

Curriculum vitae

Appakkudal R Anand

Department of Pathology,
The Ohio State University Wexner Medical Center
460 W 12th Ave, 840 BRT
Columbus, OH 43210, USA
Ph: 1-614-292-9798 ; Mobile: 1-617-287-0754
aranand@gmail.com ; appakkudal.anand@osumc.edu
Fax :1-614-247-0052

Current title: Assistant Professor (Research), Department of Pathology, Ohio State University

Research Summary

I have a long-standing interest and expertise in dissecting the molecular mechanisms of bacterial/viral pathogenesis. As a Ph.D. student in Sankara Nethralaya, India, I worked on the pathogenesis and molecular diagnosis of infectious endophthalmitis, a devastating eye infection (*Ophthalmology*, 2000; *J Infection* 2000; *Ophthalmology*, 2001). As a postdoctoral fellow at Harvard Medical School, with my continued interest in infectious disease, I turned my attention to understanding the pathogenesis of HIV. I worked on projects related to role of chemokine receptors in HIV pathogenesis, demonstrating the importance of novel molecules responsible for CD4+ T cell depletion in HIV infection (*J Biol. Chem*, 2006). After joining as a junior faculty at The Ohio State University, I worked on understanding the mechanisms of chemokine production in LPS-induced vascular inflammation, a phenomenon associated with the several vascular disorders, including sepsis and atherosclerosis. I specifically worked on projects related to role of the tyrosine kinase, Pyk2 in LPS-induced IL-8 and MCP-1 production in endothelial cells, demonstrating the importance of this molecule in vascular inflammation (*J Immunol*, 2008; *Mol Immunol* 2009). Simultaneously, I have been involved in studying mechanisms used by HIV to exploit immune cells, especially T-cells and dendritic cells, to replicate and disseminate in the host. My recent studies involve the demonstration of a novel signaling pathway that mediates HIV-induced migration of dendritic cells (*Blood*, 2009) and the identification of novel host proteins, a secretory glycoprotein Slit2 (*AIDS*, 2011, *Retrovirology*, 2013) and a T-cell adaptor protein, SLP-76 (*J Immunol*, 2012) that regulate HIV replication in T-cells. Currently, I am working on the role of other novel host proteins as well as microRNAs (miRNAs) in regulating HIV and Hepatitis C virus replication with the goal of using these molecules as therapeutic targets for HIV and HCV infection.

Education

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| 2001 | Ph.D. in Microbiology, Sankara Nethralaya, The Tamil Nadu Dr. MGR Medical University, Chennai, India (Thesis Title: <i>Evaluation of molecular techniques in the diagnosis of infectious endophthalmitis</i>) Supervisor: Prof. H.N. Madhavan MD, Ph.D. |
| 1994 | M.Sc. (Medical Microbiology), Kasturba Medical College, Mangalore University, India |
| 1991 | B.Sc. (Microbiology), St. Josephs College of Arts & Science, Bangalore University, Bangalore, India |

Research experience

- 1994-1995 Research Assistant, Department of Neuromicrobiology, National Institute of Mental Health & Neurosciences, Bangalore
- 1995-1997 Junior Research fellow, Vision Research Foundation, Sankara Nethralaya, Chennai
- 1997-2001 Senior Research fellow, Vision Research Foundation, Sankara Nethralaya, Chennai
- 2001-2002 Postdoctoral Research Fellow, Jules Stein Eye Institute, University of California at Los Angeles (UCLA), CA, USA
- 2002-2007 Postdoctoral Research Fellow, Harvard Medical School (Beth Israel Deaconess Medical Center), Boston, MA, USA

Academic Appointments

- 2007-2010 Instructor (faculty position), Department of Pathology, College of Medicine, Ohio State University Wexner Medical Center, Columbus, OH, USA
- 2010-present Assistant Professor (Research Track), Department of Pathology, College of Medicine, Ohio State University Wexner Medical Center, Columbus, OH, USA

Teaching/Mentoring Experience and Responsibilities

2007-present (Ohio State University Wexner Medical Center): Teaching/training and directing the research projects of post-doctoral fellows, Ph.D. and undergraduate students and summer research students in Immunology, Cell Biology, Virology and Molecular Biology.

Routinely teach and present at the 1) Experimental Pathology seminar series and 2) The Center for Retrovirus research seminar series.

2002-2006 (Harvard Medical School): Trained/taught and directed the research projects of laboratory technicians and undergraduate students.

1996-2001 (Sankara Nethralaya , Vision Research Foundation): Taught courses in Medical Microbiology for Residents in Ophthalmology and Masters students in Medical Laboratory Technology, Optometry and Nursing; directed the research projects of undergraduate, Masters and Ph.D. students in the Department of Ocular Microbiology.

List of students mentored

Current:

- 2009- present Nagaraja Tirumuru (post-doctoral researcher) Ohio State University(Co-mentor)
- 2010- present Helong Zhao (graduate student) Ohio State University (Co-mentor)
- 2012-present Tasha Wilkie (graduate student) Ohio State University (Co-mentor)
- 2012-present Corey Gregory (under-graduate student) Ohio State University
- 2012-present Akaansha Ganju (Research assistant) Ohio State University

Past:

- 2008-2012 Yadwinder Deol (graduate student) Ohio State University (Presently Post-doctoral fellow at University of Michigan) Co-mentor
- 2005-2007 Heather Lane (Research associate) Beth Israel Deaconess Medical Center, (Presently, Scientific support at AbCam, Cambridge, MA)
- 2010 Shaletha Holmes (SROP student, Savannah State University- SROP program is specifically designed to recruit minorities into science)

Current Grant support

2011-2013 NIHR21: "Novel approaches to inhibit LPS-induced inflammation" (NIH/NIAID) PI: Ramesh Ganju. The overall goal of this project is to develop novel strategies to inhibit Lipopolysaccharide- induced inflammation that leads to atherosclerosis. (\$225,000 direct cost per year) **Role: Co-investigator with 50% effort.**

Professional Memberships

2006-present American Society of Virology
1999-present Indian Association of Medical Microbiologists
2013- The International CCN Society

Other Professional Activities

Ad hoc Reviewer: for journals Blood (IF 10.5), International Immunology (IF 3.4), Immunology and Cell Biology (IF 3.66), Molecular Immunology (IF 2.89), Inflammation (IF 1.74).

Judge : Annual Ohio State University Medical Center (OSUMC) Trainee Research Day (2010)
Annual OSUMC Trainee Research Day (2011)
Annual OSUMC Trainee Research Day (2012)
Denman undergraduate research forum, Ohio State University (2012)

Honors

- Qualified the National Eligibility Test (NET) for Junior Research Fellowship/Eligibility for Lectureships conducted by University Grants Commission (UGC) - 1994
- Junior Research Fellowship, University Grants Commission, India (1995-1998)
- Senior Research Fellowship, University Grants Commission, Government of India (1998-2000)
- CCLRU Travel Fellowship, Indian Eye Research Group Meeting (1997)
- Best Poster Award XXV National Congress of Indian Association of Medical Microbiologists (IAMM), Chandigarh, India (1999)
- CCLRU Travel Fellowship, Indian Eye Research Group Meeting (1999)
- CCLRU Travel Fellowship, Indian Eye Research Group Meeting (2000)
- Swarnalata Punshi Award (awarded to the best Research Fellow of the year), Medical Research Foundation, Chennai, India (2001)

Invited Talks

1. Host factors that regulate HIV infection in target cells: possible implications for interventions. International Association of Medical & Pharmaceutical Virologists Meeting, CLRI, Chennai, India, November 2012.
2. Role of TGF-beta and CTGF in promoting Hepatitis C virus -induced liver fibrosis. Nationwide Children's Hospital 2010 Research Week, Columbus OH, USA, April 2010.
3. Molecular mechanisms of dendritic cell dysfunction in HIV infection. National Institute of Mental Health and Neurosciences, Bangalore, India, September, 2008.
4. Macrophage-tropic gp120-induced migration of Dendritic cells is regulated by the tyrosine kinase, Pyk2. Keystone symposia on HIV pathogenesis, Banff, Alberta, Canada, May, 2008.

List of publications (in chronological order)

1. Shalini S, Ganesh P, Anand AR. Actinobacillus actinomycetomcomitans septicaemia during pregnancy (Letter) **International Journal of Gynecology and Obstetrics** (1995) 51: 57 - 58. (Impact factor- 1.7; Citations- 3)
2. Shenoy S, Samaga M, Urs S, Anuradha KM, Kurian MM, Augustine A, Anand AR, Prasad A. Intravenous catheter related Candida rugosa fungaemia: Case Report. **Tropical Doctor** (1996) 26: 31. (Impact factor- 0.52; Citations- 5)
3. Patil SA, Gouri-Devi M, Anand AR, Vijaya N, Pratima N, Neelam K, Chandramukhi A. Significance of Mycobacterial Immune Complexes [IgG] in the Diagnosis of Tuberculous Meningitis. **Tubercle and Lung Disease** (1996) 77: 164-167. (Impact factor- 2.5; Citations- 14)
4. Therese KL, Anand AR, Madhavan HN. Spectrum of bacterial and fungal agents isolated from patients with endogenous endophthalmitis. **Indian Journal of Medical Microbiology** (1997) 15: 187-190. (Impact factor- 1.06; Citations- not available)
5. Therese KL, Anand AR, Madhavan HN. Polymerase chain reaction in the diagnosis of bacterial endophthalmitis. **British Journal of Ophthalmology** (1998) 82:1078-1082. (Impact factor- 2.93; Citations- 69)
6. Madhavan HN, Priya K, Anand AR, Therese KL. Detection of Herpes simplex virus (HSV) genome using polymerase chain reaction (PCR) in clinical samples- Comparison of PCR with standard laboratory methods for the detection of HSV. **Journal of Clinical Virology** (1999) 14: 145-151. (Impact factor-4.02; Citations- 46)
7. Madhavan HN, Anand AR, Therese KL. Infectious endophthalmitis (Review article) **Indian Journal of Medical Microbiology** (1999) 17:108-115. (Impact factor-1.06; Citations-not available)
8. Anand AR (Ramaswamy AA), Biswas J, Bhaskar V, Gopal L, Rajagopal R, Madhavan HN. Postoperative Mycobacterium chelonae endophthalmitis after extracapsular cataract extraction and posterior chamber intraocular lens implantation. **Ophthalmology** (2000) 107: 1283-1286. (Impact factor- 5.45; Citations- 25)
9. Gopal L, Anand AR (Ramaswamy AA), Madhavan HN, Saswade M, Battu RR. Postoperative endophthalmitis caused by sequestered Acinetobacter calcoaceticus. **American Journal of Ophthalmology** (2000) 129: 388-390. (Impact factor- 4.22; Citations- 12)
10. Anand AR, Therese KL, Madhavan HN. Spectrum of etiological agents of postoperative endophthalmitis and antibiotic susceptibility of the bacterial isolates. **Indian Journal of Ophthalmology** (2000) 48: 123-128. (Impact factor- 1.01; Citations- 98)
11. Anand AR, Madhavan HN, Therese KL. Use of polymerase chain reaction (PCR) and DNA probe hybridization to determine the Gram reaction of the infecting bacterium in intraocular fluids of patients with endophthalmitis. **Journal of Infection** (2000) 41: 221-226. (Impact factor- 4.12; Citations- 17)
12. Samanta TK, Biswas J, Gopal L, Anand AR, Kumarasamy N, Solomon S. Panophthalmitis due to Rhizopus in an AIDS Patient-A Clinicopathological study. **Indian Journal of Ophthalmology** (2001) 49:49-51. (Impact factor- 1.01; Citations- 2)
13. Pasricha G, Anand AR, Therese KL, Madhavan HN. Use of Polymerase chain reaction (PCR)- Restriction Fragment Length Polymorphism to trace the source of Alcaligenes xylosoxidans containing ocular clinical specimens. **Indian Journal of Applied Microbiology**. (2001) 1: 1 (41-45).(Impact factor & Citations- not available)
14. Anand AR, Madhavan HN, Neelam V, Therese KL. Use of polymerase chain reaction in the diagnosis of fungal endophthalmitis. **Ophthalmology** (2001) 108: 326-330. (Impact factor- 5.45; Citations- 46)
15. Fogla R, Rao SK, Anand AR, Madhavan HN. Insect wing case: unusual foreign body. **Cornea** (2001) 20: 119-121. (Impact factor-1.7; Citations- 8)

16. Anand AR, Madhavan HN, Sudha NV, Therese KL. Polymerase chain reaction in the diagnosis of Aspergillus endophthalmitis. *Indian Journal of Medical Research* (2001) 114:133-40. (Impact factor- 1.83; Citations- 12)
17. Gopal L, Anand AR (Ramaswamy AA), Madhavan HN, Battu RR, Sharma T, Shanmugam MP, Bhende PS, Bhende M, Ratra D, Shetty NS, Rao MK. Endophthalmitis caused by Acinetobacter calcoaceticus. A profile. *Indian Journal of Ophthalmology* (2003) 51(4): 335-40. (Impact factor- 1.01; Citations- 2)
18. Wang JF, Liu ZY, Anand AR, Zhang X, Brown LF, Dezube BJ, Gill P, Ganju RK. Alpha-chemokine-mediated signal transduction in human Kaposi's sarcoma spindle cells. *Biochim Biophys Acta*. (2004) 691(2-3): 129-39.(Impact factor- 4.73; Citations- 7)
19. Kuehne JJ, Yu AL, Holland GN, Anand AR (Ramaswamy A), Taban R, Mondino BJ, Yu F, Rayner SA, Giese MJ. Corneal pharmacokinetics of topically applied azithromycin and clarithromycin. *American Journal of Ophthalmology* (2004) 138(4): 547-53. (Impact factor- 4.22; Citations- 16)
20. Anand AR, Ganju RK. HIV-1 gp120-mediated Apoptosis of T Cells Is Regulated by the Membrane Tyrosine Phosphatase CD45. (2006) *Journal of Biological Chemistry* 281(18): 12289-99. (Impact factor- 4.77; Citations- 14)
21. Lane HC, Anand AR, Ganju RK Cbl and Akt regulate CXCL8-induced and CXCR1- and CXCR2-mediated chemotaxis. *International Immunology* (2006) 18(8):1315-25. (Impact factor- 3.30; Citations- 13)
22. Anand AR, Cucchiari M, Terwilliger EF, Ganju RK. The Tyrosine kinase, Pyk2 mediates LPS-induced IL-8 Expression in Human Endothelial Cells. *Journal of Immunology* (2008) 180(8):5636-44. (Impact factor- 5.78; Citations- 14)
23. Anand AR, Bradley R, Ganju RK. LPS-induced MCP-1 expression in human microvascular endothelial cells is mediated by the tyrosine kinase, Pyk2 via the p38 MAPK/NF-kappaB-dependent pathway. *Molecular Immunology* (2009) 46(5):962-8. (Impact factor- 2.91; Citations- 9)
24. Anand AR, Prasad A, Bradley RR, Deol YS, Nagaraja T, Ren X, Terwilliger EF, Ganju RK. HIV-1 gp120-induced migration of dendritic cells is regulated by a novel kinase cascade involving Pyk2, p38 MAP kinase and LSP1. *Blood* (2009) 114(17):3588-600. (Impact factor- 10.55; Citations- 8)
25. Anand AR, Nagaraja T, and Ganju RK. A novel role for Slit2/Robo1 axis in modulating HIV-1 replication in T-cells. *AIDS* (2011) 13;25(17):2105-11. (Impact factor- 6.24; Citations- none)
26. Nagaraja T, Anand AR (co-first author), Zhao H, and Ganju RK. The adaptor protein SLP-76 regulates HIV-1 release and cell to cell transmission in T-cells. *Journal of Immunology* (2012) 188(6):2769-77. (Impact factor- 5.78; Citations- none)
27. Nagaraja T, Chen L, Balasubramanian A, Groopman JE, Brigstock D, Anand AR (co-corresponding author), Ganju RK. Connective Tissue Growth Factor Mediates Transforming Growth Factor β -Induced Fibrosis in Hepatitis C Virus-Infected Hepatocytes. *PLoS ONE* (2012) 7(10):e46526. Epub 2012 Oct 4.(Impact factor- 4.4; Citations-none)
28. Anand AR, Helong Zhao, Nagaraja T, Robinson LA and Ganju RK. N-terminal Slit2 regulates HIV-1 replication in T-cells by modulating the actin cytoskeleton. *Retrovirology* (2013) 10:2 (7 January 2013). (Impact factor- 6.47; Citations- none).

(*Average impact factor of first author publications during Ph.D. - **3.6**; Average impact factor of first author publications post- Ph.D.- **6.1**; Total citation count- **450**)

Papers presented at National / International Conferences (in chronological order)

1. Anand AR, Therese KL, Madhavan HN. Polymerase chain reaction in the diagnosis of bacterial endophthalmitis. National Congress of Indian Association of Medical Microbiologists, Agra (1996).
2. Anand AR, Therese KL, Madhavan HN. Spectrum of aetiological agents of endogenous endophthalmitis. Indian Eye Research Group (IERG) Annual meeting, Hyderabad (1997).
3. Anand AR, Therese KL, Madhavan HN. Use of polymerase chain reaction in the diagnosis of P. acnes endophthalmitis. Indian Eye Research Group (IERG) Annual meeting, Hyderabad (1997).
4. Anand AR, Therese KL, Madhavan HN. Polymerase chain reaction in the detection of M.tuberculosis in intraocular specimens. National Congress of Indian Association of Medical Microbiologists, Sholapur (1997).
5. Anand AR, Therese KL, Madhavan HN. Role of polymerase chain reaction (PCR) in detection of M. tuberculosis in ocular specimens. Indian Eye Research Group (IERG) Annual meeting, Hyderabad (1998)
6. Anand AR, Priya K, Therese KL, Madhavan HN. Evaluation of polymerase chain reaction (PCR) in the detection of Herpes simplex virus ocular infections. National Congress of Indian Association of Medical Microbiologists, Manipal (1998).
7. Anand AR, Therese KL, Madhavan HN. Spectrum of aetiological agents of postoperative endophthalmitis and antibiotic susceptibilities of the aerobic bacterial isolates. Indian Eye Research Group (IERG) Annual meeting, Hyderabad (1999).
8. Anand AR, Sudha NV, Therese KL, Madhavan HN. Polymerase chain reaction in the diagnosis of Aspergillus endophthalmitis. National Congress of Indian Association of Medical Microbiologists, Belgaum (2000).
9. Anand AR, Sudha NV, Therese KL, Madhavan HN. Diagnostic value of PCR for detection of fungal genome in the intraocular fluids of suspected cases of fungal endophthalmitis. Indian Eye Research Group (IERG) Annual meeting, Hyderabad (2000).
10. Anand AR, RK Ganju. The membrane tyrosine phosphatase CD45 regulates HIV-1 gp120-induced apoptosis. 46th Annual meeting of the American Society of Hematology, San Diego, USA (2003).
11. Lane HC, Anand AR, Fernandis AZ, Ganju RK. Cbl Regulates CXCR4-Mediated Chemotaxis and CXCR4 Receptor Internalization. 47th Annual meeting of the American Society of Hematology, San Diego, California, USA (2004).
12. Anand AR, and Ganju RK. Akt Regulates the Activation-Induced Apoptosis of T Cells Mediated by HIV-1 gp120. 47th Annual meeting of the American Society of Hematology, San Diego, California, USA (2004).
13. Anand AR and Ganju RK. The membrane phosphatase, CD45, modulates HIV-1 envelope-induced apoptosis of T cells via the Akt pathway. Ganju Annual meeting of the American Association of Immunologists, Boston, Massachusetts, USA (2006).
14. Anand AR, Bradley RR, Prasad A, Terwilliger EF, Ganju RK. HIV-1 Macrophage-tropic gp120-induced migration of Dendritic cells is regulated by the tyrosine kinase, Pyk2. Keystone symposia on HIV pathogenesis, Banff, Alberta, Canada (2008).
15. Anand AR, Nagaraja T, Ganju RK. The neuronal repellent Slit2 inhibits HIV-1 replication in T-cells. Keystone symposia on Protection from HIV: Targeted Intervention strategies, Whistler, British Columbia, Canada (2011).
16. Anand AR, Zhao H, Nagaraja T, Ganju RK. The N-terminal Slit2 inhibits HIV infection by regulating the actin cytoskeleton pathway. Cold Spring Harbor Meeting on Retroviruses, USA (2012).