

Rudragouda Channappanvar

Assistant Professor
Veterinary Pathobiology
College of Veterinary Medicine
Oklahoma State University

Contact Information:

Email: rchanna@okstate.edu
Phone: 405-744-7224
Office: NA

Research Interests:

Innate and adaptive immunity, host-pathogen interactions, and molecular virology to examine the mechanistic basis for protective and pathogenic immune responses to highly virulent respiratory virus infections in young and aged hosts.

Education

2008-2012: Philosophy Ph.D., Department of Biology, Laboratory of Immunology and Infectious Diseases, Oakland University, Rochester, Michigan
2005-2007: Veterinary M.V.Sc., Specialization: Veterinary Pathology, Division of Veterinary Pathology, Indian Veterinary Research Institute, Izatnagar, Uttar-Pradesh, India
2000-2005: Veterinary B.S., Veterinary College Bidar, Karnataka Veterinary Animal and Fisheries Sciences University-Bidar, Karnataka, India

Academic Appointments:

2018-Present: Associate Editor, BMC Infectious Diseases
2014-Present: Adhoc Reviewer for Scientific Journals, Journal of Virology, Plos Pathogens, Emerging Infectious Diseases, Microbes and Infection, etc.
2019-2020: Assistant Professor, Virology/Viral Immunology, University of Tennessee Health Science Center
2017-2018: Assistant Research Scientist, Virology/Viral Immunology, University of Iowa
2012-2017: Post-doctoral Scholar, Virology/Viral Immunology, University of Iowa
2012: Undergraduate Instructor
2008-2012: Graduate/Teaching Assistant, Immunobiology, Oakland University
2008-2011: Graduate Teaching Assistant
2010; Pathology Externship, Diagnostic Centre for Population and Animal Health, College of Veterinary Medicine, Michigan State University
2005-2007: Junior Research Fellow: Veterinary Pathology, Indian Veterinary Research Institute
Adhoc Grant Reviewer: American Association for the Advancement of Science, Research Competitiveness Program

Awards and Honors:

2019: Early Career Faculty Travel Grant, American Association of Immunologists Conference, San Diego, CA
2016: Postdoctoral Travel Award, American Society of Virology meeting at Virginia Tech Blacksburg, VA

2016: Trainee abstract award, American Association of Immunologists meeting at Seattle, Washington

2015: Levitt Centre for Virus Pathogenesis travel award to attend Keystone Meeting on, Viral Immunity, Breckenridge, CO

2011: International Students Scholarly Achievement Award for Excellent Academic Achievement, Oakland University.

2011: Provost Grant for Graduate Research from the Oakland University for the proposed work on the 'Role of Substance P in Inflamm-Aging'

2010: Graduate Student Research Travel Grant to attend 97th Annual American Association of Immunologists (AAI) meeting at Baltimore, Maryland.

2010: Best Poster Award at Sigma Xi conference, Oakland University Chapter, Oakland University, Michigan

2007: 'Young Scientist Award' conferred by Indian Association of Veterinary Pathologists (IAVP) for the best MVSc thesis research

2005: Junior Research Fellowship and 8th rank in all India entrance exam conducted by Indian Council of Agricultural Research (ICAR) to study Masters of Veterinary Sciences (MVSc)

Research Support:

- August 2018-May 2021: NIH R21, National Institute of Health/National Institute on Aging (Primary Institute), "Role of Interferon lambda in host protection during aging", PI: Rudra Channappanavar, Awarded: \$381,000 (direct plus indirect cost)
- October 2019: NIH R01, NIH/NIAID, "Detrimental role of TLR7/TRAF6 signalling in the pathogenesis of hCoV infection.", PI: Rudra Channappanavar

Selected Publications:

1. Kun Li, Zhuo Li, Christine Wohlford-Lenane, David K. Meyerholz, Rudragouda Channappanavar, Dong An, Stanley Perlman, Paul B. McCray, Jr., Biao HeSingle-Dose, Intranasal Immunization with Recombinant Parainfluenza Virus 5 Expressing Middle East Respiratory Syndrome Coronavirus (MERS-CoV) Spike Protein Protects Mice from Fatal MERS-CoV Infection. *mBio* (Accepted for publication)
2. Chek Meng Poh, Jian Zheng, Rudragouda Channappanavar, Zi Wei Chang, Oanh Nguyen, Laurent Rénia, Katherine Kedzierska, Stanley Perlman, Leo Poon (2020). Multiplex screening assay for identifying cytotoxic CD8+ T cell epitopes, *Frontiers in Immunology*, section T Cell Biology. 2020 Mar 11;11:400. doi: 10.3389/fimmu.2020.00400. eCollection 2020.
3. Channappanavar R, and Perlman S. (2020) Evaluation of Activation and Inflammatory Activity of Myeloid Cells During Pathogenic Human Coronavirus Infection. In: Vijay R. (eds) MERS Coronavirus. *Methods in Molecular Biology*, vol 2099. Humana, New York, NY.
4. Rudragouda Channappanavar, Anthony R Fehr, Juan E Abrahante, Matthias Mack, Ramakrishna Sompallae, David K Meyerholz, and Stanley Perlman (2018). Relative timing of type I interferon response and virus replication determines disease outcome during MERS-CoV infections. *Journal of Clinical Investigation*. 130: 3635-3639. doi:10.1172/JCI126363.

5. Wenxu Jia# , Rudragouda Channappanavar# , Chao Zhang, Mingxi Li, Haixia Zhou, Shuyuan Zheng, Panpan Zhou, Jiuyang Xu, Sisi Shan, Xuanling Shi, Xinquan Wang, Jincun Zhao, Dongming Zhou, Stanley Perlman, and Linqi Zhang. Single intranasal immunization with chimpanzee adenovirusbased vaccine induces sustained and protective immunity against lethal MERS-CoV infection. *Emerging Microbes and Infections*. 2019;8(1):760-772. doi: 10.1080/22221751. 2019. 1620083 # These authors contributed equally to this work. Curriculum Vitae 4
6. Xiaoyang Hua, Rahul Vijay, Rudragouda Channappanavar, Jeremiah Athmer, David K. Meyerholz, Nitin Pagedar, Stephen Tilley and Stanley Perlman (2018). Nasal priming by a murine coronavirus provides protective immunity against lethal heterologous virus pneumonia. *JCI Insight*. 2018;3(11):e99025. <https://doi.org/10.1172/jci.insight.99025>.
7. Jeremiah Athmer, Anthony Fehr, Matthew Grunewald, Wen Qu, Dortehea Wheeler, Kevin Graepel, Rudragouda Channappanavar, Aimee Sekine, Dana Aldabeeb, Michael Gale, Jr., Mark Denison, and Stanley Perlman (2018) Selective Packaging in Murine Coronavirus Promotes Virulence by Limiting Type-I IFN Responses. *MBio*. 2018 May 1;9(3). pii: e00272-18. doi: 10.1128/mBio.00272-18.
8. Daniel K.W. Chu, Kenrie PY Hui, Ranawaka A.P.M Perera, Eve Miguel, Daniela Niemeyer, Jincun Zhao, Rudragouda Channappanavar, Gytis Dudas, Jamiu O Getnet Demissie, Doreen Muth.....Stanley Perlman, Christian Drosten, Veronique Chevalier, Malik Peiris (2018) MERS coronaviruses from camels in Africa exhibit region-dependent genetic diversity. *Proc Natl Acad Sci U S A*. 2018 Mar 20;115(12):3144-3149. doi: 10.1073/pnas.1718769115.
9. Channappanavar R and Perlman S (2017). Pathogenic human coronavirus infections: Causes and consequences of cytokine storm and immunopathology. *Seminars in Immunopathology*. 39 (5) 529.
10. Channappanavar R, Fett C, Mack M, Ten Eyck PP, Meyerholz DK and Perlman S (2017) Sex-based differences in susceptibility to SARS-CoV infection in a mouse model. *Journal of Immunology*. 198(10): 4046-4053.
11. Li K, Wohlford-Lenane CL, Channappanavar R, Park JE, Bair TB, Flaherty HA, Gallagher T, Meyerholz DK, Perlman S, McCray, Jr PB. (2017) Mouse-adapted MERS coronavirus causes lethal lung disease in hDPP4 receptor knock-in mice. *Proceedings of National Academy of Sciences*. Doi:10.1073/pnas.1619109114
12. Wang Y, Sun J, Channappanavar R, Zhao J, Perlman S* and Zhao J* (2017) Simultaneous intranasal/intravascular antibody labelling of CD4+ T Cells in mouse lungs. *Bio-protocol*. DOI: <https://doi.org/10.21769/BioProtoc.2099>.
13. Fehr AR*, Channappanavar R*, Perlman S (2017). Middle East Respiratory Syndrome: Emergence of a pathogenic human coronavirus. *Annual Reviews Medicine*. 68:387-399. doi: 10.1146/annurevmed-051215-031152. * Equal Contribution
14. Fehr AR, Channappanavar R, Jankevicious G, Fett C, Zhao J, Athmer J, Meyerholz DK, Ahel I and Perlman S (2016). The conserved coronavirus macrodomain promotes virulence and suppresses innate immune response during SARS-CoV infection. *mBio*. 7(6). pii: e01721-16. doi: 10.1128/mBio.01721-16.
15. Zhao J, Zhao J, Mangalam AK, Channappanavar R, Fett C, Meyerholz DK, Agnihothram S, Baric RS, David CS, Stanley Perlman (2016). Airway memory CD4 T cells mediate protective immunity against emerging respiratory Coronaviruses. *Immunity*. 44(6): 1379-91.

16. Luke T, Wu H, Zhao J, Channappanavar R, Coleman CM, Jiao Jin-An, Matsushita H, Liu Ye, Postnikova E, Ork BL, Glenn G, Flyer D, Defang G, Raviprakash K, Kochel T, Wang J, Nie W, Smith G, Hensley L, Olinger G, Kuhn J, Holbrook MR, Johnson R, Perlman S, Sullivan E, Frieman M (2016). MERS-CoV human immunoglobulin produced from transchromosomal bovines inhibits MERS-CoV in vivo. *Science Translational Medicine*. 8(326): 326ra21
17. Channappanavar R, Fehr AR, Vijay R, Mack M, Zhao J, Meyerholz DK and Perlman S (2016). Dysregulated Type I interferon and inflammatory monocyte-macrophage signaling promotes lethal disease in SARS-CoV infected mice. *Cell Host and Microbe*. 18: 181-193. *Curriculum Vitae* 5
18. Zhang N, Channappanavar R, Ma C, Wang L, Tang J, Garron T, Tao X, Tasneem S, Lu L, Tseng CT, Zhou Y, Perlman S, Jiang S, Du L. (2016). Identification of an ideal adjuvant for receptor binding domain-based subunit vaccines against Middle East Respiratory Syndrome Coronavirus. *Cellular and Molecular Immunology*. doi: 10.1038/cmi.2015.03.
19. Channappanavar R, Lu L, Xia S, Du L, Meyerholz DK, Perlman S, Jiang S. (2015) Protective effect of intranasal regimens containing peptidic Middle East respiratory syndrome coronavirus fusion inhibitor against MERS-CoV infection. *Journal of Infectious Diseases*, 212 (12): 1894-903.
20. Fehr AR, Athmer J, Channappanavar R, Phillips JM, Meyerholz DK, Perlman S (2015). The nsp3 macrodomain promotes virulence in mice with coronavirus-induced encephalitis. *Journal of Virology*. 89 (3): 1523-36.
21. Channappanavar R, Fett C, Zhao J, Meyerholz DK and Perlman S. (2014) Virus-specific memory CD8 T cells provide substantial protection from lethal SARS-CoV infection. *Journal of Virology*. 88(19): 11034-44.
22. Trujillo JA, Gras S, Twist KA, Croft NP, Channappanavar R, Rossjohn J, Purcell AW, Perlman S (2014) The cellular redox environment alters antigen presentation. *Journal of Biological Chemistry*; 289 (40): 27979-91.
23. Channappanavar R, Zhao J, Perlman S. (2014) T cell-mediated immune response to respiratory coronaviruses. *Immunologic research*. 59 (1-3): 118-28.
24. Trujillo JA, Gras S, Twist KA, Croft NP, Channappanavar R, Rossjohn J, Purcell AW, Perlman S (2014) Structural and functional correlates of enhanced antiviral immunity generated by heteroclitic CD8 T cell epitopes. *Journal of Immunology* 192:5245-5256.
25. Umeshappa CS, Singh KP, Channappanavar R, Sharma K, Nanjundappa RH, Singh R, Sharma AK, Singh M (2011). Enhanced clinico-pathology, and viral and immune responses following intradermal inoculation of BTV-23 serotype in Indian native sheep. *Veterinary Immunology and Immunopathology*. 15; 141 (3-4): 230-8.
26. Channappanavar R, Singh KP, Singh R and Pandey AB. (2012) Enhanced pro-inflammatory cytokine activity during experimental BTV-1 infection in Indian native sheep. *Veterinary Immunology and Immunopathology*. 15; 145 (1-2): 485-92.
27. Twardy BS, Channappanavar R, Suvas S. (2011) Level of neuropeptide Substance P correlates with the severity of herpetic stromal keratitis. *Investigative Ophthalmology Visual Sciences*. 4; 52 (12): 8604-13.
28. Umeshappa CS, Singh KP, Nanjundappa RH, Channappanavar R, Maan S, Maan NS (2012). Bluetongue virus-23 stimulates inducible nitric oxide synthase expression and

- nitric oxide production in mononuclear cells of blood and/or regional lymphoid organs. *Veterinary Research Communication*. 36(4): 245-50. doi: 10.1007/s11259-012-9538-6.
29. Channappanavar R, Twardy BS, Suvas S. (2012) Blocking of PDL-1 interaction enhances primary and secondary CD8 T cell response to HSV-1 infection. *PLoS One*. 7(7): e39757.
 30. Channappanavar R, Twardy B S, Pratima K and Suvas S. (2009) Advancing age leads to predominance of inhibitory receptor expressing CD4 T cells. Mechanism of ageing and development. 130(10): 709-12. *Curriculum Vitae* 6
 31. Ingale SL, Singh P, Raina OK, Verma AK, Channappanavar R., Mehra UR. (2010) Interleukin-2 and interleukin-10 gene expression in calves experimentally infected with *Fasciola gigantica*. *Livestock Science*. 131 (1): 141-143