PATRICK R. SECOR, PhD

Montana State University
Department of Microbiology & Cell Biology
109 Lewis Hall – Bozeman, Montana – 59717
patrick.secor@montana.edu
https://www.montana.edu/mbi/directory/2553333/patrick-secor
https://www.secorlab.org

ACADEMIC APPOINTMENTS

2024 – present
Montana State University
Associate Professor
Department of Microbiology & Cell Biology

2023 – 2024
University of Montana
Associate Professor
Division of Biological Sciences
CMMB Graduate Program
Center for Translational Medicine

2017- 2023
University of Montana
Assistant Professor
Division of Biological Sciences
CMMB Graduate Program
Center for Translational Medicine

2013-2017
University of Washington
Cystic Fibrosis Foundation Postdoctoral Fellow
Advisor: Pradeep K. Singh

2011-2013
University of Washington
NIH T32 Postdoctoral Fellow
Advisor: William C. Parks

EDUCATION

2006-2011
Montana State University
Center for Biofilm Engineering
Ph.D. in Biological Sciences/Microbiology
Advisor: Garth A. James

2002-2006
Montana State University
B.S. in Biochemistry, *cum laude*

PEER REVIEWED PUBLICATIONS

https://scholar.google.com/citations?user=LpTGTwwAAAAJ&hl=en&oi=ao

**Graduate student co-author, **Undergraduate co-author, ***Postdoc co-author*
[#]P. R. Secor listed as corresponding author

2026

(43) Pershing NL, Brzozowski RS***, Schmidt AK*, Faith DR*, Joyce AC*, Ortiz de Ora L***, Kominsky JD, Dankwardt A, Maciver A, Bell R, Henriques WS, Andersen SE, Wiedenheft B, Casjens SR, Duerkop BA, Round JL, **Secor PR#**. A prophage-encoded sRNA limits lytic phage infection of adherent-invasive *E. coli*. ***PLoS Pathogens***. 2026;22(1):e1013836. doi: 10.1371/journal.ppat.1013836. PMID: 41481766.

2025

(42) Pourtois JD, Haddock NL, Gupta A, Khosravi A, Martinez HA, Schmidt AK, Prakash PS, Jain R, Fleming P, Chang TH, Milla C, **Secor PR**, De Leo GA, Bollyky PL, Burgener EB. New *Pseudomonas* infections drive Pf phage transmission in CF airways. ***JCI Insight***. 2025;10(11):e188146. Epub 20250422. doi: 10.1172/jci.insight.188146. PubMed PMID: 40261708.

(41) Fitzpatrick AD, Taylor VL, Patel PH, Faith DR, **Secor PR**, Maxwell KL. Phage reprogramming of Pseudomonas aeruginosa amino acid metabolism drives efficient phage replication. ***mBio***. 2025;16(3):e0246624. Epub 20250207. doi: 10.1128/mbio.02466-24. PubMed PMID: 39918338.

(40) Burgener EB, Gupta A, Nakano K, Gibbs SL, Sommers ME, Khosravi A, Bach MS, Dunn C, Spano J, **Secor PR**, Tian L, Bollyky PL, Milla CE. Pf bacteriophage is associated with decline in lung function in a longitudinal cohort of patients with cystic fibrosis and *Pseudomonas* airway infection. ***J Cyst Fibros. 2025;24(2):345–352.*** Epub 20241025. doi: 10.1016/j.jcf.2024.09.018. PubMed PMID: 39490215.

2024

(39) Burgener EB, Cai P, Kratochvil MJ, Rojas-Hernandez LS, Joo NS, Gupta A, **Secor PR**, Heilshorn SC, Spakowitz AJ, Wine JJ, Bollyky PL, Milla CE. The lysogenic filamentous *Pseudomonas* bacteriophage phage Pf slows mucociliary transport. ***PNAS Nexus***. 2024:pgae390.

(38) Chen Q, Cai P, Chang THW, Burgener E, Kratochvil MJ, Gupta A, Hargil A, **Secor PR**, Nielsen JE, Barron AE, Milla C, Heilshorn SC, Spakowitz AJ, Bollyky PL. 2024. Pf bacteriophages hinder sputum antibiotic diffusion via electrostatic binding. ***Science Advances****,* 10 (22), eadl5576

(37) Schmidt AK*, Schwartzkopf CM*, Pourtois JD, Burgener E, Faith DR*, Joyce A**, Lamma T**, Kumar G, Bollyky PL, **Secor PR**[#]. 2024. Targeted deletion of Pf prophages from diverse *Pseudomonas aeruginosa* isolates impacts quorum sensing and virulence traits. ***Journal of Bacteriology***, 2024:e0040223, doi: 10.1128/jb.00402-23

(36) Copeland CJ*, Roddy JW, Schmidt AK*, **Secor PR**, Wheeler TJ. 2024. VIBES: A Workflow for Annotating and Visualizing Viral Sequences Integrated into Bacterial Genomes. ***NAR Genomics and Bioinformatics****,* 6 (2), doi.org/10.1093/nargab/lqae030. Editor's Choice.

(35) Faith DR*, Kinnersley M, Brooks DM, Drecktrah D, Hall LS, Luo E, Santiago-Frangos A, Wachter J, Samuels DS, **Secor PR**[#]. 2024. Characterization and genomic analysis of the Lyme disease spirochete bacteriophage ϕBB-1. ***PLoS Pathogens****,* 2024;20(4):e1012122. doi: 10.1371/journal.ppat.1012122

(34) Román-Cruz VC*, Miller SM, Schoener RA, Lukasiewicz C, Schmidt AK*, DeBuysscher BL, Burkhart D, **Secor PR**, Evans JT. 2024. Adjuvanted Vaccine Induces Functional Antibodies against *Pseudomonas aeruginosa* Filamentous Bacteriophages. ***Vaccines*** 12:115

(33) Schwartzkopf, C.M.*, Taylor, V., Groleau, M-C., Faith, D. R.*, Schmidt, A. K.*, Lamma, T.**, Brooks, D. M., Déziel, E., Maxwell, K., and **Secor, P. R.**[#]. Inhibition of PQS signaling by the Pf bacteriophage protein PfsE enhances viral replication in *Pseudomonas aeruginosa.* ***Molecular Microbiology.*** 2024; doi:10.1111/mmi.15202

2023

(32) de Mattos CD*, Faith DR*, Nemudryi AA, Schmidt AK*, Bublitz DC, Hammond L, Kinnersley MA, Schwartzkopf CM*, Robinson AJ**, Joyce A**, Michaels LA, Brzozowski RS, Coluccio A, Xing DD, Uchiyama J, Jennings LK, Eswara P, Wiedenheft B, **Secor PR**[#]. Polyamines and linear DNA mediate bacterial threat assessment of bacteriophage infection. ***Proc Natl Acad Sci U S A***. 2023;120(9):e2216430120. doi: 10.1073/pnas.2216430120

(31) Schwartzkopf CM*, Robinson AJ**, Ellenbecker M, Faith DR*, Schmidt AK*, Brooks DM, Lewerke L*, Voronina E, Dandekar AA, **Secor P. R.**[#] Tripartite interactions between filamentous Pf4 bacteriophage, *Pseudomonas aeruginosa*, and bacterivorous nematodes. ***PLoS Pathog***. 2023;19(2):e1010925. doi: 10.1371/journal.ppat.1010925

(30) Sapiro AL, Hayes BM, Volk RF, Zhang JY, Brooks DM, Martyn C, Radkov A, Zhao Z, Kinnersley M, **Secor P. R.**, Zaro BW, Chou S. Longitudinal map of transcriptome changes in the Lyme pathogen *Borrelia burgdorferi* during tick-borne transmission. ***eLife. 2023;12:RP86636.*** https://doi.org/10.7554/eLife.86636

(29) Wachter, J., Cheff, B., Hillman, C., Carracoi, V., Dorward, D.W., Martens, C., Barbian, K., Nardone, G., Olano, R.L., Kinnersley, M, **Secor, P.R**., and Rosa, P.A. Coupled induction of prophage and virulence factors during tick transmission of the Lyme disease spirochete. ***Nature Communications***, 2023 https://doi.org/10.1038/s41467-023-35897-3

(28) M. T. van Rossem, S. Wilks, **P. R. Secor**, M. Kaczmarek, G. D'Alessandro. Homogenization modelling of antibiotic diffusion and adsorption in viral liquid crystals. ***Royal Society Open Sci***, Vol 10, Issue 1, Jan. 2023, doi.org/10.1098/rsos.221120

2022

(27) M. S. Bach, C. R. de Vries, A. Khosravi, J. M. Sweere, M. C. Popescu, Q. Chen, S. Demirdjian, A. Hargil, J. D.Van Belleghem, G. Kaber, M. Hajfathalian, E. B. Burgener, D. Liu, Q. Tran, T. Dharmaraj, M. Birukova, V. Sunkari, S. Balaji, N. Ghosh, S. S. Steiner, M. S. El Masry, S. G. Keswani, N. Banaei, L. Nedelec, C. K. Sen, V. Chandra, **P. R. Secor**, G. A. Suh, P. L. Bollyky. Filamentous bacteriophage delays healing of *Pseudomonas*-infected wounds. ***Cell Reports Medicine***, Vol 3, Issue 6, June 2022, https://doi.org/10.1016/j.xcrm.2022.100656

(26) **Secor, P. R**.[#], Michaels, L. A., Bublitz, D.C., Jennings, L.K., Singh, P.K. (2022). The Depletion Mechanism Actuates Bacterial Aggregation by Exopolysaccharides and Determines Species Distribution & Composition in Bacterial Aggregates. ***Front. Cell. Infect. Microbiol***. https://doi.org/10.3389/fcimb.2022.869736

(25) Faith, D*., Kinnersley, M., Schwartzkopf, C.M*., de Mattos, C.D*., Schmidt, A.K*., and **Secor, P.R**[#]. (2022). Complete Genome Sequence of the N4-like *Pseudomonas aeruginosa* Bacteriophage vB_PaeP_CMS1. ***Microbiol Resour Announc***, e0023922. 10.1128/mra.00239-22

(24) van Rossem, M., Wilks, S., Kaczmarek, M., **Secor, P.R.**, and D'Alessandro, G. (2022). Modelling of filamentous phage-induced antibiotic tolerance of *P. aeruginosa*. ***PLoS One*** 17, e0261482. 10.1371/journal.pone.0261482.

(23) A.K. Schmidt*, A.D. Fitzpatrick, C. S. Schwartzkopf*, D.R. Faith*, L.K. Jennings, A. Coluccio, D.J. Hunt**, L.A. Michaels, D.W. Dorward, J. Wachter, P.A. Rosa, K.L. Maxwell, **P.R. Secor**[#]. A Filamentous Bacteriophage Protein Inhibits Type IV Pili to Prevent Superinfection of *Pseudomonas aeruginosa.* ***mBio***, 2022; https://doi.org/10.1128/mbio.02441-21

2021

(22) Kirsch JM, Brzozowski RS***, Faith D.R.*, Round JL, **Secor PR**, Duerkop BA. Bacteriophage-Bacteria Interactions in the Gut: From Invertebrates to Mammals. ***Annu Rev Virol.*** 2021;8(1):95-113. doi:10.1146/annurev-virology-091919-101238.

(21) Jennings LK, Dreifus JE, Reichhardt C, Storek KM, **Secor PR**, Wozniak DJ, Hisert KB, Parsek MR. *Pseudomonas aeruginosa* aggregates in cystic fibrosis sputum produce exopolysaccharides that likely impede current therapies. ***Cell Rep***. 2021;34(8):108782. doi: 10.1016/j.celrep.2021.108782

2020

(20) E. B. Burgener, **P. R. Secor,** M. C. Tracy, J. M. Sweere, E. M. Bik, C. E. Milla, and P. L. Bollyky. Methods for Extraction and Detection of Pf Bacteriophage DNA from the Sputum of Patients with Cystic Fibrosis, ***Phage: Therapy, Applications, and Research*****,** June 2020, doi.org/10.1089/phage.2020.0003

(19) **P. R. Secor**[#] and A. A. Dandekar, More than Simple Parasites: The Sociobiology of Bacteriophages and Their Bacterial Hosts. ***mBio***, March 10, 2020, https://mbio.asm.org/content/11/2/e00041-20

(18) **P. R. Secor**, E B Burgener, M Kinnersley, L K Jennings, V Roman-Cruz*, M Popescu, J D Van Belleghem, N Haddock, C Copeland**, L A Michaels, C R De Vries, Q Chen, J Pourtois, T J Wheeler, C E Milla, P L Bollyky. Pf Bacteriophage and Their Impact on *Pseudomonas* Virulence, Mammalian Immunity, and Chronic infections. ***Front. Immunol.***, 21 February 2020 doi.org/10.3389/fimmu.2020.00244

2019

(17) J M. Sweere, H Ishak, V Sunkari, M S. Bach, R Manasherob, K Yadava, S. M. Ruppert, C. K. Sen, S Balaji, S. G. Keswani, **P. R. Secor**, and Paul L. Bollyky. (2019) The Immune Response to Chronic *Pseudomonas aeruginosa* Wound Infection in Immunocompetent Mice. ***Advances in Wound Care***, Vol. 8

(16) E. B. Burgener, J. M. Sweere, M. S. Bach, **P. R. Secor**, N Haddock, L. K. Jennings, R. L. Marvig, H. K. Johansen, E. Rossi, X. Cao, L. Tian, L. Nedelec, S. Molin, P. L. Bollyky, and C. E. Milla. (2019) Filamentous bacteriophages are associated with chronic *Pseudomonas* lung infections and antibiotic resistance in cystic fibrosis. ***Science Translational Medicine***, Vol. 11, Issue 488, eaau9748

(15) J. M. Sweere, J. D. Van Belleghem, H. Ishak, M. S. Bach, M. Popescu, V. Sunkari, G. Kaber, R. Manasherob, G. A. Suh, X. Cao, C. R. de Vries, D. N. Lam, P. L. Marshall, M. Birukova, E. Katznelson, D. V. Lazzareschi, S. Balaji, S. G. Keswani, T. R. Hawn, **P. R. Secor**, and P. L. Bollyky. (2019) Bacteriophage trigger antiviral immunity and prevent clearance of bacterial infection. ***Science***, Vol. 363, Issue 6434, eaat9691. doi: 10.1126/science.aat9691

2018

(14) **P. R. Secor**[#]**,** Michaels, L.A., Ratjen, A., Jennings, L.K., Singh, P.K. Entropically-driven aggregation of bacteria by host polymers promotes antibiotic tolerance in *Pseudomonas aeruginosa*. ***PNAS****,* Oct 2018, 201806005; DOI:10.1073/pnas.1806005115

2017

(13) Jorth, P.A., McLean, K., Ratjen, A., **Secor, P.R.,** Bautista, G.E., Ravishankar, S., Rezayat, A., Garudathri, J., Harrison, J.J., Harwood, R.A., Penewit, K., Waalkes, A., Singh, P.K., Salipante, S.J. (2017) Evolved aztreonam resistance is multifactorial and can produce hypervirulence in *Pseudomonas aeruginosa.* ***mBio***, 8:e00517-17

(12) Nazik, H., Joubert, L.M., **Secor, P.R.,** Sweere, J.M., Bollyky, P.L., Sass, G., Cegelski, L., Stevens, D.A. (2017) *Pseudomonas* Phage Inhibition of *Candida albicans.* ***Microbiology***, 163 (11), 1568-1577

(11) **Secor P.R.**[#]**,** Sass G, Nazik H, Stevens DA. (2017) Effect of acute predation with bacteriophage on intermicrobial aggression by *Pseudomonas aeruginosa*. ***PLoS One***. 16;12(6):e0179659. doi: 10.1371/journal.pone.0179659

(10) **Secor, P.R.**[#]**,** Michaels, L.A., Smigiel, K.S., Rohani, M.G., Jennings, L.K., Hisert, K.B., Arrigoni, A., Braun, K.R., Birkland, T.P., Hallstrand, T.S., Lai, Y., Bollyky, P.L., Singh, P.K., Parks, W.C. (2017) Filamentous bacteriophage produced by *Pseudomonas aeruginosa* alters the inflammatory response and promotes non-invasive infection *in vivo*. ***Infection and Immunity****,* vol. 85, issue 1. Featured on journal cover.

2016

(9) Penner, J.C., Ferreira, J.A.G., **Secor, P.R.,** Sweere, J.M., Birukova, M.K., Joubert, L.M., Haagensen, J.A.J., Garcia, O., Malkovskiy, A.V., Kaber, G., Nazik, H., Manasherob, R., Spormann, A.M., Clemons, K.V., Stevens, D.A., Bollyky, P.L. (2016) Pf4 Bacteriophage Produced by *Pseudomonas aeruginosa* Inhibits *Aspergillus fumigatus* Metabolism via Iron Sequestration. ***Microbiology****,* 162, 1583-1594

(8) **Secor, P.R.**[#]**,** Jennings, L.K., Michaels, L.A., Sweere, J.M., Singh, P.K., Parks, W.C., Bollyky, P.L. (2016) Biofilm assembly becomes crystal clear – filamentous bacteriophage organize the *Pseudomonas aeruginosa* biofilm matrix into a liquid crystal. ***Microbial Cell***, 3(1): 49-52. Featured on journal cover.

2015 *(7)* **Secor, P.R.**[#]**,** Sweere, J.M., Michaels, L.A., Malkovskiy, A.V., Lazzareschi, D., Katznelson, E., Rajadas, J., Birnbaum, M.E., Arrigoni, A., Braun, K.R., Evanko, S.P., Stevens, D.A., Kaminsky, W., Singh, P.K., Parks, W.C., Bollyky, P.L. (2015) Filamentous Bacteriophage Promote Biofilm Assembly and Function. ***Cell Host & Microbe***, 18(5): 549-59

(6) Jennings L.K., Storek K.M., Ledvina H.E., Coulon C., Marmont L.S., Sadovskaya I., **Secor, P.R.,** Tseng B.S., Scian M., Filloux A., Wozniak D.J., Howell P.L., Parsek M.R. (2015) Pel is a cationic exopolysaccharide that cross-links extracellular DNA in the *Pseudomonas aeruginosa* biofilm matrix. ***Proc Natl Acad Sci U S A***, 112(36): 11353-8

2012 *(5)* **Secor, P. R.**[#]**,** Jennings, L. K., James, G. A., Kirker, K. R., Pulcini, E. D., McInnerney, K., Gerlach, R., Livinghouse, T., Hilmer, J. K., Bothner, B., Fleckman, P., Olerud, J. E., Stewart, P. S. (2012) Phevalin (aureusimine B) production by *Staphylococcus aureus* biofilm and impacts on human keratinocyte gene expression, ***PLoS One*** 7(7) e40973

2011 *(4)* **Secor, P. R.**[#]**,** James, G. A., Fleckman, P., Olerud, J. E., McInnerney, K., and Stewart, P.S. (2011) *Staphylococcus aureus* Biofilm and Planktonic cultures differentially impact gene expression, MAPK phosphorylation, and cytokine production in human keratinocytes. ***BMC Microbiol,*** 11:143

2009 *(3)* Kirker, K.R., **Secor, P.R.,** James, G.A, Fleckman, P., Olerud, J.E., Stewart, P.S., (2009) Loss of viability and induction of apoptosis in human keratinocytes exposed to *Staphylococcus aureus* biofilms in vitro. ***Wound Repair Regen***, 17(5): 690-9

2008 *(2)* Dowd, S.E., Sun, Y., **Secor, P.R**., Rhoads, D.D., Wolcott, B.M., James, G.A., Wolcott, R.D. (2008) Survey of bacterial diversity in chronic wounds using pyrosequencing, DGGE, and full ribosome shotgun sequencing. ***BMC Microbiol***, 8: 43

(1) James, G.A., Swogger, E., Wolcott, R., Pulcini, E., **Secor, P.R.,** Sestrich, J., Costerton, J.W., Stewart, P.S. (2008) Biofilms in chronic wounds. ***Wound Repair Regen***, 16(1): 37-44. Cited ~ 2,000 times.

INVITED PREVIEWS / COMMENTARIES / EDITORIALS

2023 Schmidt, A.K.*, Faith, D.R.*, and **Secor, P.R**[#]. PICI Thieves: Molecular Piracy and Cooperation. ***Cell Host & Microbe***, 31(1), January 2023.

2019 Bollyky, P.L. and **Secor, P.R**[#]**.** (2019) The Innate Sense of Bacteriophages. ***Cell Host & Microbe***, 25(2).

PREPRINTS

2026 Finnerty R, Lim C, **Secor PR**, Marshall CW. Long-term exposure to polyamines leads to bacteriophage resistance in *Pseudomonas aeruginosa*. *bioRxiv*. Posted July 16, 2026. doi: 10.64898/2026.07.14.738440.

RESEARCH FUNDING

Budgets are identified as direct or total costs. Amounts are for the listed award or subaward; personal allocations to Secor are not specified.

Active awards

2026 – present NIH/NIGMS **R25** GM152359 **(Co-I: Secor, PR)**, PREP-MT: Providing Research Education for Postbaccalaureate Trainees in Montana. Co-Investigator since July 2026.

2025 – 2027 NIH/NIAID Administrative Supplement to contract HHSN272201800048C (PI: Evans, JT, **Co-I Secor, PR**), Adjuvanted Lyme disease vaccine. $400,000 direct.

2024 – 2029 NIH/NIAID **R01** AI173045 (**PI, Secor, PR**), Phage-mediated horizontal gene transfer in *Borrelia burgdorferi*. $3,555,141 total award costs

Completed awards

2025 Office of Naval Research Long Range Broad Agency Announcement for Navy and Marine Corps Science & Technology (PI: Serban, M, **Co-I: Secor, PR**), Engineered Systems for Burn Research. Award duration reduced to one year.

2023 – 2024 University of Montana Center for Translational Medicine Pilot Grant (**PI, Secor, PR**), Bacteriophage lysins as novel Lyme disease therapeutics. $100k direct.

2022 – 2024 NIH/NIAID Administrative Supplement to contract HHSN272201800048C (PI: Evans, JT, **Co-I Secor, PR**), Adjuvanted Lyme disease vaccine. $1M direct

2022 – 2023 NIH/INBRE Faculty Research Grant (**PI Secor, PR**)
Defining the immunogenicity of tick saliva in mice and men. $50k direct.

2022 – 2023 NIH/NIGMS COBRE **P30** GM140963 (PI: Bowler, B, **Subaward PI: Secor, PR**), Pilot Award, Structural variation of small phage proteins. $35k direct for pilot project

2021 IDeA National Resource for Proteomics Voucher Award. Awarded March 2, 2021.

2020 – 2025 NIH/NIDDK **R01** DK124317 (PI: Round, J.L., **Co-I Secor, PR**), Bacteriophage pathobiology of inflammatory bowel disease. $2,539,200 total award costs

2020 – 2022 NIH/NIAID **R21** AI151597 (**PI: Secor, PR**), Targeting a ubiquitous spirochete bacteriophage to prevent Lyme disease. $275k direct

2018 – 2025 NIH/NIAID **R01** AI138981 (**PI: Secor, PR**), Immunization against filamentous bacteriophages to prevent bacterial infection. $5,618,222 total award costs (includes no-cost extension)

2018 University of Montana Genomics Core–Illumina Mini-Grant (**PI, Secor, P.R.**). $5k direct

2017 – 2021 NIH/NIGMS COBRE **P30** GM140963 (PI: Sprang, S, **Subaward PI: Secor, PR**) Young Investigator Award. $300k direct for Secor subaward

2017 – 2020 NIH/NIAID Career Transition Award **K22** AI125282 (**PI: Secor, PR**)
Understanding polymer-induced bacterial aggregation and antimicrobial tolerance. $250k direct

2017 – 2019 Dr. Ralph and Marian Falk Medical Research Trust – Catalyst Award (PI Bollyky, P.L., **Co-I Secor, P.R.**). $1M direct

2016 The Charlie Moore Endowed Fellowship for Cystic Fibrosis Research, (**PI, Secor, P.R.**), $10,000 direct.

2015 – 2017 Cystic Fibrosis Foundation (National) Postdoctoral Fellowship

2013 – 2014 Cystic Fibrosis Foundation Fellowship, Seattle Chapter, Postdoctoral Fellowship

2011 University of Washington Pulmonary Postdoctoral Training Grant
5**T32** HL007287-33 (NIH/NHLBI)

Fellowship awarded and declined

2013 Stanford University Immunology Postdoctoral Training Grant, awarded, but declined
5**T32** AI007290-29 (NIH/NIAID)

GRANTS PENDING REVIEW OR AWARD DECISION

Applications and proposed budgets; a funding recommendation does not constitute an award.

NIH R21 (PI: Secor, PR), DRT2 project. Submitted February 16, 2026.

NIH R01 (PI: Secor, PR), Leader peptide project. Submitted 2026; **scored at the 2nd percentile. Award decision pending.**

NIH R01 (PI: Pershing, NL; Secor laboratory subaward), NEC project, University of Utah collaboration. Submitted 2026.

NIH/Office of the Director Transformative Research Award R01OD042048 (**MPI, Secor, PR**), Phage-Immunity Crosstalk in Intestinal Homeostasis. Proposed period: 2026 – 2031. Submitted September 3, 2025. $8.4M proposed total costs over 5 years.

HHS-NIH-NIAID-BAA2025-1 **NIH Contract** (**MPI, Secor, PR**), Clinical Development of a Multivalent (PaV-T4) Vaccine Targeting *Pseudomonas aeruginosa* ESKAPE Pathogen. Reviewed, pending Administrative Evaluation. $18.59M proposed whole-contract total costs over 5 years.

NIH/NIAID **R01** AI200153 (PI: **Secor, PR**), The Role of Inoviruses in Bacterial Immunity. $3.78M proposed total costs over 5 years.

NIH/NIAID **R21** AI199233**, (PI: Secor, PR**), Phollowing and harnessing phage outbreaks in the tick microbiome for vector and pathogen control. $398,750 proposed total costs over 2 years. Recommended for funding; a new application was submitted October 12, 2026, following program officer advice. Award decision pending.

NIH/NIAID **R21** AI199232**, (PI: Secor, PR**), Phage-Induced Biofilm Dispersal and Transmission Dynamics in *Leptospira*. $398,750 proposed total costs over 2 years.

AWARDS & RECOGNITION

2025 – present Standing member, NIH Bacterial Host Interactions (BHI) Study Section
2025 Press coverage of NIH R01 Lyme disease award: Mountain Journal, Bozeman Daily Chronicle, Montana State University News
2025 Blavatnik Award Nominee, Montana State University
2025 Featured in Mountain Journal, "Patrick Secor's 'Ick Factor': Ticks, Lyme and the Growing Climate Risk," December 2, 2025.
2023 Blavatnik Award Nominee, Biological Sciences, University of Montana
2021 Faculty Merit Award for outstanding research productivity, University of Montana
2020 Faculty Merit Award for outstanding research productivity, University of Montana
2020 Co-moderator, Life at the Cutting Edge, ASMicrobe, Chicago, IL (canceled, COVID-19)
2018 Searle Scholar Nominee, University of Montana
2018 Young Investigator Award, Center for Biofilm Engineering, Montana State University
2017 Young Investigator Award, Center for Biomolecular Structure and Design, University of Montana
2016 NIH/NIAID Career Transition Award (K22)
2016 The Charlie Moore Endowed Fellowship for Cystic Fibrosis Research
2015-2017 Cystic Fibrosis Foundation (National) Postdoctoral Fellowship
2013-2014 Cystic Fibrosis Foundation Postdoctoral Fellowship, Seattle Chapter
2012-2013 NIH T32 Postdoctoral Fellow
2009 W.G. Characklis Scholarship for Outstanding Ph.D. Student

INTELLECTUAL PROPERTY

Issued patent family and commercialization

2024 US Patent 11,911,472 B2 — Monoclonal antibody and vaccine targeting filamentous bacteriophage. Granted February 27, 2024; continuation of US Patent 10,835,607 within the same patent family. Assigned to Inimmune Corp.

2020 US Patent 10,835,607 — Monoclonal antibody and vaccine targeting filamentous bacteriophage. Granted November 17, 2020. Licensed to Inimmune Corp.

Other published patent applications

2024 US Patent Application Publication 2024/0325517 A1 — Compositions and Methods Targeting Filamentous Bacteriophage. Published October 3, 2024; claims priority to provisional application 63/078,777 (September 15, 2020). Licensed to Inimmune Corp.

2021 International (PCT) application PCT/US2020/063086 — Antibacterial Carbohydrate Vaccine. Published as WO 2021/113495 A1, June 10, 2021.

Provisional patent applications

2026 RPP. U.S. provisional patent application filed June 2026.

2026 GATWAY. U.S. provisional patent application filed May 2026.

TEACHING

Fall 2026 Instructor, Microbial Physiology BIOM 450/520, Montana State University. Redesigned course content and instruction; unsolicited midsemester feedback from one graduate student praised the redesign and identified the class as a favorite among graduate courses taken.

Fall 2026 Guest lecturer, BIOB 499, Montana State University; two lectures, week of September 1, 2026.

Spring 2026 Instructor, Microbiology Seminar BIOM 494, Montana State University

Spring 2026 Guest lecturer, BIOM 499 (Emma Loveday), Montana State University, February 3, 2026.

Fall 2025 Instructor, Microbial Physiology BIOM 450/520, Montana State University; redesigned course content and instruction.

Spring 2025 Instructor, Microbiology Seminar BIOM 494, Montana State University

Spring 2025 Guest lecturer, Medical Bacteriology (Tyler Nygaard), Montana State University, April 8, 2025.

Fall 2018-2024 Instructor, Microbial Physiology (plus lab) BIOM 450/451, University of Montana

Spring 2022 Guest lecturer, BCHM 294, University of Montana, April 12, 2022.

Spring 2020 Co-instructor, The Diversity of Life BIOB 170, University of Montana

Fall 2019 Guest lecturer, HUSC 194, University of Montana, November 12, 2019.

Summer 2018 HHMI Summer Institute on Scientific Teaching

Spring 2018 Guest lecturer, BIOM 410 Microbial Genetics, University of Montana; two lectures, week of April 2, 2018.

Spring 2010 Co-instructor, Microbes in the Environment, Montana State University

2007-2008 Teaching Assistant, Molecules to Cells, Montana State University

MENTORING

Doctoral research advising

PhD graduates Camilla de Mattos, PhD, University of Montana, January 2023; postdoctoral researcher, OHSU.

Caleb Schwartzkopf, PhD, University of Montana, June 2023; Assistant Professor, Simpson University.

Valery Roman-Cruz, PhD, University of Montana, August 2023; co-advised with Dr. Jay Evans; Program Manager, Montana Department of Public Health and Human Services.

	Amelia Schmidt, PhD, University of Montana; defended September 20, 2024; postdoctoral researcher, Stanford University. ***2022 NSF GRFP honorable mention***; Dr. Linda Phillips Knoblock Fellowship (2023); Dr. Mitsuru J. (Jim) Nakamura Graduate Scholarship in Microbiology (2024). Dominick Faith, PhD, Montana State University, graduated 2026; postdoctoral researcher with Paul Bollyky, Stanford University. ***2023 NSF GRFP recipient***; Dr. Linda Phillips Knoblock Fellowship (2024).
Prior PhD advising	Alex Joyce, MCB PhD program, Montana State University, 2024–2026; TL1 award recipient, 2025.
PhD students	Albert Burkle, MCB PhD program, Montana State University, January 2026–present (rotation, 2025). Angela Voelker, MCB PhD program, Montana State University, July 2026–present.
Graduate Committees	Committee service, Montana State: Dominick Faith, Alex Joyce, Matt Abbott, Shishir Pandey, Angela Voelker, Zoe Seaford University of Montana: Camilla de Mattos, Caleb Schwartzkopf, Valery Roman-Cruz, Amelia Schmidt, Conner Copeland, Shaun Wachter, Kelley Van Vaerenberghe, Christopher Pierpont, John Statz, Ian Bailey,
External/International Graduate Committees	Nanami Kubota (University of Pittsburgh, Advisor Vaughn Cooper), Natisha Menton (Amrita University, India, advisor Geetha Kumar), Marion Bichet (Monash University, Australia, advisor Jeremy Barr)
Postdocs	Dr. Robert Brzozowski (2020–2024; now Senior Scientist, BioSqueeze Inc.); Dr. Liz Ortiz de Ora (2025–February 2026; promoted to Assistant Research Professor).
Research Faculty	Dr. Margie Kinnersley; now Senior Scientist, FYR Diagnostics Dr. DeAnna Bublitz; now Scientific Review Officer, NIH Dr. Reetika Chaurasia, Assistant Research Professor; INBRE Faculty Research Award, 2026 Dr. Liz Ortiz de Ora; Assistant Research Professor, February 9, 2026–present; COBRE CAMP Pilot Award, 2026
Research Staff	Dr. Iván Muñoz Gutiérrez, Research Scientist, February 2026–present.
Postbaccalaureate	Teaghan Arnott and John Kominsky, PREP-MT scholars.
Undergraduate	Teaghan Arnott (INBRE summer fellowship, 2025); Elaina Lewis (Undergraduate Scholars Program grant, September 2026); Lydia Hampton; Bella Mulder.
Selected honors	Camilla de Mattos: Center for Phage Technology Award for best phage abstract, ASM Microbe, 2022; Nakamura Graduate Scholarship, 2021; Toelle-Bekken Family Memorial Fund Award, 2020–2021. Dominick Faith: Toelle-Bekken Family Memorial Fund Award and research/travel support, 2022. Support included the Beyond the Lab Research Explorer Program and Travel Fund and an Experiential Learning Scholarship Fund Award. Robert Brzozowski: Young Investigator Award, Center for Biofilm Engineering, Montana State University, 2023. Caleb Schwartzkopf: travel award, Wind River Conference on Prokaryotic Biology, 2018. Autumn Robinson: UM Conference on Undergraduate Research Award, 2018. Elise Wells: Center for Translational Medicine summer internship, 2022. Autumn Robinson: abstract selected for oral presentation, National Conference on Undergraduate Research, 2020.

INVITED SEMINARS, CONFERENCES, & SYMPOSIUMS

2027 - Caltech Chemical Engineering Seminar Series, February 2027 (scheduled).

2025 - **MSU ASM Chapter**, student-invited speaker, Montana State University, October 30, 2025.

- **Conference on Bacteriophages: Biology, Dynamics, and Therapeutics**, IAS–USA, Washington, DC, October 12–14, 2025. *Caenorhabditis elegans* as a Model System for Phage Biology.

-Montana Biofilm Meeting, **Montana State University**, July 2025

- **REU Faculty Talk**, Montana State University, June 17, 2025.

2024 -Center for Biofilm Engineering Seminar Series, **Montana State University**, November 21, 2024.

-Department of Microbiology and Immunology Seminar Series, **Montana State University**, October 15, 2024.

-**Bacterial Cell Surfaces GRC**, invited speaker, University of Southern Maine, June 23-28, 2024.

-Department of Microbiology and Immunology, **University of Minnesota**, Minneapolis, MN, Feb. 2024.

-Departmental Seminar, Department of Microbial Infection and Immunity, College of Medicine, Ohio State University. May 2024.

-Biological Sciences seminar series, **UNC Charlotte**, Charlotte, NC, February 5, 2024.

-**Ecology and Evolution Seminar**, University of Oregon, January 26, 2024.

2023 -Program in Microbiology and Immunology Seminar Series, **University of Pittsburgh**, School of Medicine, October 2023. *Student invited speaker

-Department of Microbiology and Immunology Seminar Series, **Montana State University**, April 2023.

-Research Seminar, NIH Division of Intramural Research, **NIAID Rocky Mountain Laboratories**, Hamilton, MT, Feb. 2023

2022 -Departmental Seminar, Department of Plant and Microbial Biology at **UC Berkeley**, November 9, 2022

-ALARM International Symposium, **Amrita School of Biotechnology**, India, November 23–24, 2022

-Thinking like a microbe: a tribute to Stanley Falkow symposium, NIH Division of Intramural Research, **NIAID Rocky Mountain Laboratories**, Hamilton, MT, July 2022

-18th **International Conference on *Pseudomonas***, Atlanta, Georgia

2021 -Center for Biomolecular Structure and Dynamics Research Symposium, **University of Montana**

2020 -**University of Colorado Anschutz** Microbiology Seminar Series

-**American Society for Microbiology** 2020 Microbe Meeting, Co-moderator, in-depth symposium Life at the Cutting Edge *cancelled, covid

-***Pseudomonas* Seminar Series**, online seminar series organized by Urvish Trivedi (University of Copenhagen) and Cassandra Nelson (University of Maryland).

-**Friday Medical Conference / Grand Rounds**, University of Montana and regional healthcare facilities, January 10, 2020.

2019 -**NIAID Rocky Mountain Laboratories** Summer Research Symposium, Hamilton, MT

-**University of Utah** Department of Pathology Seminar Series, University of Utah

-Division of Biological Sciences Seminar Series, **University of California, San Diego**

-Department of Microbiology and Immunology Seminar Series, **Montana State University**

-Integrative Microbiology Seminar Series, **University of California, San Francisco**

-Center for Biomolecular Structure and Dynamics Research Symposium, **University of Montana**

-Institute for Infection, Immunology, and Inflammation Seminar Series, **Vanderbilt University**

2018 -Center for Biomolecular Structure and Dynamics Research Symposium, **University of Montana**

	-Organismal Biology, Ecology, and Evolution Brewery Chalk Talk Series, **University of Montana**
	-Montana Biofilm Meeting, Center for Biofilm Engineering, **Montana State University**
2017	-Harkins High School Science Fusion Lecture, **University of Montana**
2016	-Pacific Northwest Epithelial Biology Meeting, **University of Washington**
	-Cystic Fibrosis Foundation Retreat, **University of Washington**
2015	-**North American Cystic Fibrosis Conference**, Phoenix, AZ
2014	-**North American Cystic Fibrosis Conference**, Atlanta, GA
2012	-**Cystic Fibrosis Foundation** Retreat, University of Washington
2008	-Invited Speaker, **Molecular Probes**, **Invitrogen**, Eugene, OR
2006-2010	-Montana Biofilm Meeting, Center for Biofilm Engineering, **Montana State University**

SELECTED CONFERENCE ABSTRACTS

2025 Faith DR*, Arnott T**, **Secor PR**. Missing the Mucoids: AlgU-Mediated Phage Tolerance in *Pseudomonas aeruginosa*. ***Topics in Antiviral Medicine***. 33(5 Suppl):699. Abstract 142, Conference on Bacteriophages: Biology, Dynamics, and Therapeutics.

PROFESSIONAL ACTIVITIES

Editorial work

Guest Editor, *PLoS Pathogens*, February 2024–present
Associate Editor, *mBio*, July 1, 2025–June 30, 2028
Handling Editor, *FEMS Microbes*, December 2025–present

Referee for Professional Publications

Cell Host & Microbe, Cell Reports, iScience, Science Advances, eLife, EMBO Journal, Environmental Microbiology, Virulence, Nature Biofilms and Microbiomes, Frontiers in Microbiology, Genome Evolution, Virus Evolution, mBio, Journal of Bacteriology, Applied and Environmental Microbiology, mSphere, Journal of Virology, Soft Matter, PLoS ONE, Spectrum, Viruses, PLoS Biology, PLoS Pathogens, Nature Communications, PNAS, Curiositas.

Grant review

2026 Reviewer, Center for Translational Medicine Pilot Grants
2025–present Standing member, NIH BHI Study Section
2025 *ad hoc* member, NIH IMII Study Section
2025 *ad hoc* member, NIH ODCS study section
2024 *ad hoc* member, NIH BHI Study Section
2023 *ad hoc* member, NIH NIAID F31 Study Section
2022 *ad hoc* member, NIH NIAID P01 Study Section
2021 *ad hoc* member, NIH DDR Study Section
2021 *ad hoc* reviewer, Cystic Fibrosis Foundation
2020 *ad hoc* member, NIH Special Emphasis Study Section

Professional Society Affiliations

American Society for Microbiology

Departmental Service

Chair: Environmental Microbiology Faculty Search (2025)
Member: Graduate Admissions Committee, Montana State University (2024- present)
Seminar host, Montana State University: Paul Bollyky (December 2024); Kevin Forsberg (2026).
Member: Graduate Admissions Committee, University of Montana (2017- 2024, *Chair* 2022-2024)
Member: Neuroscience Faculty Search Committee, University of Montana (2019)
Member: Microbiology Curriculum Advisory Committee, University of Montana (2022-2024)
Member: DBS Curriculum Committee, University of Montana (2022-2024)
Member: Center for Translational Medicine Faculty Advisory Council, University of Montana (2019-2024)

College Service

Undergraduate Award and Scholarship Committee, University of Montana (2019)

University Service

Faculty Senate: MCB representative, Montana State University (2025–present)
Member, Faculty Senate Steering Committee, Montana State University (fall 2026–spring 2027)
Institutional Biosafety Committee, University of Montana (2021-2024)

State Service

Appointed Member, Rare Disease Advisory Council, State of Montana, January 2026–present; representative of a Montana academic research institution receiving grant funding for rare disease research. Presented the council's role and potential research connections to the MSU Faculty Senate (2026).

OUTREACH

2026	Advised Sentinel High School teachers on development of a student-led bacteriophage curriculum.
2018-2020	My lab has hosted numerous high school students through the local Advanced Problems in Science Program. High school students work on a research project for an entire semester and then share their findings with their peers back at their high schools and at a poster session at the University of Montana.
2018 & 2019	My lab hosted multiple scientific outreach activities with the Ray Bjork Learning Center's PEAK Program for gifted and talented elementary-aged children.
2017	Harkins High School Science Fusion Lecture, University of Montana
2009-2011	Instructor, American Indian Research Opportunities (AIRO) educational outreach program for Native American students interested in STEM-based careers, Montana State University