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On Deputation To RCB As Executive Director

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PhD (Biochemistry), The Australian National University, Canberra

DIIT (Biochemical Engineering), Indian Institute of Technology

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MSc (Microbiology), G. B. Pant University of Agriculture and

Technology, Pantnagar

Post-doctoral Research : CSIRO Molecular Sciences, Sydney

Visiting Scientist : Pasteur Institute, Paris



Present Research Interest

RNA virus replication and vaccine development

Japanese Encephalitis virus (JEV) is a member of the Flaviviridae family of animal viruses that contains several other medically important viruses such as Dengue and Yellow fever. JEV is a major cause of human encephalitis and is responsible for considerable mortality and morbidity in India. Frequent epidemics of Japanese encephalitis (JE) are being reported from various parts of India and JEV has become endemic in several parts of the country. We are studying the replication of JEV and investigating the role of the cellular proteins in virus replication. We are also examining the potential of small nucleic acid molecules such as siRNA and DNazymes for inhibiting JEV replication.

Our group also focuses on key aspects of the JEV life-cycle like receptor-binding and entry mechanisms, molecular mechanisms of virus replication, assembly and egress. The virus infectious-cycle involves a complex interaction between virus and host proteins. We are employing JEV- recombinant proteins and infectious viruses as exploratory systems in combination with molecular biology, cell biology and proteomic approaches. These studies provide insight into JEV pathogenesis, and have the potential to offer therapeutic interventions.

Our laboratory is also involved in the clinical development an oral rotavirus vaccine for children. Besides, we are interested in developing novel adenoviral vectors useful for vaccine delivery.

Selected Publications

- Sharma D, Priyadarshini P and **Vрати S** (2015) Unraveling the web of viroinformatics: computational tools and databases in viral research. *Journal of Virology* 89 : 1489-501
- Bhullar D, Jalodia R, Kalia M, **Vрати S** (2014) Cytoplasmic translocation of polypyrimidine tract-binding protein and its binding to viral RNA during Japanese encephalitis virus infection inhibits virus replication. *PLoS ONE* 9 (12): e114931.
- Pareek S, Roy S, Kumari B, Jain P, Banerjee A, **Vрати S** (2014) miR-155 induction in microglial cells suppresses Japanese encephalitis virus replication and negatively modulates innate immune responses. *Journal of Neuroinflammation* 11 : 97 doi: 10.1186/1742-2094-11-97
- Sharma M, Bhattacharya S, Nain M, Kaur M, Sood V, Gupta V, Khalsa R, Abidin MZ, **Vрати S**, Kalia M (2014) Japanese encephalitis virus replication is negatively

regulated by autophagy and occurs on LC3-I and EDEM1 containing membranes.

Autophagy 10:1637-51.

- Bhandari N, Rongsen-Chandola T, Bavdekar A, John J, Antony K, Taneja S, Goyal N, Kawade A, Kang G, Rathore SS, Juvekar S, Muliylil J, Arya A, Shaikh H, Abraham V, **Vrati S**, Proschan M, Kohberger R, Thiry G, Glass R, Greenberg HB, Curlin G, Mohan K, Harshavardhan GV, Prasad S, Rao TS, Boslego J, Bhan MK (2014) Efficacy of a monovalent human-bovine (116E) rotavirus vaccine in Indian infants: a randomised, double-blind, placebo-controlled trial. **Lancet** S0140-6736 : 62630-6.
- Appaiahgari MB, Glass R, Singh S, Taneja S, Rongsen-Chandola T, Bhandari N, Mishra S, **Vrati S**. (2014) Transplacental rotavirus IgG interferes with immune response to live oral rotavirus vaccine ORV-116E in Indian infants. **Vaccine** 3; 32(6):651-656.
- Bhattacharyya S, Sen U, **Vrati S**. (2014) Regulated IRE1-dependent decay pathway is activated during Japanese encephalitis virus-induced unfolded protein response and benefits viral replication. **J Gen Virol**. 95:71-79.
- Kalia M, Khasa R, Sharma M, Nain M, **Vrati S**. (2013) Japanese encephalitis virus infects neuronal cells through a clathrin-independent endocytic mechanism. **J Virol** 87(1):148-162.
- Appaiahgari MB, **Vrati S**. (2012) Clinical development of IMOJEV®--a recombinant Japanese encephalitis chimeric vaccine (JE-CV). **Expert Opin Biol Ther**. 12(9):1251-1263.
- Anantpadma, M. and **Vrati, S**. (2012) siRNA mediated suppression of Japanese encephalitis virus replication in cultured cells and mice. **Journal of Antimicrobial Chemotherapy** 67:444-451.
- Vashist, S., Bhullar, D., and **Vrati, S**. (2011) La protein can simultaneously bind to both 3' and 5'-noncoding regions of Japanese encephalitis virus genome. **DNA and Cell Biology**: 30: 339-346
- Appaiahgari M.B., and **Vrati, S**. (2010) IMOJEV® : a Yellow Fever virus-based novel Japanese encephalitis vaccine. **Expert Review of Vaccines** 9: 1371-1384.
- Anantpadma, M., Stein, D.A., **Vrati, S**. (2010) Inhibition of Japanese encephalitis virus replication in cultured cells and mice by a peptide-conjugated morpholino oligomer. **Journal of Antimicrobial Chemotherapy** 65: 953-961.
- Bhandari, N., Sharma, P., Taneja, S., Kumar, T., Rongsen-Chandola, T., Appaiahgari, M.B., Mishra, A., Singh, S., **Vrati, S**.; Rotavirus Vaccine Development Group (2009) A Dose-Escalation Safety and Immunogenicity Study of Live Attenuated Oral Rotavirus Vaccine 116E in Infants: A Randomized, Double-Blind, Placebo-Controlled Trial. **Journal of Infectious Diseases** 200: 421-429.
- Vashist, S., Anantpadma, M., Sharma, H., **Vrati S**. (2009) La protein binds the predicted loop structures in the 3' non-coding region of Japanese encephalitis virus genome: role in virus replication. **Journal of General Virology** 90: 1343-52.
- Bharati, K., Rani, R. and **Vrati, S**. (2009) Evaluation of Japanese encephalitis virus DNA vaccine candidates in rhesus monkeys [*Macaca mulatta*]. **Vaccine** 27: 10-16.
- Appaiahgari, M.B. and **Vrati, S**. (2007) DNzyme-mediated inhibition of Japanese encephalitis virus replication in mouse brain. **Molecular Therapy** 15: 1593-99.
- Appaiahgari, M.B., Saini, M., Rauthan, M., Jyoti, **Vrati, S**. (2006) Immunization with recombinant adenovirus synthesizing the secretory form of Japanese encephalitis virus envelope protein protects adenovirus-exposed mice against lethal encephalitis. **Microbes & Infection** 8: 92-104.
- Appaiahgari, M.B. and **Vrati, S**. (2004) Immunogenicity and protective efficacy in mice of a formaldehyde-inactivated Indian strain of Japanese encephalitis virus grown in Vero cells. **Vaccine** 22: 3669-3675.

- Saini, M. and **Vrati, S.** (2003) A Japanese encephalitis virus peptide present on Johnson grass mosaic virus-like particles induces virus-neutralizing antibodies and protects mice against lethal challenge. *Journal of Virology* 77: 3487- 3494.
- Kaur R., Sachdeva, G. and **Vrati, S.** (2002) Plasmid DNA immunization against Japanese encephalitis virus : Immunogenicity of membrane-anchored and secretory envelope protein. *Journal of Infectious Diseases* 185: 1-12.
- Ta, M. and **Vrati, S.** (2000) Mov34 protein from mouse brain interacts with the 3' noncoding region of Japanese Encephalitis virus. *Journal of Virology* 74: 5108-5115.
- **Vrati, S.**, Giri R.K., Razdan, A., and Malik, P. (1999) Complete nucleotide sequence of an Indian strain of Japanese Encephalitis virus : sequence comparison with other strains and phylogenetic analysis. *American Journal of Tropical Medicine and Hygiene* 61: 677-680.
- **Vrati, S.**, Agarwal, V., Malik, P., Wani, S. A. and Saini, M. (1999) Molecular characterization of an Indian isolate of Japanese Encephalitis virus that shows an extended lag phase during growth. *Journal of General Virology* 80: 1665-1671.

Selected Patents

- Patent No. 686844; DNA encoding ovine adenovirus (OAV287) and its use as a viral vector; Australian Patent
- Patent No. 289785; DNA encoding ovine adenovirus (OAV287) and its use as a viral vector; New Zealand Patent
- Patent No. 243547; Recombinant vaccine against Japanese encephalitis virus (JEV) infection and a method thereof; Indian Patent
- Patent No. 2004312444; Recombinant vaccine against Japanese encephalitis virus (JEV) infection and a method thereof; Australian Patent
- Patent No. 2005315141; DNAzymes for inhibition of Japanese encephalitis virus; Australian Patent
- Patent No. 7037712; DNA encoding ovine adenovirus (OAV287) and its use as a viral vector; US Patent
- Patent No. EP1708746; Recombinant vaccine against Japanese encephalitis virus (JEV) infection and a method thereof; European Patent
- Patent No. 123824; Recombinant vaccine against Japanese encephalitis virus (JEV) infection and a method thereof; Singapore Patent
- Patent No. 133150; DNAzymes for inhibition of Japanese encephalitis virus; Singapore Patent
- 2010 Australian Alumni Excellence Award, Australian High Commission, India
- 2009 Tata Innovation Fellowship, DBT, Govt. of India
- 2006 NASI-Reliance Industries Platinum Jubilee Award, NASI, Allahabad
- 2005 Alembic Award, Association of Microbiologists of India
- 2005 Professor K P Bhargava Memorial Medal, INSA, New Delhi
- 2004 FNASc (Fellow of the National Academy of Sciences, India)
- 2003 FASc (Fellow of the Indian Academy of Sciences)
- 2003 National Bioscience Award, DBT, Govt. of India
- 2003 Elected Member, Guha Research Conference
- 2003 Dr. J. B. Srivastava Oration award, ICMR, New Delhi
- 2001 Vasvik Industrial Research Award, Vividhlaxi Audhyogik Samshodhan Vikas Kendra, Mumbai