

CURRICULUM VITAE

Shaun W. Lee

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Adjunct Associate Professor, Department of Biological Sciences
University of Notre Dame
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Education

- 1998-2003 **Oregon Health and Science University**
Ph.D., Molecular Microbiology and Immunology
Advisor: Magdalene So
- 1989-1994 **University of California Berkeley**
Candidate, *Simultaneous Degree Program*
B.A., Molecular Cell Biology, emphasis in Neurobiology
B.A., Architecture

Positions and Employment

- 1991 Undergraduate Research Assistant, UC Berkeley
- 1995 Co-coordinator, UCI-Markey Program in Human Neurobiology
- 1995 Research Assistant, Laboratory for Neurovirology and Microbial Pathogenesis, University of California, Irvine. Advisor: W. Ian Lipkin
- 1998 Graduate researcher, Department of Molecular Microbiology and Immunology, Oregon Health Sciences University, Portland, OR. Advisor: Magdalene So
- 2000 Visiting Scientist, Department of Cell Biology, UNC Chapel Hill, Chapel Hill, NC. Advisor: Sharon Milgram
- 2003 Postdoctoral Fellow, So Lab, Department of Molecular Microbiology and Immunology, Oregon Health and Science University, Portland, OR. Advisor: Magdalene So.
- 2004 Postdoctoral Fellow, HHMI, Department of Pharmacology, School of Medicine, University of California San Diego, San Diego, CA. Advisor: Jack Dixon.
- 2009 Assistant Professor, Department of Biological Sciences, Univ of Notre Dame, Notre Dame, IN
- 2009 Member, Center for Rare and Neglected Diseases, Univ of Notre Dame, Notre Dame, IN
- 2009 Faculty member, Eck Institute for Global Health, Univ of Notre Dame, Notre Dame, IN
- 2010 Adjunct Faculty, Poverty Studies Interdisciplinary Minor Program, Univ of Notre Dame
- 2012 Adjunct Faculty, W.M. Keck Center for Transgene Research
- 2015 Associate Professor, Department of Biological Sciences, Univ of Notre Dame, Notre Dame, IN
- 2016 Monahan Family Associate Professor, Department of Biological Sciences, Univ of Notre Dame, Notre Dame, IN
- 2019 Visiting Research Professor, Department of Biomedical Engineering, University of California Irvine. Host: Professor Abe Lee.
- 2020 Faculty member and Theme Leader, Berthiaume Institute for Precision Health
- 2020 Co-founder, Co-director, Minor Program in Patient Advocacy, University of Notre Dame

- 2024 Associate Professor, Kravis Department of Integrated Science, Claremont McKenna College
2024 Kravis Associate Professor of Integrated Science

Honors and Awards

- 2022 Shilts-Leonard Teaching Award in the College of Science
2016 Rev. Edmund P. Joyce, C.S.C. Award for Excellence in Undergraduate Teaching
2015 State of the Art Speaker, XVth International Workshop on Molecular and Cellular Biology of Plasminogen Activation, Rome, Italy.
2011 NIH Innovator Award
2011 Faculty Spotlight, Centers for Rare and Neglected Diseases
2006 UCSD Heme and Blood Proteins Training Fellowship
2004 NCI Oncogenesis and Growth Regulation Postdoctoral Fellow
2004 Commencement Speaker, OHSU School of Medicine
2003 Sears Award in Molecular Microbiology and Immunology
2001 Ruth L. Kirschstein NIH Casey Eye Institute Molecular Biology Training Grant
2000 Tartar Trust Fellowship, OHSU
1997 New Computing Initiative Grant, University of California, Irvine
1994 Dean's List, University of California Berkeley
1989 Bank of America Award in Biological Science

Memberships/Service

- American Society for Microbiology (1998-Current)
American Chemical Society (2010-Current)
Biochemical Society (2011-Current)
Editorial Board, Current Drug Targets (2013-Current)
Editorial Advisory Board, Biochem Journal. (2011-Current)
Editorial Board, Frontiers in Microbiology (2015-Current)
Graduate Curriculum Committee (2009-2016)
Graduate Rotation Committee (2011-2015)
Graduate Admissions Committee (2013-2017; 2019-Current)
Departmental External Review Committee (2010)
Faculty member, Poverty Studies Interdisciplinary Minor (2009-Current)
Faculty member, Eck Institute for Global Health (2009-Current)
Faculty member, Boler-Parseghian Center for Rare and Neglected Diseases (2009-Current)
Faculty member, Chemistry-Biology-Biochemistry-Interface (CBBI) Program (2010-Current)
CBBI Fellowship Advisory Committee (2011-2022)
Faculty mentor, Building Bridges Program (2013-Current)
Reviewer, European Research Council, ERC Consolidator Grant (2014)
Co-chair, Undergraduate Curriculum Committee (2016-2020)
Cluster chair, Integrated Biomedical Sciences Program (2017-Current)
Faculty advisor, Biology Graduate Student Organization (2017-Current)
Faculty advisor, Integrated Biomedical Sciences Graduate Student Organization (2019-Current)
Member, Advanced Diagnostics and Therapeutics Strategic Planning Committee (2018-2021)
Faculty advisor, Science and Engineering Scholars Program (2018-2021)
Steering committee member, Biophysics Graduate Program (2019-Current)
Senate Faculty, University of Notre Dame (2018-2022)
Reviewer, Health Research Council New Zealand, Infectious Disease (2020)
Co-founder, Co-Director, Minor Program in Patient Advocacy, University of Notre Dame (2020-Current)

Theme leader, Berthiaume Institute for Precision Health (2020-Current)
Session chair, Gordon Conference, Plasminogen Activation and Extracellular Proteolysis (2016, 2022)
External reviewer, Tenure Promotion Candidate, University of Arizona
Review editor, Frontiers in Cellular and Infection Microbiology, Section Microbial Vaccines (2022-Current)
Reviewer, NIH Study Section, Special Emphasis Panel, ZRG1-MGG-J NIGMS MIRA Awards (2023).

Contributions to Science

1. My graduate work at Oregon Health and Science University under the direction of Dr. Maggie So focused on host cell signaling mechanisms of *Neisseria gonorrhoeae* infection. In particular, I discovered that a cellular receptor for Neisserial pili was phosphorylated upon infection, and that a particular Src-family kinase was responsible for infection. This was the first demonstration that pilus attachment to host cells by bacteria could induce host signaling cascades. Inhibition of the host kinase responsible for the phosphorylation event reduced infectivity by 50%. Furthermore, I discovered that pilus retraction exerts physical force on the host membrane, and that this recruits signaling machinery that confers survival advantages for the pathogen.

Lee, S.W., Bonnah, R.A., Higashi, D.L., Atkinson, J.P., Milgram, S.L., and So, M. CD46 is phosphorylated at tyrosine 354 upon infection of epithelial cells by *Neisseria gonorrhoeae*. 2002. *J Cell Biol*, 156(6): 951-957.

* Faculty of 1000 Biology Evaluation: Rappuoli, R. Recommended rating factor.

2. My postdoctoral work in Dr. Jack Dixon's lab at UCSD led to the discovery of an entirely new class bacterial peptide compounds that are produced by a diverse array of organisms, including several important human bacterial pathogens such as *Group A Streptococcus*, *Staphylococcus*, *Listeria*, and *Clostridium botulinum*. I discovered a highly conserved biosynthetic gene cluster that is responsible for the synthesis of a large class of bacteriocins, now known as thiazole-oxazole-modified microcins (TOMMs). These clusters contain genes that encode a precursor and three conserved enzymes that work in concert to modify the precursor into an active toxin. Using the toxin precursor peptide and modifying enzymes from the human pathogen *Streptococcus pyogenes*, I demonstrated for the first time the *in vitro* reconstitution of Streptolysin S (SLS) activity. Although the activity of Streptolysin S had been known for approximately a hundred years, **this work provided the first molecular insight into the chemical structure of Streptolysin S.**

Lee, S.W., Mitchell, D.A., Markley, A.L., Hensler, M.E., Gonzalez, D., Wohlrab, A., Dorrestein, P.C., Nizet, V., Dixon, J.E. Discovery of a Widely Distributed Toxin Biosynthetic Gene Cluster. 2008. *Proc. Natl. Acad. Sci. U.S.A.* 105:(15), 5879-84.

* Faculty of 1000 Biology Evaluation: Roepe, P., Georgetown University. Rating: 10, Exceptional

* Walsh, C.T., and Nolan, E.M. Commentary in PNAS, April 15, 2008.

3. During my postdoctoral period, I also participated in a multicenter collaborative effort with the J. Craig Venter Institute to analyze over 8 million genomic sequences collected as part of the Global Ocean Survey initiative. Our findings yielded incredible insights into the vast diversity of protein families in microorganisms as a result of this metagenomic survey of the Oceans. Moreover, it reinforced the important notion that metagenomics acceleration will allow emerging genomes to be uncovered at a linear pace. This work was published as a volume of papers in a dedicated issue of *PLOS Biology*.

Yooseph S., Sutton G, Rusch DB, Halpern AL, Williamson SJ, Remington K, Eisen JA, Heidelberg KB, Manning G, Li W, Jaroszewski L, Cieplak P, Miller CS, Li H, Mashiyama ST, Joachimiak MP, van Belle C, Chandonia JM, Soergel DA, Zhai Y, Natarajan K, **Lee S**, Raphael BJ, Bafna V, Friedman R,

Brenner SE, Godzik A, Eisenberg D, Dixon JE, Taylor SS, Strausberg RL, Frazier M, Venter JC. The Sorcerer II Global Ocean Sampling expedition: expanding the universe of protein families. 2007. *PLoS Biol.* Mar;5(3):e16.

**Featured in BBC News. Genome Pioneer Fishes for Diversity. March 27, 2007.*

4. A current area of research in our lab focuses on host-microbe dynamics of the major human bacterial pathogen, Group A *Streptococcus* (GAS). We have established several novel modalities to more precisely study the mechanisms by which GAS exploits its host environment to cause disease, including precise live imaging of sustained bacterial-host interactions, and more accurate models of *in vitro* infections using 2-D and 3-D engineered cellular systems. Our recent studies on the analysis of host plasminogen activation by GAS was the first of its kind to use a combined *in situ*-based cellular model system of fibrin clot-in epithelial wound to visualize the progress of GAS pathogenesis by real-time live imaging. It is our future strategy to use our findings to ultimately identify targets for altering the host response GAS as a possible means to treat the progress of Group A Streptococcal invasive outcomes.

Higashi DL, Biais N, Donahue DL, Mayfield JA, Tessier C, Rodriguez K, Ashfeld B, Luchetti J, Ploplis VA, Castellino FJ, **Lee, SW**. Activation of band 3 mediates Group A *Streptococcus* Streptolysin S-based beta-haemolysis. *Nature Microbiology*. 2016; (DOI: 10.1038) NMICROBIOL2015.4.

**Featured on Cover.*

Vu HM, Hammers DE, Liang Z, Nguyen GL, Benz ME, Moran TE, Higashi DL, Park CJ, Ayinuola YA, Donahue DL, Flores-Mireles AL, Ploplis VA, Castellino FJ, **Lee SW**. Group A *Streptococcus*-Induced Activation of Human Plasminogen Is Required for Keratinocyte Wound Retraction and Rapid Clot Dissolution. *Front Cardiovasc Med*. 2021 Jun 10;8:667554.

5. Our lab has also continued to investigate the mechanisms of bacteriocin production and their use as novel antimicrobial compounds. Bacteriocins are a group of genetically encoded and ribosomally produced peptides that exist in operons containing the genes necessary for its assembly and export. Our recent study provided the first approach using rational design to systematically discover reductive variants of a novel bacteriocin homologue, by producing simple, linear variants of the parent peptide that retain and improve activity. We identified nine synthetic compounds with broad and potent antimicrobial activities with minimal inhibitory concentrations (MIC) as low as 250 nM against *E. coli*, *P. aeruginosa*, *X. axonopodis*, and *S. pyogenes* with minimal cytotoxicity to mammalian cells. These general strategies provide a direct framework for improving the antimicrobial activity of natural bacteriocins as well as simplifying their synthesis for antimicrobial drug development.

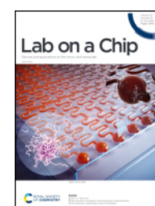
Fields FR, Manzo G, Hind CK, Janardhanan J, Foik IP, Carmo Silva PD, Balsara RD, Clifford M, Vu HM, Ross JN, Kalwajtys VR, Gonzalez AJ, Bui TT, Ploplis VA, Castellino FJ, Siryaporn A, Chang M, Sutton JM, Mason AJ, **Lee SW**. Synthetic antimicrobial peptide tuning permits membrane disruption and interpeptide synergy. *ACS Pharm & Transl Sci*. 2020 Jun 12;3(3):418-424. doi: 10.1021/acsptsci.0c00001. **Cover art selected for issue.*

Fields FR, Carothers KE, Balsara RD, Ploplis VA, Castellino FJ, and **Lee, SW**. Rational design of synsafencin, a novel antimicrobial peptide derived from the circular bacteriocin, safencin AS-48. *Journal of Antibiotics*. 2018;71(6):592-600. doi: 10.1038/s41429-018-0032-4.

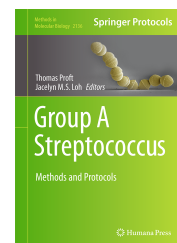
Peer-reviewed Publications

1. Vu HM, Zhong L, Bao Y-J, Carles PG, Keane JC, Cerney MG, Dahnke CN, Flores-Mireles AL, Ploplis VA, Castellino FJ, **Lee SW**. Group A *Streptococcus* remains viable inside fibrin clots and gains access to human plasminogen for subsequent fibrinolysis and dissemination. *BioRxiv*. doi.org/10.1101/2023.10.04.560727. 2023.
2. Olesk J, Donahue D, Ross J, Sheehan C, Bennett Z, Armknecht K, Kudary C, Hopf J, Ploplis VA, Castellino FJ, **Lee SW**, Nallathamby P. Peptide-conjugated phage-mimicking nanoparticles exhibit potent antibacterial action against *Streptococcus pyogenes* in murine wound infection models. *ChemRxiv*. Cambridge: Cambridge Open Engage; 2023.
3. Hammers DE, Donahue DL, Tucker ZD, Ashfeld BL, Ploplis VA, Castellino FJ, **Lee SW**. Streptolysin S targets the sodium-bicarbonate cotransporter NBCn1 to induce inflammation and cytotoxicity in human keratinocytes during Group A Streptococcal infection. *Front Cell Infect Microbiol*. 2022 Nov 1;12:1002230.
4. Corman HN, Ross JN, Fields FR, Shoue D, McDowell MA, **Lee SW**. Rationally Designed Minimal Bioactive Domains of AS-48 Bacteriocin Homologs Possess Potent Anti-Leishmanial Properties. *Microbiol Spectr*. 2022 Dec 21;10(6):e0265822. doi: 10.1128/spectrum.02658-22. Epub 2022 Nov 7.
5. Chan K W Y, Navi M, Kieda J, Moran T, Hammers D, **Lee S**, Tsai SSH. Phase transition modulation and biophysical characterization of biomolecular condensates using microfluidics. *Lab Chip*. 2022 May 26. doi: 10.1039/d2lc00037g. Epub ahead of print. PMID: 35616128.

***Cover art selected for issue.**
6. Ayinuola YA, Tjia-Fleck S, Readnour BM, Liang Z, Ayinuola O, Paul LN, **Lee SW**, Fischetti VA, Ploplis VA, Castellino FJ. Relationships Between Plasminogen-Binding M-Protein and Surface Enolase for Human Plasminogen Acquisition and Activation in *Streptococcus pyogenes*. *Front Microbiol*. 2022 May 24;13:905670. doi: 10.3389/fmicb.2022.905670. PMID: 35685926; PMCID: PMC9173704.
7. Moran TE, Hammers DE, **Lee SW**. The Role of Host-Cellular Responses in COVID-19 Endothelial Dysfunction. *Curr Drug Targets*. 2022 Jun 24. doi: 10.2174/1389450123666220624094940. Epub ahead of print. PMID: 35748550.
8. Readnour BM, Ayinuola YA, Russo BT, Liang Z, **Lee SW**, Ploplis VA, Fischetti VA, Castellino FJ. Evolution of *Streptococcus pyogenes* has maximized the efficiency of the Sortase A cleavage motif for cell wall transpeptidation. *J Biol Chem*. 2022 Apr 14;298(6):101940. doi: 10.1016/j.jbc.2022.101940. Epub ahead of print. PMID: 35430253; PMCID: PMC9123276.
9. Ayinuola O, Ayinuola YA, Qiu C, **Lee SW**, Ploplis VA, Castellino FJ. Binding of the kringle-2 domain of human plasminogen to streptococcal PAM-type M-protein causes dissociation of PAM dimers. *Microbiology open*. 2021 Nov;10(6):e1252. doi: 10.1002/mbo3.1252. PubMed PMID: 34964287; PubMed Central PMCID: PMC8633249.
10. Romero-Severson, J. Moran, TE, Shrader DG, Pandey-Joshi S, Thomas CL, Palmer EC, Shrout JD, Pfrender ME, **Lee, SW**. A seed-endophytic *Bacillus safensis* strain with antimicrobial activity has genes for novel bacteriocin-like antimicrobial peptides. *Frontiers in Microbiology*, section Antimicrobials, Resistance and Chemotherapy. 2021 Sep 27;12:734216.



11. Hammers DE, Carothers KE, **Lee SW**. The Role of Bacterial Proteases in Microbe and Host-microbe Interactions. *Curr Drug Targets*. 2021 Aug 8. 2022;23(3):222-239. Review. PubMed PMID: 34370632.
12. Vu HM, Hammers DE, Liang Z, Nguyen GL, Benz ME, Moran TE, Higashi DL, Park CJ, Ayinuola YA, Donahue DL, Flores-Mireles AL, Ploplis VA, Castellino FJ, **Lee SW**. Group A *Streptococcus*-Induced Activation of Human Plasminogen Is Required for Keratinocyte Wound Retraction and Rapid Clot Dissolution. *Front Cardiovasc Med*. 2021 Jun 10;8:667554.
13. Ayinuola YA, Brito-Robinson T, Ayinuola O, Beck JE, Cruz-Topete D, **Lee SW**, Ploplis VA, Castellino FJ. *Streptococcus* co-opts a conformational lock in human plasminogen to facilitate streptokinase cleavage and bacterial virulence. 2021. *J Biol Chem*. Jan-Jun;296:100099.
14. Golomb SM, Guldner IH, Zhao A, Wang Q, Palakurthi P, Aleksandrovic EA, Lopez J, **Lee SW**, Yang K, Zhang S. Multi-modal single cell analysis reveals brain immune landscape plasticity during aging and gut microbiota dysbiosis. *Cell Reports*. 2020 Dec 1;33(9):108438.
15. Ross JN, Fields FR, Kalwajtys V, Gonzalez AJ, O'Connor S, Zhang A, Moran TE, Hammers DE, Carothers KE, **Lee SW**. Synthetic peptide libraries designed from a minimal alpha-helical domain of AS-48- bacteriocin homologues exhibit potent antibacterial activity. *Frontiers in Microbiology*. 2020 Nov 12;11:589666.
16. Ross JN, Larco D, Colon O, Coalson J, Gaus D, Taylor K, **Lee S**. "Evolución de la Resistencia a los antibióticos en una zona rural de Ecuador," *Practica Familiar Rural*. 2020, doi.org/10.23936/pfr.v5i1.144. <https://practicafamiliarrural.org/index.php/pfr/article/view/144>
17. Fields FR, Suresh N, Hiller M, Freed SD, Haldar K, **Lee SW**. Algorithmic Assessment of Missense Mutation Severity in the Von-Hippel Lindau Protein. *PLOS One*. 2020 Nov 5;15(11):e0234100.
18. Fields FR, Manzo G, Hind CK, Janardhanan J, Foik IP, Carmo Silva PD, Balsara RD, Clifford M, Vu HM, Ross JN, Kalwajtys VR, Gonzalez AJ, Bui TT, Ploplis VA, Castellino FJ, Siryaporn A, Chang M, Sutton JM, Mason AJ, **Lee SW**. Synthetic antimicrobial peptide tuning permits membrane disruption and interpeptide synergy. *ACS Pharm & Transl Sci*. 2020 Jun 12;3(3):418-424. doi: 10.1021/acsptsci.0c00001. ***Cover art selected for issue.**
19. Higashi DL, Tessier CR, **Lee SW**. Live Cell Microscopy and Flow Cytometry to Study Streptolysin S-Mediated Erythrocyte Hemolysis. *Methods Molec Biology*, Vol. 2136, Proft T, Loh JMS (Eds). *Methods Mol Biol*. 2020;2136:243-254. doi: 10.1007/978-1-0716-0467-0_18. PubMed PMID: 32430826. ***Cover art selected for book.**
20. Farris J, Calhoun B, Alam MS, **Lee S**, Haldar K. Large scale analyses of genotype-phenotype relationships of glycine decarboxylase mutations and neurological disease severity. *PLoS Comput Biol*. 2020 May;16(5):e1007871. doi: 10.1371/journal.pcbi.1007871.
21. Qiu C, Yuan Y, **Lee SW**, Ploplis VA, Castellino FJ. A local α -helix drives structural evolution of streptococcal M-protein affinity for host human plasminogen. *Biochem J*. 2020 May 15;477(9):1613-1630. doi: 10.1042/BCJ20200197.



22. Carothers KE, Liang Z, Mayfield J, Donahue DL, Lee M, Boggess B, Ploplis VA, Castellino FJ, **Lee SW**. The Streptococcal Protease SpeB Antagonizes the Biofilms of the Human Pathogen *Staphylococcus aureus* USA300 through Cleavage of the Staphylococcal SdrC Protein. *J Bacteriol.* 2020 May 11;202(11). doi: 10.1128/JB.00008-20. Print 2020 May 11. ***Cover art selected for issue.**
23. Russo BT, Ayinuola YA, Singh D, Carothers K, Fischetti VA, Flores-Mireles AL, **Lee SW**, Ploplis VA, Liang Z, Castellino FJ. The M Protein of *Streptococcus pyogenes* Strain AP53 Retains Cell Surface Functional Plasminogen Binding after Inactivation of the Sortase A Gene. *J Bacteriol.* 2020 Apr 27;202(10). doi: 10.1128/JB.00096-20. Print 2020 Apr 27.
24. Hopf J, Waters M, Carothers KE, Roeder RK, Shrout JD, **Lee SW**, Nallathamby PD. Phage-mimicking antibacterial core-shell nanoparticles. *Nanoscale Advances.* 2019, 4812-4826. <https://doi.org/10.1039/C9NA00461K>.
25. Fields FR, Freed SD, Carothers KE, Nafiz Hamid MD, Hammers DE, Ross JN, Kalwajtys VR, Gonzalez AJ, Hildreth AD, Friedberg I, **Lee SW**. Novel antimicrobial peptide discovery using machine learning and biophysical selection of minimal bacteriocin domains. *Drug Dev Res.* 2019;1-9. <https://doi.org/10.1002/ddr.21601>. ***Featured on cover.**
26. Huwe T, Prusty BK, Ray A, **Lee S**, Ravindran B, Michael E. Interactions between Parasitic Infections and the Human Gut Microbiome in Odisha, India. *Am J Trop Med Hyg.* 2019 Jun;100(6):1486-1489. doi: 10.4269/ajtmh.18-0968.
27. Madukoma CS, Liang P, Dimkovikj A, Chen J, **Lee SW**, Chen DZ, Shrout JD. Single cells exhibit differing behavioral phases during early stages of *Pseudomonas aeruginosa* swarming. *J Bacteriol.* 2019 Jul 15. pii: JB.00184-19. doi: 10.1128/JB.00184-19.
28. Yuan Y, Ayinuola YA, Singh D, Ayinuola O, Mayfield JA, Quek A, Whisstock JC, Law RHP, **Lee SW**, Ploplis VA, Castellino FJ. Solution structural model of the complex of the binding regions of human plasminogen with its M-protein receptor from *Streptococcus pyogenes*. *J Struct Biol.* 2019 Jul 10. pii: S1047-8477(19)30154-6. doi: 10.1016/j.jsb.2019.07.005.
29. Qiu C, Yuan Y, Liang Z, **Lee SW**, Ploplis VA, Castellino FJ. Variations in the secondary structures of PAM proteins influence their binding affinities to human plasminogen. *J Struct Biol.* 2019 May 1;206(2):193-203.
30. Fields FR, Carothers KE, Balsara RD, Ploplis VA, Castellino FJ, **Lee SW**. Rational design of synsafencin, a novel antimicrobial peptide derived from the circular bacteriocin, safencin AS-48. *Journal of Antibiotics.* 2018;71(6):592-600.
31. Flaherty RA, Donahue DL, Carothers KE, Ross JN, Ploplis VA, Castellino FJ, **Lee SW**. Neutralization of Streptolysin S-Dependent and Independent Inflammatory Cytokine IL-1 β Activity Reduces Pathology During Early Group A Streptococcal Skin Infection. *Frontiers in cellular and infection microbiology.* 2018; 8:211.
32. Kane TL, Carothers, KE, **Lee SW**. Virulence factor targeting of the bacterial pathogen *Staphylococcus aureus* for vaccine and therapeutics. *Current drug targets.* 2018; 19(2):111-127.



33. Qiu C, Yuan Y, Zajicek J, Liang Z, Balsara RD, Brito-Robinson T, **Lee SW**, Ploplis VA, Castellino FJ. Contributions of different modules of the plasminogen-binding *Streptococcus pyogenes* M-protein that mediate its functional dimerization. *Journal of structural biology*. 2018; 204(2):151-164.
34. Liang Z, Stephens M, Ploplis VA, **Lee SW**, Castellino FJ. Draft Genome Sequences of Six Skin Isolates of *Streptococcus pyogenes*. *Genome announcements*. 2018; 6(26).
35. Ginton K, Beck J, Liang Z, Qiu C, **Lee SW**, Ploplis VA, Castellino FJ. Variable region in streptococcal M-proteins provides stable binding with host fibrinogen for plasminogen-mediated bacterial invasion. *J Biol Chem*. 2017 Apr 21;292(16):6775-6785.
36. Bao YJ, Li Y, Liang Z, Agrahari G, **Lee SW**, Ploplis VA, Castellino FJ. Comparative pathogenomic characterization of a non-invasive serotype M71 strain *Streptococcus pyogenes* NS53 reveals incongruent phenotypic implications from distinct genotypic markers. *Pathogens and disease*. 2017; 75(5).
37. Yuan Y, Zajicek J, Qiu C, Chandrachud V, **Lee SW**, Ploplis VA, Castellino FJ. Conformationally organized lysine isosteres in *Streptococcus pyogenes* M protein mediate direct high-affinity binding to human plasminogen. *The Journal of biological chemistry*. 2017; 292(36):15016-15027.
38. Fields, FR, **Lee SW**, McConnell, MJ. Using bacterial genomes and essential genes for the development of new antibiotics. *Biochem. Pharmacol*. 2016; Jun 15;134:74-86.
39. Flaherty RA, **Lee SW**. Implementation of a Permeable Membrane Insert-based Infection System to Study the Effects of Secreted Bacterial Toxins on Mammalian Host Cells. *J. Vis. Exp*. 2016. (114), e54406, doi:10.3791/54406.
40. Bao YJ, Shapiro, BJ, Mayfield JA, **Lee SW**, Ploplis VA, Castellino FJ. Phenotypic differentiation of *Streptococcus pyogenes* populations is induced by recombination-driven gene-specific sweeps. *Sci Rep*. 2016 Nov 8;6:36644.
41. Bao YJ, Liang Z, Mayfield JA, McShan WM, **Lee SW**, Ploplis VA, Castellino FJ. Novel genomic rearrangements mediated by multiple genetic elements in *Streptococcus pyogenes* M23ND confer potentials for evolutionary persistence. *Microbiology*. 2016 Jun 21. doi: 10.1099/mic.0.000326.
42. Bao YJ, Liang Z, Mayfield JA, Donahue DL, Carothers KE, **Lee SW**, Ploplis VA, Castellino FJ. Genomic Characterization of a Pattern D *Streptococcus pyogenes* emm53 Isolate Reveals a Genetic Rationale for Invasive Skin Tropism. *J Bacteriol*. 2016 May 27;198(12):1712-24.
43. Higashi DL, Blais N, Donahue DL, Mayfield JA, Tessier CR, Rodriguez K, Ashfeld BL, Luchetti J, Ploplis VA, Castellino FJ, **Lee SW**. Activation of band 3 mediates group A *Streptococcus* streptolysin S-based beta-haemolysis. *Nature Microbiology*. 2016;1:15004. ***Featured on Cover.**
44. Agrahari G, Liang Z, Ginton K, **Lee SW**, Ploplis VA, Castellino FJ. *Streptococcus pyogenes* Employs Strain-dependent Mechanisms of C3b Inactivation to Inhibit Phagocytosis and Killing of Bacteria. *J Biol Chem*. 2016 Apr 22;291(17):9181-9.



45. Flaherty RA, Puricelli JM, Higashi DL, Park CJ, **Lee SW**. Streptolysin S Promotes Programmed Cell Death and Enhances Inflammatory Signaling in Epithelial Keratinocytes during Group A Streptococcus Infection. *Infection and immunity*. 2015; 83(10):4118-33.
46. Bao YJ, Liang Z, Mayfield JA, **Lee SW**, Ploplis VA, Castellino FJ. CovRS-Regulated Transcriptome Analysis of a Hypervirulent M23 Strain of Group A *Streptococcus pyogenes* Provides New Insights into Virulence Determinants. *J Bacteriol*. 2015 Oct;197(19):3191-205. doi: 10.1128/JB.00511-15. Epub 2015 Jul 27.
47. Weigel KJ, Shen L, Thomas CT, Alber D, Drapalik L, Schafer ZT, **Lee SW**. Design and evaluation of a peptide-based immunotoxin for breast cancer therapeutics. 2015. *FEBS Open Bio*. 2015. Mar 14;5:202-8.
48. Ugrinov KG, Freed SD, Thomas CL, **Lee SW**. A multiparametric computational algorithm for comprehensive assessment of genetic mutations in Mucopolysaccharidosis type IIIA (Sanfilippo syndrome). *PLoS One*. 2015. 25;10(3):e0121511.
49. Maxson T, Deane,CD, Molloy EM, Cox CL, Markley AL, **Lee SW**, Mitchell, DA. HIV protease inhibitors block streptolysin S production. 2015. *ACS Chem Bio*. 2015 May 15;10(5):1217-26.
50. Morton, JT, Freed SD, **Lee SW**, Friedberg I. A large scale prediction of bacteriocin gene blocks suggests a wide functional spectrum for bacteriocins. *BMC Bioinformatics*. 2015 Nov 11;16:381.
51. Bao YJ, Liang Z, Booyjzsen C, Mayfield JA, Li Y, **Lee SW**, Ploplis VA, Song H, Castellino FJ. Unique Genomic Arrangements in an Invasive Serotype M23 Strain of *Streptococcus pyogenes* that Induce Hypervirulence. 2014. *J Bacteriology*, 196(23):4089-102.
52. Mayfield JA, Liang Z, Agrahari G, **Lee SW**, Ploplis VA, Castellino FJ. Random Mutations in the Control of Virulence Sensor Gene from *Streptococcus pyogenes* After Infection in Mice Lead to Clonal Variants With Altered Gene Regulatory Activity and Virulence. 2014. *PLOS One* 9(6):e1000698.
53. Flaherty RA, Freed SD, **Lee SW**. The Wide World of Ribosomally Encoded Bacterial Peptides. 2014. *PLoS Pathogens* 10(7): e1004221.
54. Markley AL, Jensen, E, **Lee SW**. A novel *E. coli*-based bioengineering strategy to study Streptolysin S biosynthesis. 2012. *Analytical Biochem*.15;420(2):191-3.
55. Thomas CL, **Lee SW**. Knowing is Half the Battle: Targeting Virulence Factors of Group A Streptococcus for Vaccine and Therapeutics. 2012. *Current Drug Targets*. 13(3):308-22.
56. Gonzalez DJ, **Lee SW**, Hensler M, Dahesh S, Markley AL, Mitchell DA, Banderia N, Nizet V, Dixon JE, Dorrestein PC. Clostridiolysin S: A posttranslationally modified biotoxin from *Clostridium botulinum*. 2010. *J Biol Chem*. 285(36):28220-8.
57. Mitchell DA, **Lee SW**, Markley AL, Limm J, Pence MA, Gonzalez D, Dorrestein PC, Nizet V, Dixon JE. Structural and functional dissection of the heterocyclic peptide cytotoxin streptolysin S. 2009. *J Biol Chem*. 284(19):13004.
58. **Lee SW**, Mitchell DA, Markley AL, Hensler ME, Gonzalez D, Wohlrab A, Dorrestein PC, Nizet V, Dixon JE. Discovery of a Widely Distributed Toxin Biosynthetic Gene Cluster. 2008. *Proc. Natl.*

Acac. Sci. U.S.A. 105:(15), 5879-84. ***One of three featured articles in issue. Walsh, C.T., and Nolan, E.M. Commentary in PNAS, April 15, 2008.**

59. Higashi DL, **Lee SW**, Snyder A, Weyand NJ, Bakke A, So M. Dynamics of *Neisseria gonorrhoeae* attachment: microcolony development, cortical plaque formation, and cytoprotection. 2007. *Infect Immun.* Oct;75(10):4743-53.
60. Yooseph S., Sutton G, Rusch DB, Halpern AL, Williamson SJ, Remington K, Eisen JA, Heidelberg KB, Manning G, Li W, Jaroszewski L, Cieplak P, Miller CS, Li H, Mashiyama ST, Joachimiak MP, van Belle C, Chandonia JM, Soergel DA, Zhai Y, Natarajan K, **Lee S**, Raphael BJ, Bafna V, Friedman R, Brenner SE, Godzik A, Eisenberg D, Dixon JE, Taylor SS, Strausberg RL, Frazier M, Venter JC. The Sorcerer II Global Ocean Sampling expedition: expanding the universe of protein families. 2007. *PLoS Biol.* Mar;5(3):e16. ***Featured in BBC News. Genome Pioneer Fishes for Diversity. March 27, 2007.**
61. Weyand N, **Lee SW**, Higashi DL, Cawley D, Yoshihara P, So M. Monoclonal antibody detection of CD46 clustering beneath *Neisseria gonorrhoeae* microcolonies. 2006. *Infect Immun.* Apr;74(4):2428-35.
62. **Lee SW**, Higashi DL, Snyder A, Merz AJ, Potter L, and So M. PiIT is required for PI(3,4,5)P3-mediated crosstalk between *Neisseria gonorrhoeae* and epithelial cells. 2005. *Cell. Micro.* Sep;7(9):1271-84.
63. **Lee SW**, Bonnah RA, Higashi DL, Atkinson JP, Milgram SL, So M. CD46 is phosphorylated at tyrosine 354 upon infection of epithelial cells by *Neisseria gonorrhoeae*. 2002. *J Cell Biol*, 156(6): 951-957.
64. Bonnah RA, **Lee SW**, Vasquez BL, Enns CA, So M. Alteration of Epithelial Cell Transferrin- iron Homeostasis by *Neisseria meningitidis* and *Neisseria gonorrhoeae*. 2000. *Cell Micro.* 2:207-218.
65. Evengard B, Briese T, Lindh G, **Lee S**, and Lipkin WI. Absence of evidence of Borna disease virus infection in Swedish patients with Chronic Fatigue Syndrome. 1999. *J Neurovirol.* 5(5):495-9.

Awarded Grants (External)

Active

NIH R56 HL13423 (Lee, Co-PI) NIH/NHLBI. *Structure-function Studies on Plasminogen and Plasmin.* \$155K/ yr direct cost to Lee. This study is designed to reveal aspects of fibrinolytic proteins and the role of Group A Streptococcal bacteria interactions with the host system. 10/1/2022-9/30/2023.

NIH 7R01EB025268-02 (Timperman, PI, Lee, Key personnel). NIH Sub-contract. *An Integrated Microfluidic System for Combining Top Down and Bottom Up.* \$46K direct total to Lee during period. The major goals of this subcontract are to classify proteome information on bacterial species. 4/02/2018-12/31/2023.

NIH R01CA222405-01A1 (Zhang, Siyuan, PI, Lee, Key personnel). NIH. *Modulation of Brain Metastatic Niche by Gut Microbiota.* \$40K/ yr direct cost to Lee. The major goals of this project are to identify and design gut microbiota to modulate brain metastatic outcomes. 7/1/2018-6/30/2023.

Pending/Resubmission

1R01HL158925 (Lee, Co-PI) NIH/NHLBI. *Mechanisms of Host Interaction, Hemostasis and Inflammation in COVID19 disease*. The major goals for this project are to identify the mechanisms of COVID disease using relevant host infection models.

1R21 A159370-01 (Lee, Lead PI) NIH/NIAID. *Studies of the Group A Streptococcal protease SpeB*. The major goals for this project are to identify the role of SpeB in mixed microbial interactions during Group A *Streptococcus* host colonization.

1R21 AI144643-01A1. (Lee, Lead PI). NIH/NIAID. Molecular studies of the bacterial toxin Streptolysin S produced by Group A *Streptococcus*. The major goals of this project are to gain a better understanding of the mechanism of the bacterial Streptolysin S and pursue targeted therapies towards toxin inhibition.

1R01AI153165-01. (Lee, Lead PI). NIH/DDR. Design and Testing of Linear Reductive Antimicrobial Peptides from Natural Bacteriocins. The major goals of this project are to leverage ribosomally produced bacterial peptides for optimization and use as novel antimicrobial substances.

NIH R01 (Lee, co-PI). NIH PA-20-185. *Study of Polymicrobial Communities in Prosthetic Joint Infection*. The major goals for this project are to identify key bacterial interactions and evolution of microbial communities in PJI.

1R1M1 GM140916-01 (Lee, Co-PI) NIH. *Reprogramming Culturability in a Complex Skin Microbiota*. The major goals for this project are to develop a 3-D skin microbiome model for analysis.

Completed

NIH Innovator Award, 1DP2OD00846-01
Title: Design and Use of Novel Bacteriocins. Lead PI.
Total costs: \$ 2.25 million
Dates of Project: 10/1/2011- 9/30/2016

NIH 3R01CA222405-01A1S1 (Zhang, Siyuan, PI, Lee, Key personnel). NIH Supplement. *Mechanisms of Microbiota-Modulated Immune Landscape at the Brain Metastasis Niche*. \$39K direct cost to Lee. The major goals of this project are to identify the role of the host microbiota in brain metastasis progression. 9/01/2018-8/31/2020.

NIH R01 HL13423 (Lee, Co-PI) NIH/NHLBI. *Structure-function Studies on Plasminogen and Plasmin*. \$155K/ yr direct cost to Lee. This study is designed to reveal aspects of fibrinolytic proteins and the role of Group A Streptococcal bacteria interactions with the host system. 1/01/2018-12/31/2022.

NSF 13-542 Proposal No. 1359342, Undergraduate Programs in Chemistry
Title: Chemical Analysis in Low-Resource Settings. REU Mentor.
Total costs: \$8,000
Dates of Project: 06/01/2014- 5/30/2017

Omicron Biochemicals
Title: Protein Pilot Expression study for MPSIII-A function. Lead PI.
Total costs: \$1,580
Dates of Project: 11/1/2013- 9/30/2014

Awarded Grants (Internal)

- 2020 Boler Parseghian Center for Rare and Neglected Diseases
Title: Peptide-based protein folding of truncated VHL protein.
Total Costs: \$30,000.
Dates of Project: 7/30/2021-8/1/2022.
- 2018 Boler Parseghian Center for Rare and Neglected Diseases
Title: Computational approaches to genetic analysis of VHL disease.
Total Costs: \$50,000.
Dates of Project: 8/1/2018-7/30/2020.
- 2018 Office Of The Vice President, Research, Notre Dame
Equipment Restoration and Renewal Proposal
Title: LI-COR Odyssey Infrared Imaging System and Applied Biosystems Fast Real-time PCR System and to support genetic and protein-based studies
Direct Cost: \$50,000
Patricia Clark, Merlin , co-PIs.
- 2018 Indiana Clinical and Translational Sciences Institute (CSTI)
Title: Biomimetic Infection Reporting of Antimicrobial Nanoparticles for Wound and Surgical Site Applications
Prakash Nallathamby, PI. Juliane Hopf, co-PI.
Total Costs: \$20,000. 5k supply support.
Dates of Project: 2/1/2019-1/31/2021.
- 2016 Boler Parseghian Center for Rare and Neglected Diseases
Title: Computational parametric algorithms for protein misfolding diseases.
Total Costs: \$40,000.
Dates of Project: 8/1/2016-7/30/2017.
- 2016 Eck Institute Multi-agency Partnerships for Comprehensive Monitoring and Analysis of Antibiotic Resistance in Ecuador
Total Costs: \$50,000.
Dates of Project: 6/1/2016-5/31/2018.
- 2013 Eck Institute Pilot Program Grant
Title: Development of a Novel Immunotoxin for Targeted Cancer Therapy.
Zach Schafer, co-PI.
Total costs: \$50,000
Dates of Project: 1/1/2013- 12/31/2014.
- 2013 CAMD, University of Notre Dame Computer Aided Molecular Design Core Facility.
Title: Molecular Dynamics studies of MPS III-A protein and chaperones. Lead PI.
Total costs: 200 hours software, 70 hours support.
Dates of Project: 5/1/2013- 4/30/2014.
- 2012 Eck Institute for Global Health, Building Multi-disciplinary Teams for Global Health Research and Training
Title: The Role of Commensal Bacteria in Host Plant Susceptibility to Foodborne Pathogens.
Jeanne Romero-Severson, co-PI.

Total costs: \$63,326
Dates of Project: 10/1/2012- 9/30/2014.

- 2010 CRND Research Incubator Program
Title: Biosynthesis of Novel Peptide Bacteriocins. Lead PI.
Annual Direct Costs- \$50,000
Dates of Project- 3/1/2010 to 2/28/2011
- 2010 Eck Institute for Global Health Genomics Pilot Project
Title: Array analysis of genes involved in Streptolysin S immunity. Lead PI.
Annual Direct Costs- \$10,000
Dates of Project- 4/1/2010 to 3/31/2011
- 2010 Office Of The Vice President, Research, Notre Dame
Equipment Restoration and Renewal Proposal
Title: LI-COR Odyssey Infrared Imaging System and Applied Biosystems Fast Real-time PCR System and to support genetic and protein-based studies
Direct Cost: \$50,000
Zachary Schafer, Patricia Champion, co-PIs.

Teaching

University of Notre Dame

- 2009-2010 Instructor, BIOS 30455, GH 60455, Medical Microbiology
Directed Readings, BIOS 46497
- 2011- Co-Instructor, BIOS 60569, Advanced Molecular Pathogenesis
- 2011- Co-instructor, BIOS 27241, Cell Biology Research
- 2012- Co-Instructor, BIOS 60550, Topics in Pathobiology
- 2021- Co-Instructor, BIOS 40550, 60550, Topics in Precision, Personalized Health
- 2018- Instructor, BIOS 10170, Introductory Biology: Big Questions
- 2019 Directed Readings, BIOS 46497

Oregon Health and Science University

- 2002, 2004 Instructor, Mb611, Principles of Microbial Pathogenesis. Class is required of all graduate students in the Department of Molecular Microbiology at OHSU.
Topic: Microscopic Examination of Host/Pathogen Interaction.
- 2001- 2003 Teaching Assistant, Biological Basis of Disease, Spring quarters. Class is required of all 1st year medical students at OHSU.

Patents and Inventions

Patents and Invention Disclosures filed at ND

- 2009 Invention Disclosure, Office of Tech Transfer
Title: Screening methods for Testing Activity of Novel Bacteriocins
- 2011 Invention Disclosure, Office of Tech Transfer
Title: Design of an SLS-based Immunotoxin for Treatment of Breast Cancer
- 2011 Invention Disclosure, Office of Tech Transfer

- 2011 Title: *E. coli* bioengineering strategy to produce novel compounds
Provisional Patent, Office of Tech Transfer
Title: Quinolone-resistant *Neisseria gonorrhoeae* detection and parallel screening of novel bacteriocin DNA gyrase inhibitors
- 2013 Provisional Patent, Office of Tech Transfer
Title: Design of an SLS-based Immunotoxin for Treatment of Breast Cancer
- 2013 Provisional Patent, Office of Tech Transfer
Title: Development of an inexpensive, rapid test for molecular detection of Quinolone-resistant bacteria
- 2014 Provisional Patent, Office of Tech Transfer
Title: A genetic engineering strategy for the production of peptide therapeutics
- 2014 Provisional Patent, Office of Tech Transfer
Title: Use of a newly discovered beneficial plant bacterium for non-toxic antimicrobial strategies
- 2015 Invention Disclosure, Office of Tech Transfer
Title: A Portable, inexpensive assay kit to detect antibiotic resistance
- 2016 Provisional Patent, Office of Tech Transfer, Co-inventor
Tunable Attribute Precision Screening (TAPS) antimicrobial assessment platform
- 2016 Provisional Patent, Office of Tech Transfer
Title: The use of IL-1 neutralizing antibodies in the treatment of severe bacterial infections caused by *Streptococcus pyogenes*.
- 2017 Provisional Patent, Office of Tech Transfer
Title: Design of Minimal Antimicrobial Peptides for Therapeutics
- 2019 US Patent, PCT/US18/35718.
Title: Systems and Methods for Designing Synthetic Antimicrobial Peptides.

Patents prior to ND

Title: Substances and Uses Thereof in Regulatory Biofilm Formation. Inventors: So, M., Lee, S.W. , Howie H, and Higashi D.L. OHSU-0001-PR1.

Title: Monoclonal Antibody to cytoplasmic domains of CD46. Inventors: So, M., Cawley D., Yoshihara, P., Weyand N., Lee, S.W., and Higashi D.L. OHSU Technology #1548.

Title: Method for identifying bacterial toxins and a strategy for vaccine development. Inventors: Dixon, J.E., Lee, S.W., Mitchell, D.A., Markley, A.L., Dorrestein P.C., Nizet, V. UCSD Docket No. SD2008-211

Memberships

American Association for the Advancement of Science (1995-2003)
American Society for Microbiology (1998-Current)
American Chemical Society (2010-Current)
Biochemical Society (2011-Current)

Editorial Review Journals

Editorial Review Board- Frontiers in Microbiology, Frontiers in Cellular and Infection Microbiology, Biochem Journal, Current Drug Targets.
Ad Hoc Reviewer- PLOS Pathogens, PLOS One, Journal of Biological Chemistry, Scientific Reports, Nature Microbiology, Nature Biotechnology, Nature Reviews, Frontiers in Cellular and Infection

Microbiology, Frontiers in Oncology, iScience, Journal of Bacteriology, Infection and Immunity, Science Advances, Cell Systems.

Presentations based on research conducted at ND

- 2024 Group A Streptococcal Interactions with Blood System Components Revealed Through Live Imaging. Plasminogen Activation and Extracellular Proteolysis. Session speaker. Gordon Research Conference, Feb 2024.
- 2023 From Bauhaus to Bacteriocins: Lessons and Gifts from the So Lab. Symposium honoring Dr. Maggie So. University of Arizona. Featured speaker. November 2023.
- 2023 Teaching Demonstration, DNA and RNA Viruses. Department of Biological Sciences, Mt. San Antonio College. March 2023.
- 2023 Fighting microbes: discovery and use of peptide-based bacteriocins. Departmental Seminar, California State University of Stanislaus. December 2023. Host: Dr. Matthew Cover.
- 2022 Reflections on Teaching. College of Science All-Faculty meeting, University of Notre Dame. December 2022. Shilts-Leonard Teaching Award Recipient Talk.
- 2022 Microbiomes and Personal Health. Berthuiame Institute for Precision Health, Advisory Meeting. November 2022. Speaker and Theme Lead.
- 2022 Computational Approaches for Studying Rare Genetic Disease. Clinical Translational Sciences Institute, Annual meeting, September 2022. Featured Speaker.
- 2022 Fighting microbes: discovery and use of peptide-based bacteriocins. Departmental Seminar, California State University of Bakersfield. March 2022. Host: Dr. Amber Stokes.
- 2022 Fighting microbes: discovery and use of peptide-based bacteriocins. SSCP seminar, University of Notre Dame. January 2022. Host: Dr. Susan Gursky.
- 2021 Fighting microbes: discovery and use of peptide-based bacteriocins. Departmental Seminar, California State University of Stanislaus. December 2021. Host: Dr. Choong-Min Kang.
- 2021 Computational Approaches for Studying Genetic Mutations in Rare Disease. Notre Dame-Dyne Therapeutics Patient Advocacy Summit. Speaker and session moderator. September 2021.
- 2020 The Role of Localized Proteolytic Environments in Group A Streptococcal Pathogenesis. Plasminogen Activation and Extracellular Proteolysis. Feb. 2020. Session speaker. Gordon Research Conference.
- 2019 Fighting microbes: discovery and use of peptide-based bacteriocins. Institute for Biomedical Engineering, Science and Technology, Ryerson University, Toronto CA. September 2019. Host: Dr. Scott Tsai.
- 2019 Fighting microbes: discovery and use of peptide-based bacteriocins. Department of Chemistry, Biochemistry, University of Notre Dame. August 2019. Host: Dr. Anthony Serianni.
- 2019 Discovery and Design of Linear Antimicrobial Peptides from a Circular Bacteriocin. IAB Meeting of the Center for Advanced Design and Manufacturing of Integrated Microfluidics (CADMIM). Poster presentation. Feb 2018.
- 2019 Fighting microbes: discovery and use of peptide-based bacteriocins. UCI Samueli School of Engineering, Department of Biomedical Engineering seminar. Feb 2019. Host: Dr. Wendy Liu, Abe Lee.
- 2018 Development of a computational algorithm to study protein misfolding in rare diseases. Global Genes Patient Advocacy Summit. Oct. 2018. Science and Technology Innovation Session Speaker.
- 2018 Studies on Bacterial Peptides Reveal New Avenues for Treating Infectious Disease. Advanced Diagnostics and Therapeutics 6th Annual Symposium: Nano research for the Biosciences. Mar 2018. Session speaker.
- 2018 The Role of Bacterial Proteases in Group A Streptococcal Pathogenesis. Gordon Conference, Plasminogen Activation and Extracellular Proteolysis. Feb. 2018. Session speaker.
- 2018 Development of a Computational Algorithm to study protein misfolding in rare disease. Panel

- Speaker, Rare Disease Day, Center for Rare and Neglected Diseases, University of Notre Dame. Feb. 2018. Host: Kasturi Haldar, Director.
- 2017 Fighting microbes: discovery and use of peptide-based bacteriocins. UCLA Division of Oral Biology, seminar. Dec. 2017. Host: Dr. Dean Ho.
- 2017 Fighting microbes: discovery and use of peptide-based bacteriocins. Indiana University, Purdue University School of Medicine, seminar. Nov. 2017.
- 2017 The Role of Streptolysin S in Group A Streptococcal Disease. 20th Lancefield International Symposium on Streptococcal Disease, Oral presentation. Oct 2017.
- 2017 The Role of Streptolysin S in Group A Streptococcal Disease. ASM Microbe General Meeting. American Society for Microbiology, Oral presentation. June 2017.
- 2017 Development of a Computational Algorithm to study protein misfolding in rare disease. Panel Speaker, Rare Disease Day, Center for Rare and Neglected Diseases, University of Notre Dame. Feb. 2017. Host: Kasturi Haldar, Director.
- 2016 Role of the Plasminogen-binding Group A Streptococcal M Protein in Bacterial virulence. Speaker. The first joint meeting of International Society of Fibrinolysis and Proteolysis, Shizuoka, Japan. Session talk. Oct 2016.
- 2016 Fighting microbes: discovery and use of peptide-based bacteriocins. Northwestern University School of Medicine, seminar. Host: Dr. Wyndham Lathem.
- 2016 Fighting microbes: discovery and use of peptide-based bacteriocins. University of Ohio, Department of Biological Sciences, seminar. Host: Dr. Nathan Weyand.
- 2016 Development of a Computational Algorithm to study protein misfolding in rare disease. Panel Speaker, Rare Disease Day, Center for Rare and Neglected Diseases, University of Notre Dame. Feb. 2016. Host: Kasturi Haldar, Director.
- 2015 Blood ties: Host-microbe interactions in Group A Streptococcal Pathogenesis. State of the Art Speaker, XVth International Workshop on Molecular and Cellular Biology of Plasminogen Activation, Rome, Italy. Sept. 2015.
- 2015 Fighting microbes: discovery and use of peptide-based bacteriocins. Univ. California Riverside. Department of Microbiology, Seminar. Host: Dr. Wenbo Ma.
- 2015 Discovery and Use of Ribosomally Encoded Bacterial Peptides. American Association of Pharmaceutical Scientists, Annual meeting. Oct. 2015. Sunrise session: The Global Health Epidemic of Superbug Antibiotic Resistance and Obama's 2014 Executive Order for Combating it: What is the next wave of antibiotics? Featured speaker.
- 2015 Fighting Microbes: Discovery and Use of Peptide-based Bacteriocins. Seminar, Department of Pharmacology, University of Illinois, Chicago. Host: Michael Federle, Faculty.
- 2015 Fighting Microbes: Discovery and Use of Peptide-based Bacteriocins. Seminar, Department of Microbiology, Indiana University School of Medicine, Gary, IN. Host: Taeok Bae, Faculty.
- 2014 Bacteriocins: How bacteria compete, communicate and kill- How to give a research presentation. Guest speaker, Honors Senior Seminar, Department of Biological Sciences University of Notre Dame. Host: Michelle Whaley.
- 2014 Bacteriocins: How bacteria compete, communicate and kill. Seminar, Environmental Health Sciences, School of Public Health, University of Alberta. Edmonton, Canada. Host: Byeong hwa Jeon, Faculty.
- 2014 Beneficial bacteria are packaged inside viable seeds. Poster, ASM Conference on Beneficial Microbes. Washington, D.C.
- 2014 A new look at an old toxin: the role of Streptolysin S in Group A Streptococcal disease. Seminar, Department of Biology, Aquinas College, Grand Rapids MI. Host: Jeff McKelvey, Chair.
- 2014 Antibiotic resistance testing paper analytical device (ART-PAD). NSF-REU Planning Workshop. Speaker. University of Notre Dame. Host: Marya Lieberman.
- 2014 Insights into the bacteriocin-like cytotoxin Streptolysin S produced by Group A *Streptococcus*. Poster, Banff Conference on Infectious Disease, Banff, Canada. Awarded Best Conference Poster.

- 2014 Bacteriocins: How bacteria compete, communicate and kill. Seminar, Department of Microbiology, Miami University, Oxford, OH. Host: Iddo Friedberg, Faculty.
- 2014 Lysosomal storage disorders caused by protein misfolding. Panel Speaker, World Rare Disease Day, Center for Rare and Neglected Diseases, University of Notre Dame. Host: CRND, Kasturi Haldar, Director.
- 2014 Bacteriocins: How bacteria compete, communicate and kill. Interdisciplinary Science Seminar, College of Science, University of Notre Dame. Host: Susan Gursky.
- 2014 Bacteriocins: How bacteria compete, communicate and kill. Eck Institute for Global Health Research Retreat, Notre Dame, IN. Host: David Severson, Director.
- 2014 Finding New Hope in the Post-Antibiotic Era. Antibiotic Resistance Information Night, Seminar, University of Notre Dame. Host: Brian Hickman, Social justice in American Medicine Club.
- 2013 Bacteriocins: How bacteria compete, communicate and kill- How to give a research presentation. Guest speaker, Honors Senior Seminar, Department of Biological Sciences University of Notre Dame. Host: Michelle Whaley.
- 2013 Bacteriocins: How bacteria compete, communicate and kill. Session speaker, Midwest Microbial Pathogenesis Meeting. Organizers: John Gunn, Samantha King.
- 2013 Bacteriocins: How bacteria compete, communicate and kill. Seminar, Li Group, Crump Institute for Molecular Imaging, UCLA, Los Angeles, CA. Host: Huiying Li.
- 2013 Insights into the bacteriocin-like cytotoxin Streptolysin S produced by Group A *Streptococcus*. Poster, International conference on bacteria and phage, Madison, WI.
- 2013 Bacteriocins: How bacteria compete, communicate and kill. Seminar, Department of Chemistry and Biochemistry, Calvin College, Grand Rapids, MI. Host: Carolyn Anderson, Faculty.
- 2013 Protein misfolding: Human Disease and Chaperone Therapy. Panel Speaker, World Rare Disease Day, Center for Rare and Neglected Diseases, University of Notre Dame. Host: CRND, Kasturi Haldar, Director.
- 2012 Bacteriocins: How bacteria compete, communicate and kill. Interdisciplinary Science Seminar, College of Science, University of Notre Dame. Host: Susan Gursky.
- 2012 Bacteriocins: How bacteria compete, communicate and kill- How to give a research presentation. Guest speaker, Honors Senior Seminar, Department of Biological Sciences University of Notre Dame. Host: Michelle Whaley.
- 2012 Bacteriocins: How bacteria compete, communicate and kill. Speaker, Tom Quinn Distinguished Alumnus Award Symposium, Notre Dame, IN.
- 2011 Bacteriocins: How bacteria compete, communicate and kill. Seminar, Department of Biological Sciences, University of Notre Dame.
- 2011 Biosynthesis of Streptolysin S: Discovery of a widely conserved bacteriocin gene cluster. Seminar, USDA-ARS. Ames, IA. Host: Thad Stanton, Research Leader.
- 2011 Biosynthesis of Streptolysin S: Uncovering a New Class of WMDs. Seminar, Keck Institute for Transgene Research. Host: Frank Castellino, Director.
- 2011 Discovery of a highly conserved gene cluster for the production of heterocyclic bacteriocins . CRND, Blue-Gold Day. Host: Kasturi Haldar, Director.
- 2010 Biosynthesis of Streptolysin S reveals a common mechanism for bacteriocin synthesis. Guest Speaker, *Scientia*, Undergraduate Scientific Journal Forum.
- 2010 Discovery of a widely conserved bacteriocin gene cluster: Uncovering a New Class of WMDs. Featured Guest Speaker, 15th Annual Biochemistry Forum, University of Notre Dame.

Graduate advisees

Primary advisees

Trevor Kane, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2017)
Rebecca Flaherty, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2016)
Stefan Freed, Graduate student; P.I. Dr. Shaun Lee (MS., 2018)
Francisco Fields, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2019)
Mark Fraser, M.D., Ph.D. student; co-PI. Dr. Shaun Lee (Ph.D. 2019)
Katelyn Carothers, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2020)
Jessica Ross, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2022)
Daniel Hammers, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2022)
Thomas Moran, Graduate student; P.I. Dr. Shaun Lee (Ph.D. 2024)

Master's Thesis Directed

Primary advisees

Alhagie Sowe, Eck Global Health Master's Program (co-advisor).
Jordan Marsman, Eck Global Health Master's Program (Defended 2021).
David Degrood, Eck Global Health Master's Program (Defended 2020).
Valentin Calvillo Eck Global Health Master's Program (Defended 2020).
Johnathan Figueroa, Eck Global Health Master's Program (Defended 2019).
Olivia Colon, Eck Global Health Master's Program (Defended 2019).
Victoria Alexander, Eck Global Health Master's Program (Defended 2017).
Ali Bow, Eck Global Health Master's Program (Defended 2016).
James Hodgens, ESTEEM Program (Defended 2015).
Katelyn Campbell, Eck Global Health Master's Program (Defended 2015).
Yingying Liu, Master's in Patent Law Program (Defended 2015).
Alejandro Vargas, ESTEEM Program (Defended 2014).
Marcos Marugan-Wyatt, Eck Global Health Master's Program (Defended 2014).
Travis Howell, Master's in Patent Law Program (Defended 2014).
Zach Wehrmann, ESTEEM Program (Defended 2013).
Michael Burton, Eck Global Health Master's Program (Defended 2013)

Others (thesis/advising committee, PhD)

BIOS (Department of Biological Sciences); CHEM (Department of Chemistry, Biochemistry); CEES (Civil Engineering/Environmental Sciences).

George Kennedy, Graduate student; P.I. Dr. Patricia Champion. BIOS
Nicholas Geraci, Graduate student; P.I. Dr. Mary Ann McDowell. BIOS
Emily Williams, Graduate student; P.I. Dr. Patricia Champion. BIOS
Raju Ravaparu, Graduate student; P.I. Dr. Zach Schafer. BIOS
Kelsey Weigel, Graduate student; P.I. Dr. Zach Schafer, coPI: Dr. Shaun Lee. BIOS
Rachel Schlutenhoeffer, Graduate student; P.I. Dr. Patricia Champion. BIOS
Brianna Norris, Graduate student; P.I. Dr. Miguel Morales. BIOS
Kimbra Turner, Graduate student; P.I. Dr. Miguel Morales. BIOS
Jennifer Zupkosky, Graduate student; P.I. Dr. Jeff Schorey. BIOS
Kristofor Ginton, Graduate student; P.I. Dr. Francis Castellino. CHEM
Garima Agrahari, Graduate student; P.I. Dr. Francis Castellino CHEM
Vishwanath Chandras, Graduate student; P.I. Dr. Francis Castellino CHEM
Callan Driscoll, Graduate student; P.I. Dr. Joshua Shrout. CEES
Li Li, Graduate student; P.I. Dr. Jeff Schorey. BIOS
Ye Zhang, Graduate student; P.I. Dr. Crislyn D'Souza-Schorey. BIOS
Casey Hill, Graduate student; P.I. Dr. David Severson. BIOS

Aanuoluwa Adelani, Graduate student; P.I. Dr. Kasturi Haldar. BIOS
Jennifer Zupkosky, Graduate student; P.I. Dr. Jeff Schorey. BIOS
Ian Guldner, Graduate student; P.I. Dr. Siyuan Zhang. BIOS
Patrick Doherty, Graduate student; P.I. Dr. Jeff Schorey. BIOS
Kristi Kilgore, Graduate student; P.I. Dr. Jeff Schorey. BIOS
Kevin Sanchez, Graduate student; P.I. Dr. Patricia Champion. BIOS
Alexander Chirakos, Graduate student; P.I. Dr. Patricia Champion. BIOS
Chinedu Madukoma, Graduate student; P.I. Dr. Joshua Shrout. CEES
Hannah Corman, Graduate student; P.I., Dr. Mary Ann McDowell. BIOS
Cunjia Qiu, Graduate student; P.I. Dr. Francis Castellino. CHEM
Michelle Corley, Graduate student; P.I. Dr. Mary Ann McDowell. BIOS
Iker Soto, P.I. Graduate student; Dr. Patricia Clark. Biophysics, CHEM
Niraja Suresh, Graduate student; P.I. Dr. Kasturi Haldar. BIOS
Christopher Gager, Graduate student; P.I. Dr. Ana Flores-Mireles. BIOS
Robert Stanley, Graduate student; P.I. Dr. Jeanne Romero-Severson. BIOS
Marissa Andersen, Graduate student; P.I. Dr. Ana Flores-Mireles. BIOS
Samantha Golomb, Graduate student P.I. Dr. Siyuan Zhang. BIOS
Kurt Kohler, Graduate student P.I. Dr. Ana Flores-Mireles. BIOS
Jacob Diehl, Graduate student, P.I. Patricia Clark. Biophysics, CHEM
Maggie Fink, Graduate student, P.I. Dr. Joshua Shrout. CEES
Taylor Sherman, Graduate student, P.I. Dr. Patricia Champion. BIOS
Andrew Sum, Graduate student, P.I. Dr. Elliot Hui, UC Irvine, Bioengineering. External committee member.
Disha Patel, Graduate student, P.I. Patricia Clark. Biophysics, CHEM.
Joseph Vecchio, Graduate student; P.I. Dr. Jeff Schorey. IBMS.

Outreach

Advisor, Avicenna Academy, Crown Point, IN. Student Spaceflight Experiment Program (SSEP). Experiment selected for inclusion into last NASA Space Shuttle Flight.

Primary Advisor, Joseph Paik, Special Studies Capstone Course, Poverty Studies Minor Program, 2011-2012.

Research Mentor, David Cholak, High School Student Research Volunteer, December 2009-2012. Summer funding 2010, 2011 provided by Dean's Office, College of Science.
Research project: Antibiotic Bacteriocins produced by Halobacterium lacusprofundii, First Place Award, Northern Indiana Science Fair, March 2011.

Research Mentor, Daniel Alber, High School Student Research Volunteer, August 2013-2015.
Research project: A genetic engineering strategy for the production of cancer-therapeutic compound libraries. Reilly Center Award, Northern Indiana Science Fair, March 2014. Finalist Award, Indiana State Science Fair, Selected for Competition in Intel International Science Fair, Los Angeles, CA

Faculty Mentor, Building bridges Program, University of Notre Dame. 2013- current.

Faculty Advisor, Conference on Antibiotic Resistance Assessment in Quito, Ecuador. 2014-current.

Faculty Judge, 3MT, University of Notre Dame, 2017-2018.

Faculty Judge, University of Notre Dame Regional Global Health Case Competition. 2018.

Faculty advisor, Science and Engineering Scholars Program (2018-2021)

Research Mentor, Jason Schorey, High School Student Research Volunteer, August 2021-current.
Research project: Development of peptide bacteriocins for use as anti-fungal compounds. Awarded Eck Institute of Global Health summer research fellowship.

Student Awards

Graduate Students

Jessica Ross, ASM Young Ambassador Award, 2021.

Jessica Ross American Scandinavian Fellowship Research Award, 2020.

Daniel Hammers, Eck Institute for Global Health, Graduate Student Fellowship, 2019.

Katelyn Carothers, Eck Institute for Global Health, Graduate Student Fellowship, 2018.

Daniel Hammers, Schmitt Graduate Fellowship, 2017.

Francisco Fields, CBBI Internship Award, Best Talk Award, CBBI Symposium, 2018.

Stefan Freed, Finalist, 3MT competition, 2017.

Francisco Fields, NSF Graduate Fellowship, 2016.

Francisco Fields, GEM National Award, 2016.

Stefan Freed, Chemical Biochemical Biological Interface (CBBI) Program Graduate Fellowship, 2014.

Trevor Kane, Chemical Biochemical Biological Interface (CBBI) Program Graduate Fellowship, 2013.

Rebecca Flaherty, Albertus Magnus Graduate Fellowship Award, 2013.

Undergraduate Students (external)

Madeleine Adams, American Institute for Chemical Engineers National Conference, 2016.

Donna Grace Shrader, NSF-Graduate Research Fellowship, 2012.

Emily Jensen, Indian Health Scholarship Award, 2010.

External press based on work

Inside Indiana Business, 4/26/2018.

“Antibiotic Resistance Inspires Notre Dame to Create New Weapon.”

<http://www.insideindianabusiness.com/story/38048331/antibiotic-resistance-inspires-notre-dame-to-create-new-weapon>

Infection Control Today 1/28/2016

“Study Offers New Insights into Group A Streptococcus.”

<https://www.infectioncontroltoday.com/bacterial/study-offers-new-insights-group-streptococcus>

EurekAlert! AAAS 1/28/2016

“Study Offers New Insights into Group A Streptococcus.”

https://www.eurekalert.org/pub_releases/2016-01/uond-son012816.php

Health Medicine Network 1/28/2016

“Study Offers New Insights into Group A Streptococcus.”

<http://healthmedicinet.com/news/study-offers-new-insights-into-group-a-streptococcus/>

Newswise 1/28/2016

“New Avenues Found for Treatment of Pathogen Behind Diseases Including Fasciitis, Toxic Shock Syndrome.”

<http://www.newswise.com/articles/view/646940/?sc=rsla>

Science Daily 1/28/2016
"New Insights Into Group A Streptococcus."
<https://www.sciencedaily.com/releases/2016/01/160128155002.htm>

NPR, Science Friday, University of Notre Dame, 10/17/2014.

ASM Society Press Release 9/29/2014.
"PLANTS PREPACKAGE BENEFICIAL MICROBES IN THEIR SEEDS"
<http://www.asm.org/index.php/journal-press-releases/93185-plants-prepackage-beneficial-microbes-in-their-seeds>

Science Daily 9/29/2014
"Plants prepackage beneficial microbes in their seeds"
<http://www.sciencedaily.com/releases/2014/09/140929180055.htm>

Design and Trend, Science, 10/1/2014
"Plant Microbes Found In Seeds"
<http://www.designntrend.com/articles/20465/20141001/plant-microbes-found-seeds.htm>

Food Safety Magazine, 9/29/14
"Plants Prepackage Beneficial Microbes In Their Seeds."

Phys.org news, 9/29/14
"Plants prepackage beneficial microbes in their seeds."
<http://phys.org/news/2014-09-prepackage-beneficial-microbes-seeds.html>

IFL Science 9/30/2014
"Symbiosis Between Plants and Bacteria Begins In The Seed"
<http://www.iflscience.com/plants-and-animals/symbiosis-between-plants-and-bacteria-begins-seed>

Teatro Naturale International, 9/30/14
"Against pathogenic contamination seeds are colonized by beneficial microbes"
<http://www.teatronaturale.com/technical-area/science-news/4939-against-pathogenic-contamination-seeds-are-colonized-by-beneficial-microbes.htm>

Eureka Science News, 9/30/14
"Plants prepackage beneficial microbes in their seeds"
<http://esciencenews.com/articles/2014/09/30/plants.prepackage.beneficial.microbes.their.seeds>

The New York Times, Science Section. 9/11/14.
"Mining for Antibiotics, Right Under Our Noses"

South Bend Tribune, 10/2/2011.
"Two ND Biology Professors Honored." NIH Innovator Award.

Others

Microbiology consultant, Inside Edition TV program. 2015-Current.
Featured expert in "Mud-run dangers exposed after mom loses sight in eye." Sept 2015.