

PATRICIA A. DARRAH

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National Institute of Allergy and Infectious Diseases
National Institutes of Health
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EDUCATION

2001 Ph.D., Microbiology and Immunology
Temple University School of Medicine, Philadelphia, PA
1994 B.S., Biochemistry
Albright College, Reading, PA

POSITIONS AND EMPLOYMENT

2016-present Head, Tuberculosis Unit, Cellular Immunology Section
Vaccine Research Center, NIAID, NIH, Bethesda, MD
2009-present Staff Scientist I, Cellular Immunology Section
Vaccine Research Center, NIAID, NIH, Bethesda, MD
2002 to 2009 Research Fellow, Cellular Immunology Section
Vaccine Research Center, NIAID, NIH, Bethesda, MD
2001 to 2002 Faculty Research Assistant, Cell Biology and Molecular Genetics
University of Maryland, College Park, MD
1994 to 2001 Doctoral Candidate, Microbiology and Immunology
Temple University School of Medicine, Philadelphia, PA

PROFESSIONAL MEMBERSHIPS, SERVICE AND OTHER EXPERIENCE

2016-2018 Member, American Association of Immunologists
2017 Organizer, Meeting of the Non Human Primate Research Community of The
Collaboration for Tuberculosis Vaccine Discovery, Biomedical Primate Research
Centre, Netherlands.
2017 Session chair, NIH/FDA TB Research Initiative World TB Day Mini-Symposium,
FDA, Maryland
2017 Attendee, SCAW IACUC Training Workshop, College Park, MD

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2016-present Co-leader, Non
Human Primate Research Community of The Collaboration for Tuberculosis
Vaccine Discovery, Bill & Melinda Gates Foundation

2016 Member, American Society for Microbiology

2015-present Member, Non
Human Primate Research Community of The Collaboration for Tuberculosis
Vaccine Discovery, Bill & Melinda Gates Foundation

2015-present Member and Seminar Series Committee, NIH Intramural Tuberculosis Research
Initiative (NITBRI)

2014-present VRC Representative, Women Scientist Advisors Committee

2011-present Member, VRC Animal Care and Use Committee (ACUC)

2009-present Lab Representative, VRC Safety and Health Committee

2007-2009 Institute Representative, NIH Fellows Committee (FELCOM)

2001-2002 Member, Society for Leukocyte Biology

SUPERVISORY, MENTORING, AND TEACHING EXPERIENCE

Direct supervision of biologists or technicians:

2018-present Megha Kamath, technician

2017-present Supriya Pokkali, biologist

2016 James Mitchell, biologist

Co-supervision of Post-doctoral IRTAs & Ph.D. candidates:

2018-present Phillip Swanson, Phd

2018-present Mathew Sutton, Phd

2012-2016 Kailan Sierra-Davidson

Direct supervision of Post Baccalaureate Intramural Research Training Awardees:

2019- Julie Bevilacqua

2016-2018 Joshua Hackney

2015-2016 Mercy Ude

2011-2012 Dana Berry

2010-2011 Christopher Redmond

2008-2010 Sonia Hegde

2004-2006 Dipti Patel

Direct supervision of Summer Internship Program trainees:

2016 Julia Casazza

2008 Linda Chen

Direct mentorship of high school students:

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2018 Olivia Cool, Capstone project

Teaching experience:

1996 to 1998 Lecturer, "Pathogenesis of Infectious Disease"
MCP Hahnemann University, Philadelphia, PA

HONORS AND AWARDS

2018 NIH-Immunology Interest Group Travel Award
2018 Mini-grant award (\$22.5K) from the NIH Intramural TB Research Initiative
2017 Mini-grant award (\$21K) from the NIH Intramural TB Research Initiative
2005-2007, 2009-2012, 2014, 2017, 2018
NIH Individual Performance Award
2012, 2017 NIH Group Performance Award
2011 National Institutes of Allergy and Infectious Diseases Merit Award
2003-2008 NIH Intramural AIDS Research Loan Repayment Program Award
2006 Fellows Award for Research Excellence, NIAID, NIH
2001 Society for Leukocyte Biology Student Travel Award

INVITED SEMINARS

2018 Chemistry and Biochemistry Seminar Series, Albright College, Reading PA
2017 Department of Global Health, University of Washington, Seattle WA

PUBLICATIONS

1. **Darrah PA**, Zeppa JJ, Maiello P, Hackney JA, Pokkali S, Scanga C, Fraser AJ, Lin PL, Bonavia A, Laddy DJ, Roederer M, Flynn JL, Seder RA. Intravenous BCG immunization protects rhesus macaques against TB challenge. *Manuscript submitted*.
2. Thompson E, **Darrah PA**, Foulds K, Hoffer E, Norenstedt S, Perbeck L, Kedl RM, Seder RA, Lore K. Monocytes acquire the ability to prime tissue-resident T cells via IL-10-mediated TGF β release. *Cell Reports, in press*.
3. **Darrah PA**, DiFazio RM, Maiello P, Gideon HP, Myers AJ, Rodgers MA, Evans T, Prikhodko V, Roederer M, Lin PL, Laddy DJ, Seder RA, Flynn JL. Boosting with Adenoviral vectors or protein subunit vaccines fails to improve protection provided by BCG immunization against tuberculosis in rhesus macaques. *NPJ Vaccines. 2019, 4:21*.

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4. Yu KKQ, Wilburn DB, Hackney JA, **Darrah PA**, Foulds KE, James CA, Smith MT, Jing L, Seder RA, Roederer M, Koelle DM, Swanson WJ, Seshadri C. Conservation of molecular and cellular phenotypes of invariant NKT cells between human and non-human primates. *Immunogenetics*. 2019. In press.
5. Laddy DJ, Bonavia A, Hanekom WA, Kaushal D, Williams A, Roederer M, Seder RA, Sharpe S, Verreck FAW, **Darrah PA**. Toward Tuberculosis Vaccine Development: Recommendations for Nonhuman Primate Study Design. *Infect. Immun.* 2018, 86(2):e00776-17.
6. Lynn GM, Laga R, **Darrah PA**, Ishizuka AS, Balaci AJ, Dulcey AE, Pechar M, Pola R, Gerner MY, Yamamoto A, Buechler CR, Quinn KM, Smelkinson MG, Vanek O, Cawood R, Hills T, Vasalatiy O, Kastenmuller K, Francica JR, Stutts L, Tom JK, Ryu KA, Esser-Kahn AP, Etrych T, Fisher KD, Seymour LW, Seder RA. In vivo characterization of the physiochemical properties of polymer-linked TLR agonists that enhance vaccine immunogenicity. *Nat Biotechnol.* 2015, 33(11):1201-10.
7. Thompson EA, Liang F, Lindgren G, Sandgren KJ, Quinn KM, **Darrah PA**, Koup RA, Seder RA, Kedl RM, Lore K. Human Anti-CD40 Antibody and Poly IC:LC Adjuvant Combination Induces Potent T Cell Responses in the Lung of Nonhuman Primates. *J Immunol.* 2015, 195(3):1015-24.
8. Boyd A, Almeida JR, **Darrah PA**, Sauce D, Seder RA, Appay V, Gorochov G, Larsen M. Pathogen-Specific T Cell Polyfunctionality is a Correlate of T Cell Efficacy and Immune Protection. *PLOS One.* 2015, 10(6):e0128714.
9. Quinn KM, Zak DE, Costa A, Yamamoto A, Kastenmuller, K, Hill BJ, Lynn GM, **Darrah PA**, Lindsay RW, Wang L, Cheng C, Nicosia A, Folgori A, Colloca S, Cortese R, Gostick E, Price DA, Gall JG, Roederer M, Aderem A, Seder RA. Antigen expression determines adenoviral potency independent of IFN and STING signaling. *J Clin Invest.* 2015, 125(3):1129-46.
10. Hokey DA, Wachholder R, **Darrah PA**, Bolton DL, Barouch D, Hill K, Dheenadhayalan V, Godin CS, Douoguih M, Seder RA, Roederer M, Sadoff JC, Sizemore D. A Nonhuman Primate Toxicology Study Evaluating Aerosol Delivery of AERAS-402/Ad35 Vaccine Elicits Transient T Cell Responses in Peripheral Blood and Robust Sustained Responses in the Lungs. *Hum Vaccin Immunother.* 2014, 10(8):1-12.
11. Hill BJ, **Darrah PA**, Ende Z, Ambrozak DR, Quinn KM, Darko S, Gostick E, Wooldridge L, van den Berg HA, Venturi V, Larsen M, Davenport MP, Seder RA, Price DA, Douek DC. Epitope specificity delimits the functional capabilities of vaccine-induced CD8 T cell populations. *J. Immunol.* 2014, 193(11):5626-36.
12. **Darrah PA**, Bolton DL, Aye PP, Kaushal D, Schiro FR, Blanchard JL, Sizemore D, Sadoff JC, Lackner AA, Roederer M, RA Seder. Aerosol vaccination with AERAS-402 elicits robust cellular immune responses in the lungs of rhesus macaques but fails to protect against high-dose *Mycobacterium tuberculosis* challenge. *J Immunol.* 2014, 193(4):1799-1811.
13. Quinn KM, Yamamoto A, Costa A, **Darrah PA**, Lindsay RW, Hegde ST, Johnson TR, Flynn BJ, Loré K, Seder RA. Coadministration of Polyinosinic:Polycytidylic Acid and Immunostimulatory Complexes Modifies Antigen Processing in Dendritic Cell Subsets and Enhances HIV Gag-Specific T Cell Immunity. *J Immunol.* 2013, 191(10):5085-5096.

14. Quinn KM, Da Costa A, Yamamoto A, Berry D, Lindsay RW, **Darrah PA**, Wang L, Cheng C, Kong WP, Gall JG, Nicosia A, Folgori A, Colloca S, Cortese R, Gostick E, Price DA, Gomez CE, Esteban M, Wyatt LS, Moss B, Morgan C, Roederer M, Bailer RT, Nabel GJ, Koup RA, Seder RA. Comparative analysis of the magnitude, quality, phenotype, and protective capacity of simian immunodeficiency virus gag-specific CD8+ T cells following human-, simian-, and chimpanzee-derived recombinant adenoviral vector immunization. *J Immunol.* 2013, 190(6):2720-2735.
15. Klatt NR, Vinton CL, Lynch RM, Canary LA, Ho J, **Darrah PA**, Estes JD, Seder RA, Moir SL, Brenchley JM. SIV infection of rhesus macaques results in dysfunctional T- and B-cell responses to neo and recall *Leishmania major* vaccination. *Blood.* 2011, 118(22):5803-5812.
16. Kastenmüller K, Wille-Reece U, Lindsay RW, Trager LR, **Darrah PA**, Flynn BJ, Becker MR, Udey UC, Clausen BE, Igyarto BZ, Kaplan DH, Kastenmüller W, Germain RN, Seder RA. Protective T cell immunity in mice following protein-TLR7/8 agonist-conjugate immunization requires aggregation, type I IFN, and multiple DC subsets. *J Clin Invest.* 2011, 121(5):1782-96.
17. Yang Z, Zhang X, **Darrah PA**, Mosser DM. The regulation of Th1 responses by the p38 MAPK. *J Immunol.* 2010, 185(10):6205-6213.
18. **Darrah PA**, Hegde ST, Patel DT, Lindsay RW, Chen L, Roederer M, Seder RA. IL-10 production differentially influences the magnitude, quality, and protective capacity of Th1 responses depending on the vaccine platform. *J Exp Med.* 2010, 207(7):1421-1423.
19. Lindsay RW, **Darrah PA**, Quinn KM, Wille-Reece U, Mattei LM, Iwasaki A, Kasturi SP, Pulendran B, Gall JG, Spies AG, Seder RA. CD8+ T cell responses following replication-defective adenovirus serotype 5 immunization are dependent on CD11c+ dendritic cells but show redundancy in their requirement of TLR and nucleotide-binding oligomerization domain-like receptor signaling. *J Immunol.* 2010, 185(3):1513-1521.
20. Lindenstrom T, Agger EM, Korsholm KS, **Darrah PA**, Aagard C, Seder RA, Rosenkrands I, Anderson P. Tuberculosis subunit vaccination provides long-term protective immunity characterized by multifunctional CD4 memory T cells. *J Immunol.* 2009, 182(12):8047-8055.
21. Seder RA, **Darrah PA**, Roederer M. T Cell Quality and Immune Memory: Implications for Vaccine Design. *Nature Rev Immunol.* 2008, 8(4):247-258.
22. **Darrah PA**, Patel DT, De Luca PM, Lindsay RWB, Davey DF, Flynn BJ, Hoff ST, Andersen P, Reed SG, Morris SL, Roederer M, Seder RA. Multifunctional T_H1 cells define a correlate of vaccine-mediated protection against *Leishmania major*. *Nature Med.* 2007, 13(7):843-850.
23. **Darrah PA**, Monaco MCG, Shruti J, Hondalus MK, Golenbock DT, Mosser DM. Innate immune responses to *Rhodococcus equi*. *J Immunol.* 2004, 173:1914-1924.
24. Tritel M, A.M. Stoddard, B.J. Flynn, **P.A. Darrah**, C. Wu, U. Wille, J.A. Shah, Y. Huang, L. Xu, M.R. Betts, G.J. Nabel, R.A. Seder. Prime-boost vaccination with HIV-1 Gag protein and cytosine phosphate guanosine oligodeoxynucleotide, followed by adenovirus, induces sustained and robust humoral and cellular immune responses. *J Immunol.* 2003, 171:2538-2547.
25. Shah JA, **Darrah PA**, Ambrozak DR, Turon TN, Mendez S, Kirman J, Wu C, Glauhenhaus N, Seder RA. Dendritic cells are responsible for the capacity of CpG oligodeoxynucleotides

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to act as an adjuvant for the protective vaccine immunity against *Leishmania major* in mice. *J Exp Med.* 2003, 198:281-291.

26. Chen G, **Darrah P**, Mosser DM. Vaccination against the intracellular pathogens *Leishmania major* and *L. amazonensis* by directing CD40L to macrophages. *Infect Immun.* 2001, 69:3255-3263.
27. **Darrah PA**, Hondalus MK, Chen Q, Ischiropoulos H, Mosser DM. Cooperation between reactive oxygen and nitrogen intermediates in killing of *Rhodococcus equi* by activated macrophages. *Infect Immun.* 2000, 68:3587-3593.
28. Giguere S, Hondalus MK, Yager JA, **Darrah PA**, Mosser DM, and Prescott JF (1999). Role of the 85-kilobase plasmid and plasmid-encoded virulence-associated protein A in intracellular survival and virulence of *Rhodococcus equi*. *Infect Immun.* 67:3548-3557.

BOOK CHAPTERS

1. **Darrah, PA**, Hondalus MK, and Mosser DM (1999). *Rhodococcus equi*: pathogenesis and replication in macrophages. In: Opportunistic Intracellular Pathogens and Immunity. Paradise LJ, Friedman H, and Bendinelli M (eds.). Plenum Press. New York.

ORAL PRESENTATIONS

1. **Darrah PA**, Roederer M, Flynn JL, Seder RA. IV BCG Immunization Prevents TB Infection in NHP. 2018. *NIAID Division Directors Meeting*, Bethesda, MD.
2. **Darrah PA**, Roederer M, Flynn JL, Seder RA. Intravenous BCG Immunization Protects Rhesus Macaques against TB Challenge. 2018. *Vaccine Research Center 2018 Scientific Training Retreat*, Rockville, MD.
3. **Darrah PA**, Roederer M, Flynn JL, Seder RA. Intravenous BCG Immunization Protects Rhesus Macaques against TB Challenge. 2018 NIH Immunology Interest Group Workshop, Leesburg, VA.
4. **Darrah PA**, Roederer M, Flynn JL, Seder RA. Intravenous BCG Immunization Protects Rhesus Macaques against TB Challenge. *NIH Intramural TB Research Initiative Annual Meeting.* 2018, Bethesda, MD.
5. **Darrah PA**, Roederer M, Flynn JL, Seder RA. Intravenous BCG Immunization Protects Rhesus Macaques against TB Challenge. *Vaccine Research Center Scientific Advisory Working Group Meeting.* 2018, Bethesda, MD.
6. **Darrah PA**. Introduction to the TB Vaccine Unit. *NIH Intramural TB Research Initiative World TB Day Mini-Symposium.* 2017. Silver Spring, MD.
7. **Darrah PA**, Roederer M, Flynn JL, Scanga C, Coleman MT, DiFazio R, Lin PL, Evans TG, Laddy DL, Anantha R, Limbach MP, Temmerman S, Demoitie MA, Seder RA. Protective Efficacy of Tuberculosis-Specific T Cell Immunity in the Lung After Aerosol Delivery of Adenoviral

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- Vaccines in Nonhuman Primates. *ICI2016: 16th International Congress of Immunology*. 2016, Melbourne, Australia.
8. **Darrah PA**, Roederer M, Flynn JL, Scanga C, Coleman MT, DiFazio R, Lin PL, Evans TG, Laddy DL, Anantha R, Limbach MP, Temmerman S, Demoitie MA, Seder RA. Aerosol Adenovirus Vaccination Against Tuberculosis in Rhesus Macaques. *HIV and Emerging Infectious Diseases: Challenges and Opportunities*. 2014, Rockville, MD.
 9. **Darrah PA**, Roederer M, Seder RA. Defining Correlates of Th1-mediated Protection after Vaccination using Multi-Parameter Flow Cytometry and Genomic Analysis. Basic Science Pre-Meeting Course: New Approaches for Immunologic Intervention in Tropical Infectious Diseases. *American Society of Tropical Medicine and Hygiene 60th Annual Meeting*. 2011, Philadelphia, PA.
 10. **Darrah PA**, Hegde ST, Redmond CJ, Seder RA. Genomic profiling of protective Th1 responses following vaccination. *Tenth Annual Vaccine Research Center Scientific Training Retreat*. 2011, Philadelphia, PA.
 11. **Darrah PA**, Hegde ST, Patel DT, Lindsay RW, Chen L, Roederer M, Seder RA. The role of IL-10 on the magnitude and quality of vaccine-elicited Th1 responses. *Seventh Annual Vaccine Research Center Scientific Training Retreat*. 2008, Philadelphia, PA.
 12. **Darrah PA**, Lindsay RWB, Patel DT, Roederer M, Seder RA. The role of IL-10 on the magnitude and quality of the Th1 response following vaccination against *Leishmania major*. *Twelfth Annual Woods Hole Immunoparasitology Conference*. 2008, Woods Hole, MA.
 13. **Darrah PA**, Patel DT, De Luca PM, Lindsay RWB, Davey DF, Roederer M, Seder RA. The quality of the Th1 response following vaccination correlates with protection against *Leishmania major*. *ImmunoRio 2007: 13th International Congress of Immunology*. 2007, Rio de Janeiro, Brazil.
 14. **Darrah PA**, Patel DT, De Luca PM, Lindsay RWB, Davey DF, Seder RA. "Lessons from Leishmania": Th1 quality and protection following vaccination. *Fifth Annual Vaccine Research Center Scientific Training Retreat*. 2006, Philadelphia, PA.
 15. **Darrah PA**, Patel DT, De Luca PM, Seder RA. The quality of the Th1 response determines protection against *Leishmania major* following vaccination with a recombinant adenovirus. *The Measurement of Antigen-Specific Immune Responses (MASIR) Conference*. 2006, Santorini, Greece.
 16. **Darrah PA**, Patel DT, De Luca PM, Seder RA. Quality of Th1 response determines protection against *Leishmania major* infection. *Fourth Annual Vaccine Research Center Scientific Training Retreat*. 2005, Philadelphia, PA.
 17. **Darrah PA**, De Luca PM, Patel DT, Seder RA. Recombinant adenovirus as a vaccine for infections requiring Th1 responses. *Third Annual Vaccine Research Center Scientific Training Retreat*. 2004, Richmond, VA.
 18. **Darrah PA**, Shah JA, Seder RA. The role of Toll-like receptor ligands as vaccine adjuvants. *Second Annual Vaccine Research Center Scientific Training Retreat*. 2003, Annapolis, MD.
 19. **Darrah PA**, Mentink-Kane M, Mosser DM. *Leishmania amazonensis*: Failure to induce innate immune responses following infection of macrophages. *Philadelphia Infection and Immunity Forum*. 2000, Philadelphia, PA.

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20. **Darrah, PA**, Mentink-Kane M, Mosser DM. *Leishmania amazonensis*: Failure to induce innate immune responses following infection of macrophages. *Fourth Annual Woods Hole Immunoparasitology Conference*. 2000, Woods Hole, MA.
21. **Darrah, PA**, Hondalus MK, Mosser DM. The interaction of *Rhodococcus equi* with immunologically activated macrophages. *The Havermeier Foundation Workshop*. 1996, Ontario, Canada.
22. **Darrah PA**, Hondalus MK, Mosser DM. *Rhodococcus equi*: intracellular growth in macrophages. *The Philadelphia Infection and Immunity Forum*. 1996, Philadelphia, PA.

Poster Presentations

1. **Darrah PA**, Pokkali S, Hackney JA, Scanga C, Laddy DJ, Zeppa JJ, Maiello P, Lin PL, Flynn JL, Seder RA, Roederer M. Evaluating Correlates of Protection Following Intravenous BCG Immunization of Nonhuman Primates. *Keystone Symposium: Tuberculosis: Mechanisms, Pathogenesis, and Treatment*. Banff, British Columbia, Canada. January, 2019.
2. **Darrah PA**, Roederer M, Flynn JL, Seder RA. T cell immunity in the lung and protection following aerosol, intravenous, or intradermal administration of BCG in nonhuman primates. *Vaccine Research Center 2018 Scientific Training Retreat*, Rockville, MD. September, 2018.
3. **Darrah PA**, Hackney JA, Pokkali S, Scanga C, Laddy DJ, Fraser AJ, Zeppa JJ, Lin PL, Bonavia A, Flynn JL, Roederer M, Seder RA. T cell immunity in the lung and protection following aerosol, intravenous, or intradermal administration of BCG in nonhuman primates. *Keystone Symposium: Tuberculosis: Translating Scientific Findings for Clinical and Public Health Impact*. Whistler, British Columbia, Canada. April, 2018.
4. **Darrah PA**, Scanga C, Laddy DJ, Hackney JA, Pokkali S, Fraser AJ, Zeppa JJ, Lin PL, Bonavia A, Casimiro D, Flynn JL, Roederer M, Seder RA. T cell immunity in the lung and protection following aerosol, intravenous, or intradermal administration of BCG in nonhuman primates. *Global Forum on TB Vaccines*. New Delhi, India. February, 2018.
5. **Darrah PA**, Laddy DJ, Bonavia A, Scanga C, Flynn JL, Roederer M, Seder RA. **Aerosol or Intravenous BCG Immunization Induces Robust Tissue Resident T Cell Immunity in the Lungs of Nonhuman Primates**. *Keystone Symposium: New Developments in Our Basic Understanding of Tuberculosis*. Vancouver, British Columbia, Canada. January, 2017.
6. **Darrah PA**, Roederer M, Scanga C, Flynn JL, Coleman MT, DiFazio R, Lin PL, Evans TG, Laddy DJ, Anantha R, Limbach MP, Demoitie M, Seder RA. Protective Efficacy of Tuberculosis-Specific T Cell Immunity Generated in the Lung by Aerosol Delivery of Replication-Defective Adenoviral Vaccines in Nonhuman Primates. *Keystone Symposium: Tuberculosis Comorbidities and Immunopathogenesis*. Keystone, CO. February, 2016.
7. **Darrah PA**, Hegde ST, Redmond CJ and Seder RA. The effect of antigen dose on vaccine-elicited Th1 responses and protection against *Leishmania major*. *Keystone Symposium: Immunologic Memory, Persisting Microbes and Chronic Disease*. Banff, Alberta, Canada. February, 2011.
8. **Darrah PA**, Lindsay RWB, Patel DT, Chen L, Roederer M and Seder RA The role of IL-10 on

the magnitude and quality of the Th1 response following vaccination against *Leishmania major*. *Keystone Symposium: Immunologic Memory and Host Defense*. Keystone, CO. February, 2009.

9. **Darrah PA**, Patel DT, De Luca PM, Lindsay RWB, Davey DF, Roederer M, and Seder RA. The quality of the Th1 response determines protection against *Leishmania major* following vaccination with a recombinant adenovirus. *Keystone Symposium: Immunologic Memory*. Santa Fe, NM. March 2007.
10. **Darrah PA**, De Luca PM, Patel DT, Seder RA. Protection against *Leishmania major* following vaccination with a recombinant adenovirus is determined by the quality rather than the magnitude of the Th1 response. *The American Association of Immunologists Annual Meeting/ Immunology 2006*. Boston, MA. May 2006.
11. **Darrah PA**, De Luca PM, Patel DT, Seder RA. The quality rather than the magnitude of Th1 responses correlates with protection against *Leishmania major* following vaccination with a replication-defective recombinant adenovirus. *The American Association of Immunologists 2005 Annual Meeting* as part of *Experimental Biology 2005*. San Diego, CA. April 2005.
12. **Darrah PA** and Mosser DM. Activation of innate immune responses by intracellular pathogens. *The Cytokine Odyssey 2001*. Maui, Hawaii. November 2001.
13. **Darrah PA** and Mosser DM. Susceptibility of *Rhodococcus equi* to reactive oxygen and nitrogen intermediates. *The Philadelphia Infection and Immunity Forum*. Philadelphia, PA. April 1997.
14. **Darrah PA**, Hondalus MK, and Mosser DM. *Rhodococcus equi*. intracellular growth in macrophages. *The Philadelphia Infection and Immunity Forum*. Philadelphia, PA. April 1996.