

# Natividad Ruiz, Ph.D.

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## EDUCATION AND TRAINING

- 1998 – 2006 *Postdoctoral Research Associate*, Princeton University. Advisor: Professor Thomas J. Silhavy
- 1998 *Doctor of Philosophy* in Molecular Microbiology and Microbial Pathogenesis, Washington University in St. Louis. Advisor: Professor Michael G. Caparon
- 1993 *Bachelor of Arts with Highest Distinction* in Microbiology and Chemistry, University of Kansas
- 1990 – 1993 *Undergraduate Research Assistant*, University of Kansas. Advisor: Professor John C. Brown

## ACADEMIC POSITIONS

- 2019 – *Professor*, Department of Microbiology, The Ohio State University
- 2015 – 2019 *Associate Professor*, Department of Microbiology, The Ohio State University
- 2010 – 2015 *Assistant Professor*, Department of Microbiology, The Ohio State University
- 2006 – 2010 *Research Molecular Biologist*, Princeton University

## TEACHING EXPERIENCE

- M4130 (Microbial Genetics), Ohio State University (course director, 100%), Sp14-Sp20
- M2000 (Introduction to Microbiology Research), Ohio State University (course co-director, 33%), Au19-20
- M4120 (Microbial Physiology and Diversity), Ohio State University, Au13 (2 lectures), Au14 (2 lectures), Au16 (3 lectures), Au17 (4 lectures), Au18 (4 lectures), Au19 (4 lectures)
- M4130 (Microbial Genetics), Ohio State University (course co-director, 70%), Sp13
- M7724 (Molecular Pathogenesis), Ohio State University, Sp13 and Sp14 (2 lectures)
- M8899 (Seminar in Microbiology), Ohio State University (course co-director, 50%), Au12 & Sp13
- M4120 (Microbial Physiology and Diversity), Ohio State University, Au12 (3 lectures)
- M6010 (Principles of Microbiology), Ohio State University, Au12-15 (2 lectures), Au16-16 (1 lecture)
- M581.01 (Microbial Genetics), Ohio State University (course director, 100%), Sp12
- M880 (Seminar in Microbiology), Ohio State University (course co-director, 50%), Au11, Wn12 & Sp12
- OSBP796 (Interdisciplinary Seminar in Advanced Biochemistry), Ohio State University (course co-director, 50%), Au11
- M724 (Molecular Pathogenesis), Ohio State University, Sp11 (2 lectures)
- M661 (Bacterial Physiology), Ohio State University (guest lecturer), Au10
- MCO506 (Prokaryotic and Eukaryotic Cell Biology and Genetics), Uniformed Services University of the Health Sciences, Bethesda, MD (guest lecturer), 2010
- MOL380A (Modern Microbiology and Disease), Princeton University (course co-director, 33%), Sp08
- FRS166 (Microbes: Menace and Marvels), Princeton University (course director, 100%), Sp06

MOL545 (Advanced Microbial Genetics), Princeton University (seminar course co-director, 50%), 2001  
 MOL350 (Laboratory in Molecular Biology), Princeton University (lecturer), Sp01  
 HHMI Undergraduate Research Summer Program, Princeton University (summer instructor), Su00  
 MOL505 (Molecular Biology of Prokaryotes), Princeton University (teaching assistant), Au99  
 Junior Tutorial, Princeton University (instructor), 1998  
 Instructor for the Young Scientist Program in St. Louis (instructor), 1997 - 1998  
 BIO100 (Introduction to Biology), Washington University in St. Louis (teaching assistant), 1994  
 MCRB507 (Pathogenic Microbiology Laboratory), University of Kansas (teaching assistant), 1993  
 MCRB505 (Immunology Laboratory), University of Kansas (teaching assistant), 1992

## RESEARCH SUPPORT

1. National Institutes of Health Grant 2R01 GM100951. “Envelope Biogenesis in Gram-negative Bacteria”. PI (07/05/2012-08/31/2024). Title was changed from “Biogenesis of peptidoglycan in *Escherichia coli*” in 2016.
2. National Institutes of Health 3R01 GM100951-08S1 Administrative supplement to “Envelope Biogenesis in Gram-negative Bacteria”. PI (07/01/2019-06/30/2020)
3. National Institutes of Health Grant 1R03 AI139271. “Functional characterization of AsmA-like proteins in *Escherichia coli*”. PI (06/13/2018-05/31/2020)
4. The Ohio State University Drug Development Institute (Comprehensive Cancer Center). “Optimization of the production of recombinant MOMP”. Collaboration project with Dr. Thomas Cherpes.

## REFEREED PUBLICATIONS

(\* denotes co-corresponding authors)

1. Lundstedt, E.A, Kahne, D\*., **Ruiz, N.\*** (2020). Assembly and maintenance of lipids at the bacterial outer membrane. *Chem Rev.* doi: 10.1021/acs.chemrev.0c00587 (in press). PMID: 32955879.
2. Lundstedt, E.A, Simpson, B.W., **Ruiz, N.** (2020). LptB-LptF coupling mediates closure of the substrate-binding cavity in the LptB<sub>2</sub>FGC transporter through a rigid-body mechanism to extract LPS. *Mol Microbiol.* doi: 10.1111/mmi.14506 (in press). PMID: 32236984
3. Rubino F.A., Mollo, A., Kumar, S., Butler, E.K.; **Ruiz, N.\***, Walker, S.\*, Kahne, D.\* (2020). Detection of transport intermediates in the peptidoglycan flippase MurJ identifies residues essential for conformational cycling. *J Am Chem Soc.* 142:5482-5486. PMID: 32129990
4. Simpson, B.W., Pahil, K.S., Owens, T.W., Lundstedt, E.A., Davis, R.M., Kahne, D.\*, **Ruiz, N.\*** (2019). Combining mutations that inhibit two distinct steps of the ATP hydrolysis cycle restores wild-type function in the lipopolysaccharide transporter and shows that ATP binding triggers transport. *mBio* (4): e01931-19. doi: 10.1128/mBio.01931-19. PMID: 31431556.
5. Kumar, S. and **Ruiz, N.** (2019). Probing conformational states of a target protein in *Escherichia coli* cells by *in vivo* cysteine cross-linking coupled with proteolytic gel analysis. *Bio-protocol* 9(12): e3271. DOI: 10.21769/BioProtoc.3271.
6. Owens, T.W., Taylor, R.J., Pahil, K.S., Bertani, B.R., **Ruiz, N.\***, Kruse, A.C.\*, Kahne, D.\* (2019) Structural basis of unidirectional export of lipopolysaccharide to the cell surface. *Nature* 567:550-553. PMID: 30894747.
7. Kumar, S., Rubino F.A., Mendoza, A.G., **Ruiz, N.** (2019) The bacterial lipid II flippase MurJ functions by an alternating-access mechanism. *J Biol Chem* 294(3):981-990. PMID: 30482840.

8. Bertani, B.R. Taylor, R.J, Nagy, E., Kahne, D. \*, **Ruiz, N\***. (2018) A cluster of residues in the lipopolysaccharide exporter that selects substrate variants for transport to the outer membrane. *Mol Microbiol* 109(4):541-554. PMID: 29995974.
9. Bertani, B. R. and **Ruiz, N.** (2018) Function and biogenesis of lipopolysaccharides. *Eco Sal Plus* 2018; doi:10.1128/ecosalplus.esp-0001-2018. PMID: 30066669.
10. Rubino, F.A., Kumar, S., **Ruiz, N.**, Walker, S., Kahne, D. (2018) Membrane potential is required for MurJ function. *J Am Chem Soc.* 140(13):4481-4484. PMID: 29558128.
11. May, J.M., Owens, T., Mandler, M., Simpson, B.W., Lazarus, M., Sherman, D.J., Davis, R.M., Okuda, S., Masefski, W., **Ruiz, N.\***, Kahne, D\*. (2017) The antibiotic novobiocin binds and activates the ATPase that powers lipopolysaccharide transport. *J Am Chem Soc* 139(48):17221-17224. PMID: 29135241
12. Chamakura, K.R., Sham, L.T., Davis, R.M., Min, L., Cho, H., **Ruiz, N.**, Bernhardt, T.G., Young, R. (2017) A viral protein antibiotic inhibits lipid II flippase activity. *Nature Microbiol* 2(11):1480-1484. PMID: 28894177.
13. Qiao, Y., Srisuknimit, V., Rubino, F., Schaefer, K., **Ruiz, N.**, Walker, S., Kahne, D. (2017) Lipid II overproduction allows direct assay of transpeptidase inhibition by  $\beta$ -lactams. *Nat Chem Biol.* 13(7):793-798. PMID: 28553948
14. Elhenawy, W., Davis, R.M., Fero, J, Salama, N.R., Feldman, M.F., **Ruiz, N.** (2016) The O-antigen flippase Wzk can substitute for MurJ in peptidoglycan synthesis in *Helicobacter pylori* and *Escherichia coli*. *PLoS ONE.* 11(8):e0161587. PMID: 27537185.
15. Simpson, B.W., Owens, T.W., Orabella, M.J., Davis, R.M., May, J.M., Trauger, S.A., Kahne, D. \*, **Ruiz, N.\*** (2016) Identification of residues in the lipopolysaccharide ABC transporter that coordinate ATPase activity with extractor function. *mBio* 7(5): e01729-16. PMID: 27795402
16. **Ruiz, N.** (2016) Filling holes in peptidoglycan biogenesis of *Escherichia coli*. *Curr Opin Microbiol* 34:1-6. PMID: 27449418.
17. Lee, J., Xue, M., Wzorek, J.S., Wu, T., Grabowicz, M., Gronenberg, L.S., Sutterlin, H.A., Davis, R.M., **Ruiz, N. \***, Silhavy, T.J. \*, Kahne, D.E. \* (2016) Characterization of a stalled complex on the  $\beta$ -barrel assembly machine. *Proc Natl Acad Sci U S A.* 113:8717-22. PMID: 27439868
18. Okuda, S., Sherman, D.J., Silhavy, T.J., **Ruiz, N.**, Kahne, D. (2016) Lipopolysaccharide transport and assembly at the outer membrane: the PEZ model. *Nat Rev Microbiol* 14:337-45. PMID: 27026255.
19. **Ruiz, N.** (2016) Lipid flippases for bacterial peptidoglycan biosynthesis. *Lipid Insights* 8(s1) 21–31. PMID: 26792999
20. Simpson, B.W., May, J.M., Sherman, D.J., Kahne, D.\*, **Ruiz, N.\*** (2015) Lipopolysaccharide transport to the cell surface: biosynthesis and extraction from the inner membrane. *Phil Trans R Soc B* 370:20150029. PMID: 26370941
21. May, J.M., Sherman, D.J., Simpson, B.W., **Ruiz, N.\***, Kahne, D.\* (2015) Lipopolysaccharide transport to the cell surface periplasmic transport and assembly into the outer membrane. *Phil Trans R Soc B* 370:20150027. PMID: 26370939
22. Laguna, R., Young, S.J., Chen, C.C; **Ruiz, N.**, Yang, S.T., and Tabita, F.R. (2015) Development of a plasmid addicted system that is independent of co-inducers, antibiotics and specific carbon source additions for bioproduct (1-butanol) synthesis in *Escherichia coli*. *Metab Eng Commun* 2: 6-12.
23. Butler, E.K., Tan, W.B., Joseph, H., and **Ruiz, N.** (2014) Charge requirements of lipid II flippase activity in *Escherichia coli*. *J Bacteriol* 196:4111-4119. PMID: 25225268.
24. Sham, L. T., Butler, E. K., Lebar, M. D., Kahne, D., Bernhardt, T.G.\*, and **Ruiz, N.\*** (2014) MurJ is the flippase of lipid-linked precursors for peptidoglycan biogenesis. *Science* 345:220-222. PMID: 25013077.

- Highlighted in Nat Rev Microbiol (July 2014), Chemical & Engineering News (July 2014), Faculty of 1000 (July 2014), and Scientific American (July 2014).
25. Malojčića, G., Andresa, D., Grabowicz, M., **Ruiz, N.**, Silhavy, T. J., and Kahne, D. (2014) LptE binds to and alters the physical state of LPS to catalyze its assembly at the cell surface. *Proc Natl Acad Sci U S A* 111:9467-9472. PMID: 24938785.
  26. Sherman, D.J., Lazarus, M.B., Murphy, L., Liu, C., Walker, S. **Ruiz, N.\***, and Kahne, D.\* (2014) Decoupling catalytic activity from biological function of the ATPase that powers lipopolysaccharide transport. *Proc Natl Acad Sci U S A* 111:4982-4987. PMID:24639492
  27. Nicolaes, V., El Hajjaji, H., Davis, R., Van der Henst, C., Depuydt, M., Leverrier, P., Aersten, A., Haufroid, V., Ollagnier, S., De Bolle, X., **Ruiz, N.**, and Collet, J.F. (2013) Insights into the function of YciM, a heat-shock membrane protein required to maintain envelope integrity in *Escherichia coli*. *J Bacteriol* 196:300-309. PMID:24187084.
  28. Butler, E.K., Davis, R.M., Bari, V., Nicholson, P.A., and **Ruiz, N.** (2013) Structure-function analysis of MurJ reveals a solvent-exposed cavity containing residues essential for peptidoglycan biogenesis in *Escherichia coli*. *J Bacteriol* 195:4639-4649. PMID:23935042.
  29. Yao, Z., Davis, R.M., Kishony, R., Kahne, D., and **Ruiz, N.** (2012) Regulation of cell size in response to nutrient availability by fatty acid biosynthesis in *Escherichia coli*. *Proc Natl Acad Sci U S A* 109:E2561-E2568. PMID:22908292. Highlighted in Nature Reviews in Microbiology (October 2012), Nature Chemical Biology (October 2012), and Faculty of 1000 (September 2012).
  30. Freinkman, E., Okuda, S., **Ruiz, N.**, and Kahne, D. (2012) Regulated assembly of the transenvelope protein complex required for lipopolysaccharide export. *Biochemistry* 51:4800-4806. PMID:22668317.
  31. Karamoko, M., Cline, S., Redding, K., **Ruiz, N.**, and Hamel, P. P. (2011) Lumen Thiol Oxidoreductase1, a disulfide bond-forming catalyst, is required for the assembly of photosystem II in *Arabidopsis*. *Plant Cell* 23:4446-4461. PMID: 22209765
  32. Chimalakonda, G., **Ruiz, N.**, Chng, S.-S., Garner, R. A., Kahne, D., and Silhavy, T. J. (2011) Lipoprotein LptE is required for the assembly of LptD by the  $\beta$ -barrel assembly machine in the outer membrane of *Escherichia coli*. *Proc Natl Acad Sci U S A* 108:2492-2497. PMID: 21257909
  33. **Ruiz, N.**, Chng, S.-S., Hiniker, A., Kahne, D., Silhavy, T.J. (2010) Nonconsecutive disulfide bond formation in an essential integral outer membrane protein. *Proc Natl Acad Sci U S A* 107:12245-12250. PMCID: PMC2901483.
  34. Chng, S.-S., **Ruiz, N.**, Chimalakonda, G., Silhavy, T. J., and Kahne, D. (2010) Characterization of the two-protein complex in *Escherichia coli* responsible for lipopolysaccharide assembly at the outer membrane. *Proc Natl Acad Sci U S A* 107:5363-5368. PMCID: PMC2851745.
  35. **Ruiz, N.**, Kahne, D., and Silhavy, T. J. (2009) Transport of lipopolysaccharide across the cell envelope: the long road of discovery. *Nature Rev Microbiol* 7: 677-683. PMCID: PMC2790178.
  36. **Ruiz, N.** (2009) *Streptococcus pyogenes* YtgP (Spy\_0390) complements *Escherichia coli* strains depleted of the putative peptidoglycan flippase MurJ. *Antimicrob Agents Chemother* 53(8): 3604-3605. PMCID: PMC2715597.
  37. Vertommen, D.<sup>§</sup>, **Ruiz, N.**<sup>§</sup>, Leverrier, P.<sup>§</sup>, Silhavy, T.J., and Collet, J.F. (2009) Characterization of the role of the *Escherichia coli* periplasmic chaperone SurA using differential proteomics. *Proteomics* 9: 2432-2443 (<sup>§</sup> authors contributed equally).
  38. **Ruiz, N.** (2008) Bioinformatics identification of MurJ (MviN) as the peptidoglycan lipid II flippase in *Escherichia coli*. *Proc Natl Acad Sci U S A* 105: 15553-15557. PMCID: PMC2563115.
  39. **Ruiz, N.**, Gronenberg, L.S., Kahne, D., and Silhavy, T.J. (2008) Identification of two inner-membrane proteins required for the transport of lipopolysaccharide to the outer membrane of *Escherichia coli*. *Proc Natl Acad Sci U S A* 105: 5537-5542. PMCID: PMC2291135.

40. Button, J.E., Silhavy, T.J., and **Ruiz, N.** (2007) A suppressor of cell death caused by the loss of  $\square^E$  downregulates extracytoplasmic stress responses and outer membrane vesicle production in *Escherichia coli*. *J Bacteriol* 189: 1523-1530. PMID: PMC1855761.
41. **Ruiz, N.**, Wu, T., Kahne, D., and Silhavy, T.J. (2006) Probing the barrier function of the outer membrane with chemical conditionality. *ACS Chem Biol* 1:385-395.
42. **Ruiz, N.**, Kahne, D., and Silhavy, T. J. (2006) Advances in understanding bacterial outer membrane biogenesis. *Nature Rev Microbiol* 4: 57-66.
43. **Ruiz, N.**, Falcone, B., Kahne, D., and Silhavy, T.J. (2005) Chemical conditionality: A genetic strategy to probe organelle assembly. *Cell* 121: 307-317.
44. Wu, T., Malinverni, J., **Ruiz, N.**, Kim, S., Silhavy, T. J., and Kahne, D. (2005) Identification of a multi-component complex required for outer membrane biogenesis in *Escherichia coli*. *Cell* 121: 235-245.
45. **Ruiz, N.** and Silhavy, T.J. (2005) Sensing external stress: watchdogs of the *Escherichia coli* cell envelope. *Curr Opin Microbiol* 8: 122-126.
46. Peterson, C. N., **Ruiz, N.**, and Silhavy, T.J. (2004) RpoS proteolysis is regulated by a mechanism that does not require the SprE (RssB) response regulator phosphorylation site. *J Bacteriol* 186: 7403-7410. PMID: PMC523208
47. **Ruiz, N.** and Silhavy, T.J. (2003) Constitutive activation of the *Escherichia coli* PHO regulon upregulates *rpoS* translation in an Hfq-dependent fashion. *J Bacteriol* 185: 5984-5992. PMID: PMC225030.
48. **Ruiz, N.**, Peterson, C. N., and Silhavy, T.J. (2001) RpoS-dependent transcriptional control of *sprE*: regulatory feedback loop. *J Bacteriol* 183: 5974-5981. PMID: PMC99676.
49. Eggert, U. S., **Ruiz, N.**, Falcone, B. V., Branstrom, A. A., Goldman, R. C., Silhavy, T. J., and Kahne, D. (2001) Genetic basis for activity differences between vancomycin and glycolipid derivatives of vancomycin. *Science* 294: 361-364.
50. Madden, J. C., **Ruiz, N.**, and Caparon, M. (2001) Cytolysin-mediated translocation (CMT): A functional equivalent of Type III secretion in Gram-positive bacteria. *Cell* 104: 143-152 and cover illustration.
51. **Ruiz, N.**, Wang, B., Pentland, A., and Caparon, M. (1998) Streptolysin O and adherence synergistically modulate proinflammatory responses of keratinocytes to group A streptococci. *Mol Microbiol* 27: 337-346.
52. Wang, B., **Ruiz, N.**, Pentland, A., and Caparon, M. (1997) Keratinocyte proinflammatory responses to adherent and nonadherent group A streptococci. *Infect Immun* 65: 2119-2126.

## NON-REFEREED PUBLICATIONS

1. **Ruiz, N.** A Bird's Eye View of the Bacterial Landscape. (2013) *Methods Mol Bio* 966:1-14.

## INVITED SEMINARS

1. Department of Microbiology, Harvard Medical School (MA), May 12, 2020 – CANCELLED (COVID-19).
2. Departments of Microbiology and Immunology and Pharmacological Sciences, Stony Brook University (NY), May 5, 2020 – CANCELLED (COVID-19).
3. Microbiology and Molecular Genetics Graduate Program, Emory University (GA), December 9, 2019.
4. Frontiers in Biophysics Seminar Series (Structural and Computational Biology & Biophysics and the Molecular Biophysics Training Program), Purdue University (IN), November 12, 2019.
5. Department of Microbiology & Immunology, University of North Carolina School of Medicine (NC), November 5, 2019.

6. Christian De Duve Institute of Cellular Pathology, Universite Catholique de Louvain, Brussels (Belgium), September 23, 2019.
7. Max Planck Institute for Terrestrial Microbiology, Marburg (Germany), September 16, 2019.
8. Department of Chemistry & Biochemistry, University of Delaware (DE), May 10, 2019.
9. Department of Biochemistry, Case Western Reserve University, Cleveland, (OH), February 22, 2019.
10. Department of Pharmacology, University of Illinois at Chicago (IL), December 5, 2018.
11. Department of Microbiology; student-invited speaker, University of Georgia (GA), October 18, 2018.
12. Plant & Microbial Biology Department, Berkeley University (CA), August 29, 2018.
13. Molecular & Cellular Biology Graduate Program, University of Massachusetts Amherst (MA), December 5, 2017.
14. Department of Medicinal Chemistry and Pharmacognosy, University of Illinois at Chicago (IL), October 27, 2017.
15. Department of Biology, Hofstra University, Hempstead (NY), October 21, 2016.
16. Department of Biochemistry, Duke University School of Medicine, Durham (NC), October 14, 2016.
17. Department of Biochemistry and Molecular Biology, Rosalind Franklin University of Medicine and Science, North Chicago (IL), June 2, 2016.
18. Institute of Plant Biochemistry and Photosynthesis, CSIC, Sevilla (Spain), December, 18, 2015.
19. Christian De Duve Institute of Cellular Pathology, Universite Catholique de Louvain, Brussels (Belgium), September 25, 2015.
20. Genentech, South San Francisco (CA), March 18, 2015.
21. Department of Biochemistry and Molecular Biology, Penn State University, University Park (PA), November 10, 2014.
22. Department of Molecular Biology, Princeton University, Princeton (NJ), October 22, 2014.
23. Department of Molecular Genetics, Ohio State University, Columbus (OH), March 6, 2014.
24. Department of Biological Sciences, University of Alberta, Edmonton (Canada), November 28, 2013.
25. Department of Microbiology, Universidad de Chile, Santiago de Chile (Chile), November 5, 2013.
26. Department of Microbiology, University of Illinois at Urbana-Champaign, Urbana (IL), October 17, 2013.
27. Genentech, South San Francisco (CA), July 23, 2013.
28. OSU Chemistry-Biology Interface Training Program, Ohio State University, Columbus (OH), February 19, 2013.
29. Department of Biology, Kenyon College, Gambier (OH), February 7, 2013.
30. The Child Health Research Center Speaker Series at The Research Institute at Nationwide Children's Hospital, Columbus (OH), January 31, 2013.
31. Cold Spring Harbor Laboratory Advanced Bacterial Genetics Course, Cold Spring Harbor (NY), June 16, 2012.
32. Department of Biology, Microbiology Seminar Series, Indiana University, Bloomington (IN), March 6, 2012.
33. Department of Microbiology, Miami University, Oxford (OH), February 8, 2012.
34. Novartis Institutes for Biomedical Research, Emeryville (CA), September 28, 2011.

35. Department of Biochemistry, Ohio State University, Columbus (OH), May 6, 2011.
36. Center for Microbial Pathogenesis, The Research Institute at Nationwide Children's Hospital, Columbus (OH), March 2, 2011.
37. Center for Microbial Interface Biology, Ohio State University Medical Center, Columbus (OH), February 14, 2011.
38. Department of Microbiology and Immunology, Uniformed Services University of the Health Sciences, Bethesda (MD), March 29, 2010. Seminar and class lecture.
39. Department of Microbiology, University of Pennsylvania, Philadelphia (PA), January 16, 2009.
40. Department of Medical Microbiology & Immunology, University of Wisconsin, Madison (WI), December 5, 2008.
41. Christian De Duve Institute of Cellular Pathology, Universite Catholique de Louvain, August 30, 2007. Brussels, Belgium.

### **INVITED PRESENTATIONS AT SCIENTIFIC MEETINGS**

1. Microbial Stress Response Gordon Conference. Mount Holyoke College, South Hadley, MA (July 2020). CANCELLED (COVID-19)
2. PdB-Spier Symposium, November 2019. Stellenbosch, South Africa. Invited speaker.
3. Great Wall Symposium, September 2019. Paris, France. Invited speaker.
4. Bacterial cell division: Closing the gap, EMBO workshop, June 2019. Lund, Sweden. Invited speaker.
5. New Antibacterial Discovery and Development Gordon Research Conference, March 2018. Ventura, CA. Invited speaker.
6. 7<sup>th</sup> FEBS Special Meeting on ABC Proteins – ABC2018: From Multidrug Resistance to Genetic Disease, March 2018. Innsbruck, Austria. Invited speaker.
7. Society for Glycobiology Meeting, November 2017. Portland, OR. Invited speaker.
8. “Building and tearing down the wall: peptidoglycan dynamics” Symposium. ASM Microbe, June 2017. New Orleans, LA. Invited speaker and convener of symposium.
9. Microbial Genetics and Genomics VII, May 2017. Asilomar, CA. Invited speaker.
10. “The bacterial cell wall takes center stage”. 5th International Symposium of the SFB 766, 2017. Tubingen, Germany. Invited speaker.
11. Great Wall Symposium, September 2015. Villa Finaly, Florence, Italy. Invited speaker.
12. CMIB Symposium, 2014. The Ohio State University Wexner Medical Center, OH. Invited speaker.
13. Midlands Microbiology Meeting, 2014. Birmingham University, Birmingham (UK). Invited speaker.
14. Protein Transport Across Cell Membranes Gordon Conference, 2014. Hotel Galvez, Galveston, TX. Invited speaker.
15. XII Pan-American Biochemistry and Molecular Biology Congress, 2013. Puerto Varas, Chile. Invited speaker.
16. Molecular Genetics of Bacteria and Phages Meeting, 2013. University of Wisconsin, Madison, WI. Invited speaker and chair of “Life Beyond the Cytosol” session.
17. Midwest Microbial Pathogenesis Conference, 2011. University of Michigan, Ann Arbor, MI. Invited speaker.

18. “Biogenesis of the Bacterial Cell Surface” Symposium, ASM General Meeting, 2011. New Orleans, LA. Invited speaker and co-chair of symposium.
19. Ohio Branch of the American Society for Microbiology Annual Meeting, 2011. Ohio University, Athens, OH. Invited speaker.
20. Microbial Stress Response Gordon Research Conference, 2010. Mount Holyoke College, South Hadley, MA. Invited speaker.
21. Bacterial Cell Surfaces Gordon Research Conference, 2010. Colby-Sawyer College, New London, NH. Invited chair for the *Outer Membrane* section.
22. FASEB Summer Research Conference: Transport ATPases: From Molecules to Maladies, 2010. Snowmass Village, CO. Invited speaker.
23. Cellular Lipid Transport - Connecting Fundamental Membrane Assembly Processes to Human Disease, 2008. Canmore, Alberta, Canada. Invited speaker.
24. ASBMB General Meeting, *Membrane Biogenesis* Symposium, 2007. Washington D.C. Invited speaker.

## **DISTINCTIONS**

- 2024 Co-chair elect (with Jean-Francois Collet), “Bacterial Cell Surfaces Gordon Conference”, West Dover, VT. (June 2022; vice-chair for 2022 Conference)
- 2020 Session Chair, “Outer Membrane” session, Bacterial Cell Surfaces Gordon Conference. West Dover, VT. CANCELLED (COVID-19)
- 2018 Session chair, “Stress and the Cell Envelope” session, Microbial Stress Response Gordon Conference. Mount Holyoke College, South Hadley, MA (July 2018).
- 2018 Co-organizer of the “Genetic Approaches to Understanding Complex Cellular Processes Conference” Princeton, NJ, 2018 (45 attendees; co-organizer: Dr. Nathaniel Rigel, Hofstra University).
- 2017 Convener of the “Building and tearing down the wall: peptidoglycan dynamics” Symposium. ASM Microbe. New Orleans, LA.
- 2016 Semifinalist for the Howard Hughes Medical Institute Faculty Scholars Program (2015 competition).
- 2013 Chair, “Life Beyond the Cytosol” session, Molecular Genetics of Bacteria and Phages Meeting, Madison, WI.
- 2012 Distinguished Undergraduate Research Mentor Award Nominee, Ohio State University.
- 2011 Co-chair, “Biogenesis of the Bacterial Cell Surface Symposium”, American Society for Microbiology 111<sup>th</sup> Annual General Meeting, New Orleans, LA.
- 2010 Chair, “Outer Membrane” session, Bacterial Cell Surfaces Gordon Conference. Colby-Sawyer College, New London, NH.
- 2006 Postdoctoral Teaching Award in Molecular Biology, Princeton University
- 2004 Postdoctoral Talk Award at the Molecular Biology Department Retreat, Princeton University
- 2002 Postdoctoral Poster Award at the Molecular Biology Department Retreat, Princeton University
- 1993 B.A. in Microbiology and Chemistry, Highest Distinction, University of Kansas
- 1993, 1992, and 1991 Cassandra Ritter Award for undergraduate academic and research excellence in Microbiology
- 1993 Taft Award for excellence in Physical Chemistry
- 1993 Cora M. Downs Award for outstanding woman student based on laboratory participation and academic performance in Microbiology



- 1993 Phi Kappa Phi
- 1993 Sigma Xi
- 1992 C. E. Spahr Sciences Scholarship
- 1991 Clark E. Bricker Award for outstanding second-year student in Chemistry
- 1991 Golden Key National Honor Society
- 1990 Sorg Scholarship for outstanding beginning students in Chemistry

## **ADMINISTRATIVE SERVICE**

### **Department of Microbiology:**

- 2019: Member, Faculty Search Committee
- 2017 – present: Member, Undergraduate Curriculum Committee
- 2015 – present: Microbiology Honors Advisor
- 2018: Member, Graduation Ceremony Committee
- 2016: Member, Faculty Search (Rod Sharp Chair in Microbiology) Committee
- 2014 – 2017: Member, Graduate Studies Committee
- 2014 – 2016: Organizer of Annual Department of Microbiology Symposium
- 2013 – 2014: Member, OAA Unit Review Committee
- 2013: Member, Departmental Chair Search Committee
- 2010 – 2013: Member, Graduate Admission Committee

### **Non-departmental Committees:**

- 2020: Member, Cellular, Molecular, and Biochemical Sciences Program Pre-doctoral Fellowship Review Committee
- 2019 – present: Chair, Ohio State Biochemistry Program Admission Committee
- 2019 – present: Member, Ohio State Biochemistry Program Graduate Studies Committee
- 2018 – 2019: Member, Ohio State Biochemistry Program Admission Committee
- 2013 – 2016: Member, Ohio State Biochemistry Program Recruiting Committee
- 2013 CMIB T32 Postdoctoral Fellowship Review Committee member
- 2012 – 2016: CMIB Host-Pathogen Seminar Series Committee member

### **University Service:**

- 2014 – 2019: Member, Committee on Academic Misconduct
- 2015 – 2018: Member, College of Arts and Sciences Honors Committee
- 2016– 2018: Member, College of Arts and Sciences Honors Curriculum and Assessment Subcommittee
- 2015: Member, College of Arts and Sciences Honors Curriculum Subcommittee
- 2015: Member, College of Arts and Sciences Curriculum Committee

## **PROFESSIONAL SERVICE**

### **Service to Societies and Networks:**

2019-2021: Member of the American Society for Microbiology Microbe 2020-2022 Program Committees (3-y term)

2019- 2021: Councilor At-Large of the American Society for Microbiology Council on Microbial Sciences

2016: Member, ASM Nominating Committee for President-Elect

2016: Member, International Advisory Board for the International Microbiology Congresses of the International Union of Microbiological Societies (IUMS 2017)

2015 –present: Member, Scientific Advisory Board of the Train2Target in the European Training Network

### **Reviewer for Journals:**

2004 – present: Journal of Bacteriology, Molecular Microbiology, Journal of Biological Chemistry, EMBO Journal, Molecular Genetics and Genomics, Biotechnology Progress, Proteomics, Biochemistry, Journal of the American Chemical Society, BMC Microbiology, Proceedings of the National Academy of Sciences of the USA, Chemistry and Biology, PLoS ONE, Frontiers in Cellular and Infection Microbiology, DNA Repair, PLoS Pathogens, mBio, BBA Molecular Cell Research, PLoS Genetics, Microbiology, Marine Drugs, Glycobiology, Genes and Development, eLife, FEBS Journal, FEBS Letters, BBA Proteins and Proteomics, Microbial Drug Resistance, Scientific Reports, Science, Nature, BBA Molecular and Cell Biology of Lipids, Nature Microbiology, Nature Structural & Molecular Biology, Nature Communications, ACS Chemical Biology, mSphere, Frontiers in Microbiology, Communications Biology, Applied and Environmental Microbiology, European Journal of Lipid Science and Technology, Current Biology

2020: Guest editor for PNAS (1 paper)

2016: Guest editor for mBio (1 paper)

2015 – present: Editorial Board Member of Journal of Bacteriology

2012 – present: Editorial Advisory Board Member of Molecular Microbiology

### **Grant Reviewer:**

June 2016 – June 2020: Member, NIH, PCMB Study Section

2007 – present: Ad-hoc reviewer: NIH, NSF, European Research Council (ERC Advanced Grant), Wellcome Trust/DBT India Alliance Fellowship, Wellcome Trust Research New Investigator Award Wellcome Trust Research Career Development Fellowship, Netherlands Organisation for Scientific Research Division for Earth and Life Sciences, Portuguese Foundation for Science and Technology,

### **Consulting:**

July 2018 – present: Anexigen, Inc., San Diego, CA.

2018 Common Fund Glycoscience Program, National Institutes of Health.