

Marianna A. Patrauchan, Ph.D.

Assistant Professor
Department of Microbiology and Molecular Genetics
College of Arts and Sciences
Oklahoma State University

Contact Information:

E-mail: m.patrauchan@okstate.edu

Phone: 405-744-8148

Office: Rm 304A Life Sciences East, Oklahoma State University, Stillwater, OK 74074

Education:

1986-1989: B.S. Biology, National Taras Shevchenko University

1989-1991: M.S. Microbiology and M.S. Teaching Biology and Chemistry, National Taras Shevchenko University

1991-1995: Ph.D. Microbiology, Institute of Microbiology and Virology, National Academy of Sciences

Awards and Honors:

2009: Nominee for the Arts & Sciences Student Council Outstanding Professor Award

2009-2018: Faculty Mentor, 9 Wentz Undergraduate Research Awards (J. Cloud, S. Hnatusko, E. Best, A. Lawson, K. Burch, H. Wendelbo, M. Cloeter, R. Rogers, D. McLeod)

2012-2019: Faculty Mentor, 3 Niblack Undergraduate/Graduate Research Awards (E. Best/M. Guragain, R. Rogers/B. Kayastha, C. Salinas/M. King)

2012: Faculty Mentor/Sponsor, Chickasaw Higher Education Research Scholarship Award (S. Johnson)

2012-2018: Advisor, 3 ASM travel awards (S. Lotlikar, M. Guragain, M. King)

2013/2015: Faculty Mentor, 2 Graduate College Summer Dissertation Fellowships (M. Guragain, S. Khanam)

2014: Faculty Mentor/Sponsor, 3 OSU Undergraduate Research Scholarship Awards (A. Price, T. Olvera, M. Waner)

2014: Nominee for the Arts & Sciences College Outstanding Faculty Mentor Award

2014: Nominee for the OSU Outstanding Faculty Member Phoenix Award

2015: Nominee for the Arts & Sciences College Outstanding Faculty Mentor Award

2015: Faculty Mentor, Distinguished Graduate Fellowship (M. Guragain)

2014-2018: Faculty Mentor, 3 Otto S. Cox Graduate Fellowships for Genetic Research (M. Guragain, S. Khanam, M. King)

2016-2018: Faculty Mentor, 8 LSAMP Undergraduate Research Scholarships (R. Rogers, E. Gallaway, A. Davis, S. Mares, J. McCoy, K. Figueroa, C. Salinas)

2018: Nominee for the OSU President Fellow Award

1998: NSF International Fellowship, Michigan State University

1998-1999: NSF-NATO Postdoctoral Fellowship, Montana State University

1997/1998: Two Annual Fellowships for young scientists for contributions in research, National Academy of Sciences

1988-1991: Lenin's Honor Scholarship for excellent academic results, Kiev State University

1991: Honor "Red" M.S. Diploma, Kiev State University

Other Professional Experiences and Memberships:

2014-present: Associate Professor, Department of Microbiology and Molecular Genetics, Oklahoma State University

2008-2014: Assistant Professor, Department of Microbiology and Molecular Genetics, Oklahoma state University

2007: Adjunct Faculty, Faculty of Medicine, University of British Columbia, Vancouver, Canada

2002-2006: Research Associate, Department of Microbiology and Immunology, University of British Columbia

1999-2002: Postdoctoral Researcher, Microbiology Department, Montana State University

1998-1999: Postdoctoral Fellow (NSF-NATO Fellowship), Center for Biofilm Engineering, Montana State University

1998: Visiting Researcher (NSF Fellowship), Center for Microbial Ecology, Michigan State University

1995-1998: Researcher, Laboratory of Microbial Degradation of Surfactants, Institute of Colloid and Water Chemistry, National Academy of Sciences

Research Funding:

Current:

- 01/2019-07/2020: NIH, Diversity Supplement AREA R15, "Ca²⁺-binding protein EfhP mediates Ca²⁺ regulation of *Pseudomonas aeruginosa* virulence and host-pathogen interactions." Role: Advisor
- 08/2018-07/2021: NIH/NIGMS, NIH CoBRE Phase II, "Two pathways for calcium signaling and virulence regulation in *P. aeruginosa*." Role: Principal Investigator
- 08/2017-07/2020: NIH/NIGMS (1R15GM124670-01), Academic Research Enhancement Award R15, "Ca²⁺-binding protein EfhP mediates Ca²⁺ regulation of *Pseudomonas aeruginosa* virulence and host-pathogen interactions." Role: Principal Investigator

Past:

- 12/2016-11/2018: OSU, TDBP Phase 1, "Drinking water preservation using polymeric coating containing antimicrobial silver cyanoximates." Role: Principal Investigator
- 08/2017-07/2018: NIH/NIGMS, OCRID COBRE Phase I Pilot Project, "Two pathways for calcium signaling and virulence regulation in *P. aeruginosa*", Role: Principal Investigator
- 01/2012-02/2016: Academic Research Enhancement Award R15, NIH/SBCA/BMBI (1R15AI088594-01A1), "Antimicrobial effect of a new class of light resistant silver (I) complexes. Adhesion and biofilm studies.", Role: Co-Investigator
- 08/2015-07/2016: OCRID COBRE Phase I Pilot Project, NIH/NIGMS, "Does PA0327 bind calcium and regulate *Pseudomonas aeruginosa* virulence?", Role: Principal Investigator
- 07/2013-02/2016: Research Supplement AREA R15, NIH, "Antimicrobial effect of a new class of light resistant silver (I) complexes. Adhesion and biofilm studies", Role: Advisor
- 08/2012-07/2015: Research Grant, OCAST (HR12-167), "Antibiotic resistance in *Pseudomonas aeruginosa*.", Role: Principal Investigator
- 09/2011-09/2015: Research Grant, Department of Energy (DE-FOA-0000311), "Induced Polarization Signature of Biofilms in Porous Media: From Laboratory Experiments to Theoretical Developments and Validation", Role: Co-Investigator

- 10/2013-07/2014: OCRID COBRE Phase I Pilot Project, NIH (P20GM103648), "Photoreceptors as a novel class of virulence factors in opportunistic pathogens", Role: Co-Investigator
- 07/2009-06/2012: AHA Grant-in-Aid, American Heart Association (09BGIA2330036), "Calcium and *Pseudomonas aeruginosa* infective endocarditis", Role: Principal Investigator
- 2011: OSU Arts and Sciences Technology Fee, "Acquisition of a state-of-the-art floor-model centrifuge", Role: Co-Applicant\
- 2011: OSU Facility Renovation and Core Facility, "Next generation PCR facility in LSE", Role: Co-Applicant
- 06/2009-08/2009: Summer Research Grant, Oklahoma State University, College of Arts & Sciences, "Calcification. Search for a new virulence factor in *Pseudomonas aeruginosa*", Role: Principal Investigator
- 01/2008-06/2010: New Faculty Start-up Funds, Oklahoma State University, Role: Principal Investigator

Selected Publications:

Journal Articles (In preparation or pending review)

1. S.R. Lotlikar**, B. Kayastha**, D. Vullo, S.S Khanam**, R. Braga*, A.B. Murray, R. McKenna, C.T. Supuran, and **M.A. Patrauchan** "*Pseudomonas aeruginosa* β -carbonic anhydrase, psCA1, is required for calcium deposition and contributes to virulence" *Under Revisions*
2. M. Guragain**, S.S. Khanam**, M. King**, B. Cougar, L. Kafer*, E. Gallaway*, H. Wendelbo* and **M.A. Patrauchan** "Calcium Channel-Dependent Transient Changes in the Intracellular Calcium are Required for Calcium Regulation of Virulence and Antibiotic Resistance in *Pseudomonas aeruginosa*"
3. M. King**, D. McLeod*, and **M.A. Patrauchan** "Transcriptional regulation of the novel phytase, CarP in *P. aeruginosa*"
4. M. King**, A. Price*, B. Russ*, W. Hoff, and **M.A. Patrauchan** "Swarming in *Pseudomonas aeruginosa* is regulated by growth conditions"
5. B. Kayastha**, R. Rogers*, and **M.A. Patrauchan** "Novel calcium sensor EfhP regulates *P. aeruginosa* virulence"
In Print or Press
1. S.R. Lotlikar**, M. Whited, E. Gallaway*, T. Grant*, S. Popis, M. Guragain**, R. Rogers*, S. Hamilton*, N.G. Gerasimchuk, and **M.A. Patrauchan**. Silver (I) Cyanoximates Inhibit Biofilm Formation of Gram-positive and Gram-negative bacteria. *Polymers*, **2019** [Accepted]
2. C.L. Rosier, E.A. Atekwana, G.A. Aal, and **M.A. Patrauchan**. Cell concentrations and metabolites enhance the SIP response to biofilm formation. *Journal of Applied Geophysics*, **2019** Jan, Vol 160 183-194.
3. M. King**, B. Kayastha**, M. Franklin, and **M.A. Patrauchan**. Calcium signaling regulates virulence in human pathogens. *Advances in Experimental Medicine and Biology*, [Accepted]
4. A.B. Murray, M. Aggarwal, M. Pinard, D. Vullo, **M. Patrauchan**, C.T. Supuran, and R. McKenna. Structural Mapping of Anion inhibitors to β -Carbonic Anhydrase psCA3 from *Pseudomonas aeruginosa*. *ChemMedChem*. **2018** Oct 8, 13(9) 2024-2029. Cover Feature.
5. S.S. Khanam**, M. Guragain**, D. Lenaburg*, R. Kubat*, and **M.A. Patrauchan** "Calcium induces tobramycin resistance in *Pseudomonas aeruginosa* by regulating RND efflux pumps." **2017**, *Cell Calcium*. Jan 61, 32-43 Featured in *Biomedical Advances* <http://biomedical-advances.org/inf-20175-31/>.
6. M.M. King**, M. Guragain**, S.A. Sarkisova, and **M.A. Patrauchan** "Pyocyanin Extraction and Quantitative Analysis in Swarming *Pseudomonas aeruginosa*" **2016**, *Bio-protocol*. Vol 6, Iss 23, Dec 05
7. M. Guragain**, A.K. Campbell, and **M.A. Patrauchan** "Measurement of Intracellular Calcium Concentration in *Pseudomonas aeruginosa*" **2016**, *Bio-protocol*. Vol 6, Iss 23, Dec 05, 2016
8. M. Guragain**, M. King**, K.S. Williamson, A.C. Perez-Osorio, T. Akyama, S. Khanam**, **M.A. Patrauchan**, and M.J. Franklin "The *Pseudomonas aeruginosa* PAO1 two-component regulator, CarSR, regulates calcium homeostasis and calcium-induced virulence factor production through its regulatory targets, CarO and CarP" **2016**, *J Bacteriol*. Jan 11, 198(6):951-63.

9. M.A. Pinard, S.R. Lotlikar**, C.D. Boone, D. Vullo, C.T. Supuran, **M.A. Patrauchan** and R. McKenna "Structure and inhibition studies of a type II beta-class carbonic anhydrase psCA3 from *Pseudomonas aeruginosa*" **2015**, *Bioorg. Med. Chem.* Aug 1; 23 (15), 4831-4838.
10. Invited review: D.C. Dominquez, M. Guragain**, and **M.A. Patrauchan**. Calcium binding proteins and calcium signaling in prokaryotes. **2015** *Cell Calcium*. Mar 57(3), 151-65.
11. S.A. Sarkisova, S.R. Lotlikar**, M. Guragain**, R. Kubat*, J. Cloud*, M.J. Franklin, and **M.A. Patrauchan**. A *Pseudomonas aeruginosa* EF-hand protein, EfhP (PA4107) modulates stress responses and virulence at high calcium. **2014**, *PLoS One*. Jun 11;9(2):e98985. doi: 10.1371/journal.pone.0098985.
12. C.N. Riddles, M. Whited, S.R. Lotlikar**, K. Still*, **M.A. Patrauchan**, S. Silchenko, and N.N. Gerasimchuk. Synthesis and Characterization of Two Cyanoxime Ligands, Their Precursors, and Light Insensitive Antimicrobial Silver (I). **2014**, *Cyanoximates. Inorganica Chimica Acta*. 412C, 94-103.
13. M. Guragain**, D. Lenaburg*, S. Moore*, I. Reutlinger*, and **M.A. Patrauchan** "Calcium homeostasis in *Pseudomonas aeruginosa* requires multiple transporters and modulates swarming motility". **2013**, *Cell Calcium*. 54(5), 350-61.
14. M. Pinard, S.R. Lotlikar**, **M.A. Patrauchan**, R. McKenna. Preliminary X-ray crystallographic analysis of beta-carbonic anhydrase psCA3 from *Pseudomonas aeruginosa*. **2013**, *Acta Cryst.* F69, 891-894.
15. S.R. Lotlikar**, S. Hnatusko*, N.E. Dickenson, S.P. Choudhari, W. Picking, and **M.A. Patrauchan**. Purification and characterization of three β -carbonic anhydrases from *P. aeruginosa* PAO1. **2013**, *Microbiology*, 159, 1748-1759.
16. S. Dalvi, S. Azetsu, **M.A. Patrauchan**, D.F. Aktas, B.Z. Fathepure. Proteogenomic elucidation of initial steps in benzene degradation pathway in a novel halophile, *Arhodomonas* sp strain Rozel Isolated from a hypersaline environment. **2012**, *AEM*. 78(20), 7309-7316.
17. M.A. Patrauchan, D. Miyazawa, J.C. LeBlanc, C. Aiga, C. Florizone, L.D. Eltis, and W.W. Mohn. Proteomic analysis of *Rhodococcus jostii* RHA1 survival during carbon starvation. **2012**, *AEM*. 78(18), 6714-6725.
18. M.A. Patrauchan, J.J. Parnell, M.P. McLeod, C. Florizone, J.M. Tiedje and L.D. Eltis. Genomic analysis of the phenylacetyl-CoA pathway in *Burkholderia xenovorans* LB400. **2011**, *Arch Microbiol*. 194 (9), 641-650.
19. S. Okamoto, F. van Petegem, **M. A. Patrauchan** and L. D. Eltis. AnhE, a metallochaperone involved in the maturation of a cobalt-dependent nitrile hydratase. **2010**, *J Biol Chem*, 285 (33), 25126-33.
20. D.J. Smith, **M.A. Patrauchan**, C.M. Florizone, L.D. Eltis, and W.W. Mohn. The distinct roles of P450 monooxygenases DitQ and DitU in catabolism of abietane diterpenoids by *Burkholderia* sp. LB400. **2008**. *J. Bacteriol*. 190(5), 1575-83.
21. M.A. Patrauchan, C.M. Florizone, S. Eapen, B. Sethuraman, M. Fukuda, J. Davies, W.W. Mohn, and L.D. Eltis. Roles of ring-hydroxylating dioxygenases in styrene and benzene catabolism in *Rhodococcus jostii* RHA1. **2008**. *J. Bacteriol*. 190(1), 37-47.
22. M.A. Patrauchan, S. Sarkisova, and M.J. Franklin. Strain-specific proteome responses of *Pseudomonas aeruginosa* to biofilm growth and calcium. **2007**. *Microbiology*. 153(11), 3838-3851.
23. M.B. Perry, L.L. Maclean, **M.A. Patrauchan**, and E. Vinogradov. The structure of the exocellular polysaccharide produced by *Rhodococcus* sp. RHA1. **2007**. *Carbohydrate Research*. 342(15), 2223-2229.
24. V.J. Denef, J.A. Klappenbach, **M.A. Patrauchan**, C. Florizone, J.L.M. Rodrigues, J.J. Parnell, T.V. Tsoi, W. Verstraete, L.D. Eltis, and J.M. Tiedje. Genetic and genomic insights into the role of benzoate-catabolic pathway redundancy in *Burkholderia xenovorans* LB400. **2006**. *Appl. Environ. Microbiol*. 72, 585-595.
25. V.J. Denef, **M.A. Patrauchan**, C. Florizone, J. Park, T.V. Tsoi, W. Verstraete, J.M. Tiedje, and L.D. Eltis. Growth substrate- and phase-specific expression of biphenyl, benzoate and C1 metabolic pathways in *Burkholderia xenovorans* LB400. **2005**. *J. Bacteriol*. 187, 7996-8005.
26. M.A. Patrauchan, C.M. Florizone, M. Dosanjh, W.W. Mohn, J. Davies, and L.D. Eltis. Catabolism of benzoate and phthalate in *Rhodococcus* sp. Strain RHA1: Redundancies and Convergence. **2005**. *J. Bacteriol*. 187, 4050-4063.
27. J.M. Navarro-Llorens, **M.A. Patrauchan**, G.R. Stewart, J.E. Davies, L.D. Eltis, and W.W. Mohn. Phenylacetate catabolism in *Rhodococcus* sp. RHA1: a central pathway for degradation of aromatic compounds. 2005. *J. Bacteriol*. 187, 4497-4504.
28. S. Sarkisova, **M.A. Patrauchan**, D. Berglund, D.E. Nivens, M.J. Franklin. Calcium-Induced Virulence Factors Associated with the Extracellular Matrix of Mucoïd *Pseudomonas aeruginosa* Biofilms. **2005**. *J Bacteriol*. 187, 4327-37.
29. M.A. Patrauchan, S. Sarkisova, K.Sauer, M.J. Franklin. Calcium influences cellular and extracellular product formation during biofilm-associated growth of a marine *Pseudoalteromonas* sp. **2005**. *Microbiology*, 151, 2885-2897.

30. M.A. Patrauchan, P.J. Oriel. Degradation of benzyldimethylalkylammonium chloride by *Aeromonas hydrophila* sp. K. **2003**. *J Appl Microbiol.* 94, 266-272.

Book Chapters

1. M. King**, B. Kayastha**, M. Franklin, and **M.A. Patrauchan** Calcium signaling regulates virulence in human pathogens. In: Calcium Signaling, 2nd edition. Editors: Md. Shahidul Islam, Springer, **2020**.
2. D.C. Dominquez and **M.A. Patrauchan**. Calcium in bacteria. In: Encyclopedia of Metalloproteins. Editors: Eugene A. Permyakov and Robert H. Kretsinger. Springer. **2012**.