.semcdb.2018.02.002
    - Invited article for special issue "Antimicrobial peptides"
18. Yount, N.Y., Weaver, D.C., **Lee, E.Y.**, Lee, M.W., Wang, H., Chan, L.C., Wong, G.C.L., Yeaman, M.R. A Unifying Structural Signature of Eukaryotic α-helical Host Defense Peptides. *Proc Natl Acad Sci U S A* 116(14): 6944-6953 (2019). DOI: 10.1073/pnas.1819250116
19. **Lee, E.Y.***, Zhang, C.*, Di Domizio, J., Jin, F., Connell, W., Hung, M., Malkoff, N., Veksler, V., Gilliet, M., Ren, P., Wong, G.C.L. Helical antimicrobial peptides assemble into protofibril scaffolds that present ordered dsDNA to TLR9. *Nat Commun* 10(1): 1012 (2019). DOI:

10.1038/s41467-019-08868-w *Equal contribution
• Received press coverage in multiple news outlets

20. Lande, R., **Lee, E.Y.**, Palazzo, R., Marinari, B., Pietraforte, I., Santos, G.S., Mattenberger, Y., Spadaro, F., Stefanantoni, K., Iannace, N., Dufour, A.M., Falchi, M., Bianco, M., Botti, E., Bianchi, L., Alvarez, M., Riccieri, V., Truchetet, M.-E., Wong, G.C.L., Chizzolini, C., Frasca, L. CXCL4 assembles DNA into liquid crystalline complexes to amplify TLR9-mediated interferon-α production in systemic sclerosis. *Nat Commun* 10(1): 1731 (2019). DOI: 10.1038/s41467-019-09683-z
• Highlighted in *Science* as an Editor's Choice DOI: 10.1126/science.364.6442.747-e

21. Silvestre-Roig, C.*, Braster, Q.*, Wichapong, K., **Lee, E.Y.**, Teulon, J.M., Berrebeh, N., Winter, J., Adrover, J.M., Santos, G.S., Froese, A., Lemnitzer, P., Ortega-Gomez, A., Chevre, R., Marschner, J., Schumski, A., Winter, C., Perez-Olivares, L., Pan, C., Paulin, N., Schoufour, T., Hartwig, H., Gonzalez-Ramos, S., Kamp, F., Megens, R.T.A., Mowen, K.A., Gunzer, M., Maegdefessel, L., Hackeng, T., Lutgens, E., Daemen, M., von Blume, J., Anders, H.-J., Nikolaev, V.O., Pellequer, J.-L., Weber, C., Hidalgo, A., Nicolaes, G.A.F., Wong, G.C.L., Soehnlein, O. Externalized histone H4 orchestrates chronic inflammation by inducing lytic cell death. *Nature* 569(7755): 236-240 (2019). DOI: 10.1038/s41586-019-1167-6 *Equal contribution
• Received press coverage in multiple news outlets
• Highlighted in *Nature Reviews Cardiology* DOI: 10.1038/s41569-019-0214-1

22. **Lee, E.Y.**, Kulkarni, R.P. Circulating biomarkers predictive of tumor response to cancer immunotherapy. *Expert Rev Mol Diagn* 19(10): 895-904 (2019). DOI: 10.1080/14737159.2019.1659728

23. Maloney, N.J., Zhao, J., Tegtmeyer, K., **Lee, E.Y.**, Cheng, K. Off-label studies on apremilast in dermatology: a review. *J Dermatolog Treat* 31(2): 131-140 (2020). DOI: 10.1080/09546634.2019.1589641

24. Bloom, M.B., Johnson, J., Volod, O., **Lee, E.Y.**, White, T., Margulies, D.R. Improved prediction of HIT in the SICU using an improved model of the Warkentin 4-T System: 3-T. *Am J Surg* 219(1): 54-57 (2020). DOI: 10.1016/j.amjsurg.2019.07.039

25. Dishman, A.F.*, Lee, M.W.*, de Anda, J., **Lee, E.Y.**, He, J., Huppler, A.R., Wong, G.C.L., Volkman, B.F. Switchable Membrane Remodeling and Antifungal Defense by Metamorphic Chemokine XCL1. *ACS Infect Dis* 6(5): 1204-1213 (2020). DOI: 10.1021/acsinfecdis.0c00011 *Equal contribution
• Featured on *PNAS* Journal Club Link

26. Fang, J., Liu, Y.T., **Lee, E.Y.**, Yadav, K. Telehealth solutions for in-hospital communication with patients under isolation during COVID-19. *West J Emerg Med* 21(4): 801-806 (2020). DOI: 10.5811/westjem.2020.5.48165

27. **Lee, E.Y.**, Srinivasan, Y., de Anda, J., Nicastro, L.K., Tukel, C., Wong, G.C.L. Functional reciprocity of amyloids and antimicrobial peptides: Rethinking the role of supramolecular assembly in host defense, immune activation, and inflammation. *Front Immunol* 11: 1629 (2020). DOI: 10.3389/fimmu.2020.01629

28. Yount, N.Y., Weaver, D.C., de Anda, J., **Lee, E.Y.**, Lee, M.W., Wong, G.C.L., Yeaman, M.R. Discovery of Novel Type II Bacteriocins Using a New High-Dimensional Bioinformatic Algorithm. *Front Immunol* 11: 1873 (2020). DOI: 10.3389/fimmu.2020.01873

29. **Lee, E.Y.***, Maloney, N., Cheng, K., Bach, D.Q. Machine learning for precision dermatology: Advances, opportunities, and outlook. *J Am Acad Dermatol* 84(5): 1458-1459 (2021). DOI: 10.1016/j.jaad.2020.06.1019 *Corresponding author
• Featured on the "AI in Healthcare" Blog Link

30. **Lee, E.Y.***, Arzeno, J., Ni, C., Holland, V. Ocular lichen planus treated with lifitegrast. *Int J Dermatol* 60(6): e231-e233 (2021). DOI: 10.1111/ijd.15230 *Corresponding author

31. Bloom, M.B., Noorzad, A., Lin, C., Little, M., **Lee, E.Y.**, Torbati, S. Standing Electric Scooter Injuries: Impact on a Community. *Am J Surg* 221(1): 227-232 (2021). DOI: 10.1016/j.amjsurg.2020.07.020

32. Kirchner, A., Kulkarni, V., Rajkumar, J., Usman, A., Hassan, S., **Lee, E.Y.*** Readability assessment of patient-facing online educational content for pyoderma gangrenosum. In press, *J Am Acad Dermatol* (2021). DOI: 10.1016/j.jaad.2021.04.023 *Corresponding author

33. **Lee, E.Y.**, Chan, L., Wang, H., Lieng J., Hung, M., Srinivasan, Y., Wang, J., Waschek, J., Ferguson, A.L., Lee, K.F., Yount, N.Y., Yeaman, M.R., Wong, G.C.L. PACAP is a pathogen-inducible resident antimicrobial neuropeptide affording rapid and contextual molecular host defense of the brain. *Proc Natl Acad Sci USA* 118(1) e1917623117 (2021). DOI: 10.1073/pnas.1917623117
    - Featured on the cover of *PNAS*, January 2021 Link
    - Highlighted in *PNAS* commentary article "An ancient neuropeptide defends the brain against infection" *Proc Natl Acad Sci U S A* 118(5) e2023990118 (2021) DOI: 10.1073/pnas.2023990118

34. Kirchner, A., Patel, M., Kulkarni, V., Usman, A., **Lee, E.Y.*** Quantitative readability analysis of online patient educational materials for dermatofibrosarcoma protuberans . In press, *Int J Dermatol* (2021). DOI: 10.1111/ijd.15722 *Corresponding author

35. Xian, W., Hennefarth, M.R., Lee, M.W., Do, T., **Lee, E.Y.**, Alexandrova, A., Wong, G.C.L. Histidine Mediated Ion Specific Effects Enable Salt Tolerance of a Pore Forming Marine Antimicrobial Peptide. In revision, Angewandte Chemie (2022).

36. **Lee, E.Y.**, Zhang, Y., Di Domizio, J., Curk, T., Abbaspour, L., Berezhnoy, N., Fazli, H., Nordenskiold, L., Golestanian, R., Dobnikar, J., Leforestier, A., Gilliet, M., Wong, G.C.L. Antimicrobial peptides restructure externalized chromatin components from cell death into liquid crystalline columnar complexes that amplify inflammation via TLR9. In preparation (2022).

Invited Talks

1. **Lee, E.Y.** Machine learning and membrane remodeling activity. Aspen Center for Physics 2018 Winter Conference: "Data-driven Discovery and Design in Soft and Biological Materials", Aspen, CO, January 7-13, 2018 [Oral]

2. **Lee, E.Y.** NETs generate immune complexes to amplify TLR9-based inflammation in psoriasis. The National Psoriasis Foundation Presents More Than Skin Deep: Frontiers in Psoriatic Disease, Research and Treatments. CNSI, UCLA, Los Angeles, CA, June 23, 2018 [Oral]

3. **Lee, E.Y.**, Zhang, C., Di Domizio, J., Lande, R., Frasca, L., Gilliet, M., Ren, P., Wong, G.C.L. Host defense peptides amplify TLR9-mediated inflammation in autoimmune diseases by scaffolding dsDNA into spatially-periodic nanocrystals. Keystone Symposia on Innate Immune Receptors: Roles in Immunology and Beyond, Taipei, Taiwan, March 10-14, 2019 [Oral and Poster] Link

4. **Lee, E.Y.** Nanocrystal immune sensing drives autoimmunity. UCLA-Caltech MSTP Interview Day, October 10, 2019 [Oral]

Presented Abstracts

1. **Lee, E.Y.**, Nisthal, A., Mayo, S.L. Application of high-throughput screening to the generation of a thermodynamic stability database of the GB1 protein domain. SURF Caltech SFP Abstract Book (2011). Summer Undergraduate Research Fellowship Seminar, Caltech, October 15, 2011 [Oral] Link

2. **Lee, E.Y.**, Xian, W., Wong, G.C.L. Improving design rules for antimicrobial peptides using bioinformatics. GATP-BWF-SIB Joint Research Symposium, UCLA, May 26, 2015 [Oral]

3. **Lee, E.Y.**, Fulan, B., Wong, G.C.L., Ferguson, A.L. Mapping the undiscovered sequence space of antimicrobial peptides using machine learning: A taxonomy of membrane-active peptides. Big Data-BWF-CHIP-GATP-SIB Joint Research Symposium, UCLA, April 28, 2016 [Poster]

4. **Lee, E.Y.**, Fulan, B., Wong, G.C.L., Ferguson, A.L. Mapping the undiscovered sequence space of antimicrobial peptides using machine learning: A taxonomy of membrane-active peptides. Gordon Research Conference on Antimicrobial Peptides, Ventura, CA, February 26 - March 3, 2017 [Poster]
5. **Lee, E.Y.**, Takahashi, T., Curk, T., Dobnikar, J., Gallo, R.L., Wong, G.C.L. Liquid crystalline ordering of antimicrobial peptide-RNA complexes controls TLR3 activation. *Journal of Investigative Dermatology*, 137(5): S12. DOI: 10.1016/j.jid.2017.02.083. 2017 Society for Investigative Dermatology Annual Meeting, Portland, OR, April 26-29, 2017 [Oral and Poster].
6. **Lee, E.Y.**, Di Domizio, J., Curk, T., Abbaspour, L., Berezhnoy, N., Fazli, H., Nordenskiold, L., Dobnikar, J., Gilliet, M., Wong, G.C.L. Neutrophil extracellular traps and necrotic cell death: Structural basis of chromatin-mediated inflammation in psoriasis. 2017 National Psoriasis Foundation Research Symposium, Chicago, IL, August 3-5, 2017 [Poster]
7. **Lee, E.Y.**, Takahashi, T., Curk, T., Dobnikar, J., Gallo, R.L., Wong, G.C.L. Crystallinity of dsRNA-AMP immune complexes modulates TLR3-mediated inflammation. 2017 National Psoriasis Foundation Research Symposium, Chicago, IL, August 3-5, 2017 [Poster]
8. **Lee, E.Y.**, Di Domizio, J., Curk, T., Abbaspour, L., Berezhnoy, N., Fazli, H., Nordenskiold, L., Dobnikar, J., Gilliet, M., Wong, G.C.L. NETs generate immune complexes to amplify TLR9-based inflammation in psoriasis. 2017 National Psoriasis Foundation Research Trainee Symposium, Portland, OR, October 11-12, 2017 [Oral and Poster]
9. **Lee, E.Y.**, Fulan, B., Wong, G.C.L., Ferguson, A.L. Mapping membrane activity in undiscovered peptide sequence space using machine learning. 12th Annual Peptide Therapeutics Symposium, The Salk Institute for Biological Studies, La Jolla, CA, October 26-27, 2017 [Poster] Link
10. **Lee, E.Y.**, Zhang, C., Di Domizio, J., Jin, F., Connell, W., Hung, M., Malkoff, N., Veksler, V., Gilliet, M., Ren, P., Wong, G.C.L. Design Rules for Immunomodulation by Host-Defense Peptides. APS March Meeting 2018, Los Angeles, CA, March 5-9, 2018 [Oral] Link
11. **Lee, E.Y.**, Takahashi, T., Curk, T., Dobnikar, J., Gallo, R.L., Wong, G.C.L. Crystallinity of dsRNA-Antimicrobial Peptide Complexes Modulates TLR3-Mediated Inflammation. APS March Meeting 2018, Los Angeles, CA, March 5-9, 2018 [Oral] Link
12. **Lee, E.Y.**, Leforestier, A., Di Domizio, J., Curk, T., Abbaspour, L., Berezhnoy, N., Fazli, H., Nordenskiold, L., Dobnikar, J., Gilliet, M., Wong, G.C.L. NETs generate structured antimicrobial peptide-nucleosome immune complexes with inter-DNA spacings optimal for TLR9 activation. *Journal of Investigative Dermatology*, 139(5): S3. DOI: 10.1016/j.jid.2019.03.089. 2019 Society for Investigative Dermatology Annual Meeting, Chicago, IL, May 8-11, 2019 [Oral and Poster]
13. **Lee, E.Y.**, Zhang, C., Di Domizio, J., Takahashi, T., Curk, T., Dobnikar, J., Gallo, R.L., Gilliet, M., Ren, P., Wong, G.C.L. LL37 antimicrobial peptides amplify inflammation in psoriasis by assembling into protofibril scaffolds that present ordered nucleic acids to TLR9 and TLR3. *Journal of Psoriasis and Psoriatic Arthritis* 4(3): 159-160. DOI: 10.1177/2475530319855519. 2019 NPF Cure Symposium, Seattle, WA, May 30-31, 2019 [Poster]
14. **Lee, E.Y.**, Lande, R., Chizzolini, C., Wong, G.C.L., Frasca, L. CXCL4-DNA immune complexes drive inflammation in systemic sclerosis by amplifying TLR9-mediated interferon-α production. *Annals of Translational Medicine* 9(5): AB013 (2021). DOI: 10.21037/atm.2021.AB013. Rheumatologic Dermatology Society Annual Meeting, Atlanta, GA, November 9, 2019 [Oral]
15. **Lee, E.Y.**, Chan, L., Wang, H., Lieng J., Hung, M., Srinivasan, Y., Wang, J., Waschek, J., Ferguson, A.L., Lee, K.F., Yount, N.Y., Yeaman, M.R., Wong, G.C.L. Resident neuropeptide PACAP mediates potent cell-free infection defense in tissues. *Journal of Investigative*

Dermatology, 140(7): S40. DOI: 10.1016/j.jid.2020.03.331. 2020 Society for Investigative Dermatology Annual Meeting, Scottsdale, AZ, May 13-16, 2020 [Poster]. Meeting cancelled due to COVID-19.

Contributed Abstracts

1. **Lee, E.Y.**, Xian, W., Wong, G.C.L. Species-specific antibiotics from design rules for antimicrobial peptides. UCLA Medical Scientist Training Program Annual Report (2013).
2. Yule, A.C., Plurad, D., **Lee, E.**, Bricker, S., Bongard, F., Neville, A., Putnam, B., Kim, D.Y., Harbor-UCLA Medical Center. Clamshell Thoracotomy: Underutilized or Overly Aggressive? Annual Meeting of the American Association for the Surgery of Trauma, Philadelphia, PA, Sept. 10-13, 2014. Link
3. **Lee, E.Y.**, Mehta, M. Detection and analysis of sharp wave-ripples in local field potential recordings from rat hippocampi. UCLA Medical Scientist Training Program Annual Report (2014).
4. Tursi, S., **Lee, E.**, Lee, M., Medeiros, N., Wilson, P., Galluccci S., Wong, G.C., Tukel C. Bacterial amyloid curli acts as a carrier for DNA to elicit an autoimmune response via TLR2 and TLR9. *J Immunol* May 1, 2017, 198 (1 Supplement) 77.12. AAI Immunology Annual Meeting, Washington, D.C., May 12-16, 2017. Link
5. Tursi, S., **Lee, E.**, Medeiros, N.J., Lee, M.H., Buttaro, B., Galluccci S., Wong, G.C., Tukel C. Bacterial amyloid curli acts as a carrier for DNA to elicit an autoimmune response via TLR2 and TLR9. ASM Microbe 2017, Atlanta, GA, June 7-11, 2017.
6. De Anda, J., **Lee, E.Y.**, Lee, C.K., Bennett, R.R., Ji, X., Soltani, S., Harrison, M.C., Baker, A.E., Luo, Y., Chou, T., O'Toole, G.A., Armani, A.M., Golestanian, R., Wong, G.C.L. High-Speed "4D" Computational Microscopy of Bacterial Surface Motility. APS March Meeting 2018, Los Angeles, CA, March 5-9, 2018. Link
7. Takahashi, T., Kulkarni, N.N., **Lee, E.Y.**, Zhang, L-J., Wong, G.C.L., Aiba, S., Gallo, R.L. Discovery of a receptor-dependent step in cathelicidin activation of inflammation identifies a novel therapeutic target for psoriasis and rosacea. *Journal of Investigative Dermatology*, 138(5): S151. DOI: 10.1016/j.jid.2018.03.898. 2018 International Investigative Dermatology Meeting, Orlando, FA, May 16-19, 2018.
8. Srinivasan, Y., **Lee, E.Y.**, Lai, G.H., Schmidt, N.W., Degrado, W.F., Wong, G.C.L. Mechanism of amyloid-mediated cellular toxicity via mitochondrial disruption corresponds to membrane curvature generation. HSSEAS Undergraduate Research Week Poster Day, UCLA, May 22, 2018. Link
9. Braster, Q., Silvestre-Roig, C., Wichapong, K., **Lee, E.Y.**, Teulon, J.M., Adrover, J.M., von Blume, J., Nikolaev, V.O., Pellequer, J.-L., Hidalgo, A., Nicolaes, G.A.F., Wong, G.C.L., Soehnlein, O. Externalized histone H4 orchestrates chronic inflammation by inducing lytic cell death. *European Journal of Clinical Investigation* 49(S1): 62-62 (2019). DOI: 10.1111/eci.13108. 53rd Annual Scientific Meeting of the European Society for Clinical Investigation "The Clocks of Metabolism and Disease", Coimbra, Portugal, May 22-24th, 2019
10. Bloom, M.B., Noorzad, A., Lin, C., Little, M., **Lee, E.Y.**, Torbati, S. Electric Scooters: Impact on a Community. Annual Meeting of the American Association for the Surgery of Trauma, Dallas, TX, Sept. 18-21, 2019. Link
11. Dishman, A.F., Tyler, R., Fox, J., Lee, M., de Anda, J., **Lee, E.**, Wong, G.C. Evolution and Functional Advantages of Protein Metamorphosis. *Biophysical Journal*, 118(3): 24a (2020). DOI: 10.1016/j.bpj.2019.11.310. 2020 Biophysical Society Annual Meeting, San Diego, CA, Feb. 15-19, 2020.

Other Presentations

1. Predicting the three-dimensional tilt states of bacteria. Physical Microbiology Meeting, UC Irvine, February 24, 2016 [Oral]
2. Immunogenicity of nucleosome core particles explained by altered chromatin wrapping states. Multidisciplinary Immunology Seminar Series, UCLA, April 6, 2016 [Oral]
3. Mapping membrane activity in undiscovered peptide sequence space using machine learning. UCLA-Caltech MSTP Research Conference 2016, UCLA, September 9, 2016 [Poster]
4. Mapping membrane activity in undiscovered peptide sequence space using machine learning. MSTP Monday Tutorial Series, UCLA, October 17, 2016 [Oral]
5. Soft matter physics meets innate immunity: A new understanding of autoimmune diseases. Institute for Molecular Engineering, de Pablo Lab, University of Chicago, August 2, 2017 [Oral]
6. Liquid crystalline ordering of antimicrobial peptide-RNA complexes controls TLR3 activation. UCLA-Caltech MSTP Research Conference 2017, UCLA, September 8, 2017 [Poster]
7. Neutrophil extracellular traps and necrotic cell death: Structural basis of chromatin-mediated inflammation in psoriasis. UCLA-Caltech MSTP Research Conference 2017, UCLA, September 8, 2017 [Poster]
8. Discovery and Design of Multifunctional Membrane-Active and Immunomodulatory Peptides and Proteins. Dissertation Defense, UCLA, December 12, 2017 [Oral]
9. Soft matter physics meets innate immunity: Interrogating the immunomodulatory mechanisms of host-defense peptides. UCLA Dermatology Research-In-Progress Seminar, UCLA, May 29, 2018 [Oral]
10. Nanocrystalline immune complexes modulate Toll-like receptor-mediated inflammation in autoimmune diseases. UCLA-Caltech MSTP Research Conference 2018, UCLA, September 7, 2018 [Oral]
11. Host defense peptides amplify TLR9-mediated inflammation in autoimmune diseases by scaffolding dsDNA into spatially-periodic nanocrystals. UCLA-Caltech MSTP Research Conference 2019, UCLA, September 13, 2019 [Poster]
12. NETs generate structured antimicrobial peptide-nucleosome immune complexes with inter-DNA spacings optimal for TLR9 activation. UCLA-Caltech MSTP Research Conference 2019, UCLA, September 13, 2019 [Poster]
13. Nanocrystal immune sensing drives autoimmunity. Department of Rheumatology, Cedars-Sinai Medical Center, October 11, 2019 [Oral]

Leadership, Teaching, and Volunteer Experiences

David Geffen School of Medicine, UCLA, Los Angeles, CA USA

MS4 MSTP Representative, DGSOM Medical Education Committee (MEC) **2019 - 2020**

• I advocate on behalf of the UCLA-Caltech MSTP student body to shape the upcoming redesigned DGSOM medical school curriculum. I was also invited to join the Clerkships Planning subcommittee to provide input into reentry flexibility for MSTP students.

Co-President, Delta Chapter of the AΩA Honor Medical Society at UCLA **2019 - 2020**

• I coordinate applications for the AΩA Research Scholarships and Community Service Grants, and assist in planning chapter events and AΩA Grand Rounds.

Co-Chair, UCLA-Caltech MSTP Education Committee **2017 - 2020**

• Planned the 2018 and 2019 Annual UCLA-Caltech MSTP Research Conferences, selected keynote speakers and scientific themes (September 2018: synthetic biology in medicine, September 2019: machine learning in medicine), and organized the weekly Monday night MSTP research tutorial.

Committee Member, DGSOM IT Prioritization Committee (DGITPC) **2016 - 2020**
• I work directly with the Deans of the School of Medicine, physicians, faculty, and IT specialists on a committee to spearhead new information-technology and HIPAA-compliant security initiatives for the DGSOM and the UCLA Health System. I represent students from both the medical and graduate schools.

Medical Student Peer Tutor, DGSOM Tutoring Program **2014 - 2020**
• I tutor medical students and taught organized review sessions for all aspects of the MS1, MS2, and MS3 curriculum, including microbiology, immunology, physiology, pathology, pharmacology, and all MS3 clinical clerkships. I also tutor students specifically for USMLE Step 1.

MSTP Mentor **2012 - Present**
• I mentor aspiring MD/PhD applicants from various schools towards successful acceptances into Medical Scientist Training Programs (MSTPs) across the country, including several DGSOM MSTP students (Kristie Yu, Alexander Kim). I also provide mentorship to more junior current MSTP students with respect to grant writing, teaching, and publication strategy.

Co-Director, Medical Innovations Interest Group **2013 - 2014**
• Organized a seminar series introducing medical students to translational opportunities beyond clinical medicine, including commercialization of basic research, protection of intellectual property, and entrepreneurship. Conducted in collaboration with the Business of Science Center at UCLA.

Co-Director, Student Interest Group in Neurology **2013 - 2014**
• Organized a specialized interest group exposing medical students to current advances in neuroscience and their applications to clinical neurology.

Medical Student Team Member, Advancing Bioengineering Innovations (ABI) **2013**
• I collaborated with a multidisciplinary team of engineering students, law students, and business students to design a prototype for a novel fog-free self-cleaning laparoscopic camera for use in laparoscopic surgeries. My role was to advise the team on decisions requiring medical knowledge and clinical considerations.

Business of Science Center, UCLA, Los Angeles, CA USA

Team Leader, Inventathon **2013**
• I led a team of computer scientists, medical students, and electrical engineers to develop a prototype solution for an unmet medical need during a 24 hour hackathon. My team won 3rd Prize for "Hemodynamic", a pill-based tool for non-invasive monitoring of gastrointestinal bleeding.

Department of Bioengineering, UCLA, Los Angeles, CA USA

Graduate Student Research Mentor **2014 - 2018**
• Mentored 12 undergraduate and graduate students in my laboratory on experimental design and execution, scientific writing, and career planning. Most mentees received research units, achieved co-authorship on my publications, and went onto medical or graduate school after graduation. Mentees include Xiang Ji (Sun Yat-sen University BS, UCSD PhD), William Connell (UCLA BS, UCSF PhD), Jennifer Wang (UCLA BS, MD), Juelline Lieng (UCLA BS, UCSD M.S.), Sandra Zarmer (UCLA BS, UNC PhD), Mandy Hung (UCLA BS, Boston U. M.S.), Cole Malkoff (UCLA BS), Yashes Srinivasan (UCLA BS), Veronica Veksler (UCLA BS), Giancarlo Santos (UCLA BS, PhD), Deepti Kannan (Stanford BS, MIT PhD), and Jaime de Anda (UCLA BS, PhD).

Speaker, Career Mentorship Panel, Biomedical Engineering Society (BMES) **2016 - 2018**
• Spoke at career mentorship panels and pre-medical student information sessions, and provided mentorship to students who were seeking careers in medicine after studying engineering.

Speaker, Pre-Medical Student Panel, Neuroscience Undergraduate Society (NUS) **2016**
• Spoke at career mentorship panels for neuroscience undergraduate students interested in applying to medical school or other pre-health careers.

Founder, Multidisciplinary Immunology Seminar Series **2016**
• I founded the inaugural edition of this multi-departmental seminar series aimed at fostering on-campus scientific collaboration at the intersection of immunology, chemistry, physics, and mathematics. Speakers primarily included graduate students and postdoctoral scholars from various research groups at UCLA.

UCLA Cross-disciplinary Scholars in Science and Technology Summer Program (Link), Los Angeles, CA USA

Co-Mentor **2015**
• Mentored physics undergraduate exchange student Xiang Ji (Sun Yat-sen University) on COMSOL simulations of tilted bacteria, optics, and image processing. This led to his co-authorship on my co-first-author publication in *ACS Nano*,"High-Speed "4D" Computational Microscopy of Bacterial Surface Motility".

Medigram (Link), Los Altos, CA USA

Lead Consultant at UCLA **2013 - 2015**
• Helped to trial a novel iOS-based physician messaging tool to improve quality of patient care and physician-physician communication, and worked as a student liaison with UCLA Neurosurgery to roll out a live pilot study.

California Institute of Technology, Pasadena, CA USA

University Tutor **2010 - 2012**
• Tutored Caltech peers in undergraduate and graduate level physics, organic chemistry, biology, and mathematics, spanning over 10 courses.

Resident Disc Jockey **2008 - 2012**
• Played for multiple campus-wide school-sanctioned parties as well as smaller events.

Southern California State Science Olympiad (Link), Los Angeles, CA USA

Event Coordinator **2008 - Present**
• I proctor various building and study-based Science Olympiad events at the middle school and high school levels, and have helped organize the annual Los Angeles Regional and Southern California State competitions for the last 11 years. Including competition years, I have been involved with Science Olympiad for 17 years.

Junior Blind of America (now Wayfinder Family Services), Los Angeles, CA USA

Volunteer **2006 - 2012**
• The Junior Blind of America (JBA) is a nonprofit organization dedicated to providing specialized services for blind and visually impaired individuals. I have volunteered as a counselor-in-training at JBA's Camp Bloomfield and at their annual Junior Blind Olympics.

Professional Memberships

- Alpha Omega Alpha (AΩA)
- American Physical Society (APS)
- National Psoriasis Foundation (NPF)
- Society for Investigative Dermatology (SID)
- Rheumatologic Dermatology Society (RDS)
- Sigma Xi (ΣΞ)
- Science Olympiad

- Tau Beta Pi

Skills

- Laboratory Skills: Small-angle X-ray scattering, protein expression, protein engineering, high-throughput screening, light microscopy, electron microscopy, mammalian cell culture, antimicrobial assays, immune stimulation assays, ELISA
- Computational Skills: Mathematica, Matlab, LaTeX, R, Java, Python, Objective C, COMSOL Multiphysics, VMD
- Other Skills: Adobe Illustrator, Adobe Photoshop, Adobe InDesign
- Languages: English (fluent), Mandarin Chinese (proficient), Spanish (proficient)

Hobbies and Interests

- Speedcubing and geometric puzzles
- Food photography and molecular gastronomy
- Sabermetrics and sports analytics
- DJing

References

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