Georgiana E. Purdy
Curriculum vitae

Address Molecular Microbiology & Immunology Department
Mail Code L220
Oregon Health Sciences University
3181 S.W. Sam Jackson Park Road
Portland, Oregon 97239
Phone 503 346-0767
Fax 503 494-6862

Education

1998-2003 Ph.D. in Molecular Biology (with Prof. Shelley Payne)
ICMB, University of Texas at Austin
Thesis title: Characterization of *Shigella flexneri* DegP.

1994-1998 B.S. in Microbiology with Honors
University of Florida, Gainesville, Florida

1994-1998 B.A. in History of Science with Honors
University Florida, Gainesville, Florida

Teaching Experience

Course Instruction:

2014 OHSU School of Medicine, Fundamentals, Lecturer: Introduction to Bacteria, Bacterial genetics, Bacterial gene regulation, Bacterial virulence and Notable opportunistic Gram positive pathogens; Workshop Leader: Diagnostic bacteriology for Gram positives

2011-2014 OHSU MBIM615 Dynamic Interface Between Host and Pathogen, Department of Molecular Microbiology and Immunology, Course Director

2012-2014 OHSU CONJ660 PMCB Student Rotation Talks, Course Director

2012-2014 OHSU School of Medicine, Biological Basis for Disease, Lecturer: Tuberculosis

2014 OHSU School of Medicine, Biological Basis for Disease, Lecturer: Regulation of Bacterial gene expression, Genetics of antimicrobial resistance

2009-2013 OHSU School of Medicine, Biological Basis for Disease, Discussion Group Leader:
Upper Respiratory Infections
Bacterial and Viral Urogenital Infections
Zoonoses and Vector Borne Parasites
Hepatitis
Gastrointestinal Infections

2009-2010 OHSU School of Medicine, Biological Basis for Disease, Normal Flora Laboratory

1999 University of Texas at Austin, Department of Microbiology Immunology Laboratory, Teaching Assistant

Pedagogical training:

2014 OHSU SOM Curriculum Transformation: Teacher Preparation Program

Oversight of Undergraduate Researchers:

2011-2012 Mischka Moechtar, Reed College, “Analysis of mycobacterial OxyS function”

2010-2011 Scott Eisenhower, Arizona State University, “ Amino acids important for OxyS function”

2002-2003 Anna Moorhead, University of Texas “Isolation of *S. flexneri* chlorate-resistant mutants”

2001-2002 Lindsay A. Parish, University of Texas “Characterization of a *S. flexneri dam* mutant”

Oversight of High School Researchers (for senior thesis projects):

2013 Emma Nienow-Birch, St. Mary’s Academy, “Microscopic analysis of bacteria upon treatment with antimicrobials”

2010 Meghana Kalavar Jesuit High School “Bactericidal Ub-peptides”

2009 Scott Eisenhower, N. Clackamas High School “Isolation of bactericidal Ub-peptides”

Research Experience

2014-present **Associate Professor**, Department of Molecular Microbiology and Immunology, Oregon Health and Science University, Portland, OR

The Purdy laboratory focuses on the host-pathogen interactions of *M. tuberculosis* (Mtb) and basic mycobacterial physiology with the overarching premise that a better understanding of the pathogens strengths and weaknesses will inform improved TB therapeutics. There are three major areas of research in the lab. First, to better understand both the pathogenic mechanisms of Mtb and the immune functions of macrophages, the Purdy laboratory combines bacterial genetics, biochemistry and cell biology techniques. We have identified Mtb genes required for survival in the context of infected macrophages and macrophages co-cultured with Mtb -responsive human T cell clones. Mutants lacking these genes are being characterized to further tease apart the interplay of pathogen and host. Tuberculosis continues to pose a threat to public health, and resistance to commonly used antibiotics is an increasing problem in efforts to control the disease. Mycobacteria display intrinsic resistance to antibiotics due to both the low permeability of the mycobacterial cell wall and active efflux. To better understand the genetic basis of this resistance phenotype, our second area of emphasis is characterizing Mtb mutants with altered susceptibility to host antimicrobial peptides and antibiotics. These studies revealed that the MmpL transporters play a key role in mycobacterial cell wall biosynthesis and remodeling under different growth conditions. Finally, in collaboration with others we are developing and characterizing the mechanism of action of novel therapeutics against Mtb. Combined, this work will further define the pathogenic nature of Mtb, expand our knowledge of mycobacterial intrinsic resistance, and identify targets and new strategies for future drug therapy.

2008-2014 **Assistant Professor**, Department of Molecular Microbiology and Immunology, Oregon Health and Science University, Portland, OR

2003-2008 **Postdoctoral Research Associate**, Department of Microbiology and Immunology, Cornell University, Ithaca, NY (with Prof. David G. Russell)
My projects focused on the interaction between *Mycobacterium tuberculosis* and the host macrophage.

1998- 2003 **Graduate Research Assistant**, Institute for Cellular and Molecular Biology, University of Texas at Austin (with Prof. Shelley M. Payne)
My graduate work focused on the role of *Shigella flexneri* periplasmic chaperones in virulence and the extracytoplasmic stress response.

1997-1998 **Undergraduate Research**, Department of Microbiology, University of Florida, Gainesville, FL

1994 **Summer Undergraduate Research Fellow**, Institute for Food and Agricultural Sciences, University of Florida, Gainesville, FL

Research Support

Active Projects:

2011-2016 NIH/NIAID R01 AI087840-01A1
TB Membrane Transporters and Intrinsic Resistance
This project will elucidate the mode of action of ubiquitin-derived peptides and elucidate the role of ABC and MFS membrane transport systems in intrinsic resistance to these host antimicrobial peptides. The overall goal is to define the role of host antimicrobial peptides in *M. tuberculosis* infection.
Role: PI

UL1TR000128 (Orwoll PI, Purdy sub) 7/1/2013-6/30/2014
OCTRI Strategic Investment Funding
Pilot HTS for inhibitors of mycobacterial biofilms
This Strategic Investment Funding will allow us to take advantage of resources available at OTRADI to generate essential data for a future NIH application focused on identification of small molecule inhibitors

of MmpL11. We developed a robust whole-cell assay that capitalizes on the biofilm-deficient phenotype of mycobacterial *mmpL11* mutants. We will validate this assay by screening the MicroSource Discovery Spectrum Collection that contains ~2400 compounds with diverse structures that includes known compounds as well as bioactive extracts.
Role: sub

Completed Research:
2009-2011 K22 Career Development Award NIH/NIAID K22 AI079399
Mycobacterial genes mediating resistance to bactericidal ubiquitin peptides – This project will elucidate the mode of action of ubiquitin-derived peptides through identification and characterization of mycobacterial hyper-susceptible and hyper-resistant mutants and will define the role of host antimicrobial peptides in *M. tuberculosis* infection.
Role: PI

2009-2011 Pacific Northwest Regional Center for Excellence Career Development Award
U54 AI081680 (Nelson PI, Purdy sub)
Aging and innate immune functions of macrophages
This project will define the role of aging on innate immune functions of alveolar macrophages from non-human primates. Of particular interest is the impact of aging on autophagic clearance of *M. tuberculosis*.
Role: sub

2009-2010 MRF New Investigator
Autophagy and Aging in the Control of M. tuberculosis infections
This project will allow us to define the role of autophagy and aging in immune control of *M. tuberculosis* using primate alveolar macrophages.
Role: PI

2009-2010 Collins Medical Trust
Identification and Characterization of Biologically –Relevant Mycobactericidal Ubiquitin-Derived Peptides
This project will identify biologically relevant ubiquitin-derived peptides and determine their activity on mycobacteria and other bacterial species.
Role: PI

Awards

2006-2008	Ruth Kirschstein NRSA Individual Postdoctoral Fellowship (NIH/NIAID F32 AI665372)
2005-2006	Heiser Program for Research in Leprosy and Tuberculosis Postdoctoral Research Fellowship
2002	American Society for Microbiology Student Travel Grant
2002	L. Joe Berry Memorial Scholarship Award
1998-2000	University of Texas at Austin, Institute for Cellular and Molecular Biology Graduate Fellowship
1998	University of Florida Presidential Recognition Award
1994-1998	Florida Bright Scholar
1994-1998	University of Florida, Institute for Food and Agricultural Sciences Scholarship

Activities and Service
Professional Memberships

2005-2008	Member, New York Academy of Sciences
1999-present	Member, American Society for Microbiology

Service

Internal to OHSU

2009-present Director, MMI Department Seminar Series
2009-2015 Member, Institutional Biosafety Committee
2010-2013 Member, Faculty Council
2010-2016 Member, School of Medicine Research Committee
2013-2016 Member, School of Medicine Student Honors and Awards Committee

Peer Review Groups

2007 Ad Hoc reviewer, Swiss National Science Foundation
2009 Ad Hoc reviewer, Pacific Northwest Regional Center for Excellence
2011 Reviewer, NIAID ZAI1-LG-M-J: Chemical Approaches to Target Validation for Drug Resistant Pathogens
2012 Ad Hoc reviewer, Ireland Health Research Board
Reviewer, NIAID ZRG1 IDM-S (03): topics in microbial pathogens (member conflict)
Reviewer, NIAID ZRG1 IDM-S (92): topics in microbial pathogens (R15/AREA)
2013 Reviewer, NIAID ZRG1 IDM-B (81): topics in microbial pathogens (R15/AREA)
Reviewer, NIAID ZRG1 IMM-N (12): Non-HIV Microbial Vaccine Development
2014 Reviewer, NIAID ZAI1 SM-M-M (2): NIAID Program Projects
Reviewer, NIAID ZRG12 IDM-C (52): US-South African Program for Collaborative Biomedical Research

Journal Reviewer

2005-Present Ad Hoc, Microbes and Infection
2008-Present Ad Hoc, Transboundary and Emerging Diseases
2009-Present Ad Hoc, Tuberculosis
2011-Present Ad Hoc, Cell Host and Microbe
2012-Present Ad Hoc, Journal of Antioxidants and Redox Signaling, Molecular Microbiology, PlosOne, Cellular Microbiology, Infection and Immunity
Review Editor, Frontiers in Cellular and Infection Microbiology
2013-Present Ad Hoc, PNAS, PlosPathogens

Invited Speaker

2007 Emory Vaccine Center, Emory University, Atlanta, GA.
University of Kentucky, School of Medicine, Lexington, KY.
2008 University of Arkansas for Medical Sciences. Little Rock, AR.
University of Louisville, School of Medicine, Louisville, KY.
Louisiana State University, College of Veterinary Medicine, Baton Rouge, LA.
University of Florida, Gainesville, FL.
National Jewish Medical and Research Center, Denver, CO.
2010 American Society for Microbiology General Meeting, San Diego, CA.
Reed College, Portland, OR.
2011 Lewis and Clark College, Portland, OR
Portland State University, Portland, OR
2012 Seattle Biomedical Research Institute, Seattle, WA
2013 Front Range Mycobacteria Conference, Fort Collins, CO
University of Central Florida, Orlando, FL

Publications

Refereed Publications:

Waddell, C.D, T.J. Walter, S.A. Pacheco, **G.E. Purdy,** and L.J. Runyen-Janecky. 2014 NtrBC and Nac contribute to efficient *Shigella flexneri* intracellular replication. *J. Bacteriol*. 196(14):2578-86. PMID 24794563.

Radhakrishnan, A., N. Kumar, C. Wright, T-H Chou, J.R. Bolla, C-C. Su, K.R. Rajashankar, L. Messerle, **G.E. Purdy**, and E.W. Yu. Crystal Structure of the transcriptional regulator Rv0678 of *Mycobacterium tuberculosis*. *J. Biol. Chem*. 289(23):16526-16540. PMID: 24737322

Kumar, N., A. Radhakrishnan, C.C. Wright, T-H Chou, H-T Lei, J.R. Bolla, M.L. Tringides, K.R. Rajashankar, C-C. Su, **G.E. Purdy**, and E.W. Yu. 2014. Crystal Structure of the transcriptional regulator Rv1219c of *Mycobacterium tuberculosis. Protein Science*. 23(4):423-32. PMID: 24424575

Pacheco, S.A., F.F. Hsu, K.M. Powers, and **G.E. Purdy.** 2013 The MmpL11 transporter contributes to mycobacterial cell wall biosynthesis and biofilm formation in *M. smegmatis. J. Biol. Chem.* 288:24213-24222. PMID 238369904.

Purdy, G.E., S.A. Pacheco, J. Turk, and F.F. Hsu. 2013. Characterization of mycobacterial triacylglycerols and the unusual monomeromycolyl diacylglycerols from *Mycobacterium smegmatis* biofilms by linear ion-trap multiple-stage and high-resolution mass spectrometry with electrospray ionization. *Anal. Bioanal. Chem.* 405(23), 7415–26. PMID: 23852148

Pacheco, S.A., K.M. Powers, F. Engelmann, I. Messaoudi, and **G.E. Purdy.** 2013. Autophagic killing effects against Mycobacterium tuberculosis by alveolar macrophages from young and aged Rhesus macaque. *PLoS ONE* 8(6): e66985. doi:10.1371/journal.pone.0066985. PMID 23825603

Foss, M.H., Powers, K.M., and **G.E. Purdy.** 2012. Structural and functional characterization of mycobactericidal ubiquitin-derived peptides in model and bacterial membranes. *Biochemistry*, 51(49):9922-9. PMID:23173767 PMC3567233

Hsu, F.F., S. Pacheco, J. Turk and **G.E. Purdy**. 2012. Structural Elucidation of Glycopeptidolipids of *Mycobacterium smegmatis* by High Resolution Multiple-stage Linear Ion-trap Mass Spectrometry with Electrospray Ionization, *J Mass Spectrom*. 47(10):1269-81. PMID: 23019158 PMC3462375

Harriff, M., **G.E. Purdy,** and D.M. Lewinsohn. 2012. Escape from the phagosome: the explanation for MHC-I processing of mycobacterial antigen? *Front. Immun.* **3**:40. doi: 10.3389/fimmu.2012.00040. PMID: 22566923 PMC3342008

Daugherty, A. K.M. Powers, M.S. Standley, C.S. Kim, and **G.E. Purdy**. 2011. *M. smegmatis* RoxY is a repressor of *oxyS* and contributes to resistance to oxidative stress and bactericidal ubiquitin peptides. *J. Bacteriol*. 193(24):6824-33. PMID: 21984791. PMC3232828

Purdy, G.E. 2011. Taking out TB – Lysosomal trafficking and mycobactericidal ubiquitin-derived peptides. *Front. Microbio.* 2:7. Epub 2011 Jan 31, 2011. PMID: 22566923 PMC3109310

Purdy, G.E., M. Niederweis, and D.G. Russell. 2009. Decreased outer membrane permeability protects mycobacteria from killing by ubiquitin-derived peptides. *Mol. Microbiol*. 73(5):844-57. PMID: 19682257. PMC2747030

Alonso, S., K. Pethe, D.G. Russell and **G.E. Purdy**. 2007. Lysosomal killing of *Mycobacteria* by soluble ubiquitin-derived peptides is enhanced by autophagy. *PNAS* 104:6031-6036.* PMID:17389386 PMC1851611
* Reviewed by Faculty of 1000

Purdy, G.E., C.A. Fisher and S.M. Payne. 2007. IcsA surface presentation in *S. flexneri* requires the periplasmic chaperones DegP, Skp and SurA. *J. Bacteriol.* 189:5566-5573. PMID: 17526712. PMC1951818.

Purdy, G.E. and D.G. Russell. 2007. Lysosomal ubiquitin and the demise of *Mycobacterium tuberculosis*. *Cell. Microbiol*. 9:2768-2774. PMID: 17714517

Purdy, G.E. and D.G. Russell. 2007. Ubiquitin trafficking to the lysosome: keeping the house tidy and getting rid of unwanted guests. *Autophagy*, 3: 399-401. PMID: 17457035

Rohde, K., R.M. Yates, **G.E. Purdy,** and Russell, D.G. 2007 *Mycobacterium tuberculosis* and the environment within the phagosome. *Immunol Rev* 219: 37-54. PMID:17850480

Owens, R.M., F.F. Hsu, B.C. VanderVen, **G.E. Purdy**, E. Hesteande, P. Giannakas, J.C. Sacchettini, J.D. McKinney, P.J., Hill, J.T. Belisle, B.A. Butcher, K. Pethe, and D.G. Russell. 2006. *M. tuberculosis* Rv2252 encodes a diacylglycerol kinase involved in the biosynthesis of phosphatidylinositol mannosides (PIMs). *Mol. Microbiol*., 60:1152-1163. PMID: 16689792

Russell, D.G., **G.E. Purdy**, R.M. Owens, K.H. Rohde, and R.M. Yates. 2005. *Mycobacterium tuberculosis* and the Four-minute Phagosome. *ASM News* 71:459-463.

Purdy, G.E., R.M. Owens, L.Bennett, D.G. Russell, and B.A. Butcher. 2005. Kinetics of phosphatidylinositol-3-phosphate acquisition differ between IgG bead-containing phagosomes and *Mycobacterium tuberculosis*-containing phagosomes. *Cell. Microbiol*. 7:1627-1634. PMID:16207249

Purdy, G.E., M. Hong, and S.M. Payne. 2002. *Shigella flexneri* DegP facilitates IcsA surface expression and is required for efficient intercellular spread. *Infect. Immun*. 70:6355-6364. * PMID:12379715 PMC130383
* Reviewed by Faculty of 1000

Purdy, G.E., and S.M. Payne. 2001. The SHI-3 iron transport island of *Shigella boydii* 0-1392 carries the genes for aerobactin synthesis and transport. *J. Bacteriol*. 183:4176-4182. PMID:11418557 PMC95306

Manuscripts in preparation:
Foss, M.H., Pou, S., Winter, R.W., Riscoe, M.K. and **G.E. Purdy**. Ethambutol-like adamantyl 1,2-diamines function via a new mechanism of action against the pathogen *Mycobacterium tuberculosis.*

Abstracts Presented:
Pacheco, S.A.*, Wright, C.C. Hsu, F.F., Foss, M.H., Alday, P.H. Melly, G. and **G.E. Purdy**. 2014 MmpL11 contributes to mycobacterial physiology and virulence. Gordon Research Conference on Microbial Toxins and Pathogenesis. Waterville Valley, NH

Foss, MH*, Pou, S., Winter, RW, Riscoe, MK and **G.E. Purdy**. 2014. Ethambutol-like adamantyl 1,2-diamines function via a new mechanism of action against the pathogen *Mycobacterium tuberculosis.* OHSU MMI/VGTI/ID Annual Retreat, Portland, OR.
*, presenter

Pacheco, S.A.*, C.C. Wright, C.D. Waddell and **G.E. Purdy**. 2013. Identification and characterization of MmpL11 interacting proteins. OHSU MMI/VGTI/ID Annual Retreat, Portland, OR.

Foss, M.H.*, Powers, K. M., and **G.E. Purdy.** 2013. Structural and functional characterization of mycobactericidal ubiquitin-derived peptides. Keystone Symposia on Tuberculosis, Whistler, BC, Canada; Gordon Research Conference on Antimicrobial peptides, Ventura, CA; OHSU MMI/VGTI/ID Annual Retreat, Portland, OR.

Pacheco, S.A.*, Hsu, F.F., Powers, K.M. and **G.E. Purdy.** 2012. The MmpL11 transporter contributes to mycobacterial cell wall biosynthesis. OHSU MMI/VGTI/ID Annual Retreat, Portland, OR.

Powers, K.M.*, and **G.E. Purdy.** 2012. Structural and functional characterization of mycobactericidal ubiquitin-derived peptides. OHSU MMI/VGTI/ID Annual Retreat, Portland, OR.

M.S. Standley, A. Daugherty, C.S. Kim, K.M. Powers and **G.E. Purdy**. 2011. RoxY and OxyS are required for mycobacterial resistance to bactericidal ubiquitin peptides and oxidative stress. Keystone Symposia on Tuberculosis, Vancouver, BC, Canada.

Purdy, G.E., M. Niederweis, and D.G. Russell, 2009. Mycobactericidal ubiquitin-peptides target the mycobacterial membrane and impair membrane function. Keystone Symposia on Tuberculosis, Keystone, CO.

Purdy, G.E. and D.G. Russell. 2008. Mycobactericidal ubiquitin-derived peptides access the mycobacterial membrane via porins and possess pore-forming activity. Gordon Research Conference on Microbial Toxins and Pathogenesis. Andover, NH.

Purdy, G.E., S. Alonso and D.G. Russell. 2007. Lysosomal killing of Mycobacteria by Ubiquitin-derived peptides. American Society for Microbiology 107th General Meeting. Toronto, Ontario, Canada.

Purdy, G.E. and D.G. Russell, 2007. Lysosomal killing mediated by ubiquitin-derived peptides is enhanced by autophagy. **Oral Presentation**. Cornell Infection and Pathobiology Seventh Annual Retreat, Owego, NY.

Purdy, G.E., S. Alonso, K. Pethe, and D.G. Russell. 2007. Killing of *Mycobacteria* by soluble lysosomal fraction is mediated by ubiquitin-derived peptides and is enhanced by autophagy. Keystone Symposia on Tuberculosis, Vancouver, BC, Canada. and 2006 Gordon Research Conference on Microbial Toxins and Pathogenesis. Andover, NH.

Purdy, G. E., R. Owens and D. G. Russell. 2005. Identification and characterization of secreted *M. tuberculosis* lipid kinases. Meeting on Microbial Pathogenesis and Host Response. Cold Spring Harbor, New York. and 2005 Keystone Symposia on Tuberculosis, Whistler, BC, Canada.

Purdy, G. E., R. Owens and D. G. Russell. 2004. Analysis of PI3P levels on *M. tuberculosis*-containing phagosomes. FEBS/EMBO Frontiers of Cellular Microbiology and Cell Biology Conference, San Feliu de Guixols, Spain.

Purdy, G. E. and S. M. Payne. 2003. DegP is required for wild type levels of nitrate reductase activity in *Shigella flexneri*. American Society for Microbiology 103rd General Meeting. Washington, DC.

Purdy, G. E. and S. M. Payne. 2002. DegP is a *S. flexneri* virulence factor. **Oral Presentation**. Texas Branch American Society for Microbiology Meeting. Austin, TX.

Purdy, G. E., M. Hong, and S. M. Payne. 2002 *S. flexneri* DegP is required for wild type levels of intercellular spread. American Society for Microbiology 102nd General Meeting. Salt Lake City, UT.

Purdy, G. E. and S. M. Payne. 2000. A *Shigella boydii* Island Encodes Aerobactin Synthesis and Transport. American Society for Microbiology 100th General Meeting. Los Angeles, CA.