

BIOGRAPHICAL SKETCH

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NAME Verma, Saguna		POSITION TITLE Associate Professor, Department of Tropical Medicine, Medical Microbiology and Pharmacology		
eRA COMMONS USER NAME SAGUNAVERMA				
EDUCATION/TRAINING (<i>Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.</i>)				
INSTITUTION AND LOCATION		DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Devi Ahilya University, Indore, India		B.S.	1985	Zoology, Chemistry,
Devi Ahilya University, Indore, India		M.S.	1987	Biochemistry
Devi Ahilya University, Indore, India		Ph.D.	1989-93	Life Sciences

A. Personal Statement

I am a formally trained virologist and immunologist with expertise in the studies of RNA virus/host interactions and innate immunity. The *long-term research goal* of my lab is to understand the pathways that govern virus-host innate immune interactions, to ultimately design therapeutic interventions and/or adjunct therapies to improve disease pathology. We have been primarily working with an important mosquito-borne pathogen in the US, West Nile virus (WNV), belonging to Flaviviridae family that causes severe encephalitis in humans. However, we have recently begun to study dengue virus, which belongs to the same virus family, as well as members of another globally important virus family, Filoviridae (Ebola, Marburg). My research uses both, in vitro and in vivo mouse models to delineate various innate immune signaling pathways that contribute to inflammation and neuronal death in flavivirus infections. The three ongoing projects in my lab are- first, disruption of the blood-brain barrier and its consequence with respect to the neuroinflammation and entry of WNV in the mice brain; second, to understand the role of novel pathogen recognition receptors NLRP3/ASC and NLRC5 in modulating protective antiviral immunity to WNV; and third, to characterize epigenetic modulation as immune evasion strategy in WNV and dengue virus.

In addition to strengthening my research program, I also believe in the potential of expanding collaborative network. My lab has established successful collaborations leading to co-authored publications and/or grant submissions with other faculties within the department and researchers at other national and international institutes including University of Washington, Mount Sinai School of Medicine NY, University of Florida, University of Calgary at Canada and University of Nancy at France. To be in line with the current strategy/focus of NIH, i.e., 'Foster partnership with private pharmaceutical and drug companies', my lab has recently developed successful collaboration with Novartis Institute for Tropical Diseases Ltd, Singapore, which involves testing the efficacy of antiviral for WNV in mice model.

In addition, I am also actively involved in teaching (medical school and graduate students), mentoring and training undergraduate and graduate students.

B. Positions and Honors

Positions and Employment:

1989-1991	CSIR-NET Junior Research Fellow, School of Life Sciences, Indore, India
1992-1993	CSIR-NET Senior Research Fellow, School of Life Sciences, Indore, India
1994-1999	Project Scientist, Genes and Proteins Laboratory, National Institute of Immunology, New Delhi, India
2000-2002	Break in career as was fully occupied in raising two kids in the US
2003-2005	Junior Researcher, Retrovirology Research Laboratory, Department Tropical Medicine and Medical Microbiology, John A. Burns School of Medicine, University of Hawaii at Manoa, Honolulu, Hawaii

- 2005-2010 Assistant Researcher, Department Tropical Medicine, Medical Microbiology and Pharmacology, John A. Burns School of Medicine (JABSOM), University of Hawaii at Manoa (UHM), Honolulu, Hawaii
- 2010-2014 Assistant Professor (tenure-track), Department Tropical Medicine, Medical Microbiology and Pharmacology, JABSOM, UHM, Honolulu, Hawaii
- 2014-present Associate Professor (tenure-track), Department Tropical Medicine, Medical Microbiology and Pharmacology, JABSOM, UHM, Honolulu, Hawaii

Awards and Fellowships:

- 1985 Recipient of Merit Scholarship in B.Sc. by the Devi Ahilya University, Indore, India
- 1989-1993 Recipient of the University Grants Commission-Council of Science and Industrial Research (UGC-CSIR) and Lecturer Eligibility Fellowship, India
- 1992 Recipient of the Madhya Pradesh Council of Science and Technology, India (MPCST) YOUNG SCIENTIST, Merit certificate in 7th Young Scientist conference organized by Council of Science and Technology, India
- 1992 Travel Award from CSIR, India, to attend the annual meeting of the Federation of American Societies for Experimental Biology, Anaheim, CA
- 2004 Travel Award from the Retrovirology and Opportunistic Infections Society to attend 01Eleventh Conference on Retroviruses and Opportunistic Infections, San Francisco, CA
- 2005 Hawaii State-Biomedical Research Infrastructure Network (BRIN) Travel Award to attend the Eighth International Symposium on Kawasaki Disease, San Diego, CA

Society Memberships:

- American Society of Microbiology
 American Society of Virology
 American Associated of Immunologists

Professional services:

- 2008-2013 Member of the Scientific Advisory Committee of "Hawaii Community Foundation"
- 2010-2013 Member of medical student selection committee of the JABSOM
- 2010-present Member of the reviewer board of the *Journal of Pediatric Biochemistry*
- 2010-present Reviewed several manuscripts for journals such as 'Journal of Virology', 'Journal of General Virology', 'Plos One', 'Virology' and 'Journal of Neuroinflammation'.
- 2010-present Member of the department's graduate student selection and curriculum development committee
- 2012-present Voting member of the University of Hawaii's Institutional Animal Care and Use Committee
- 2013-present Editorial Board Member of the journal *Clinical Microbiology and Austin Virology and Retro Virology*

C. Peer-Reviewed Publications

- Verma S**, Kumar GP, Laloraya M, Singh A, Nivsarkar M, Bharti S. Discovery of a novel and alternate hydrogen peroxide generating machinery in mammalian thyroid gland that modulates iodination of tyrosine. *Biochemical and Biophysical Research Communications* 1990;169:1-7.
- Pradeep KG, Seerwani N, Laloraya M, Nivsarkar M, **Verma S**, Singh A. Superoxide dismutase as a regulatory switch in mammalian testicular steroidogenesis. *Biochemical and Biophysical Research Communications* 1990;173:302-308.
- Verma S**, Kumar GP, Laloraya M, Singh A. Activation of iodine into a free radical intermediate by superoxide: A physiologically significant step in the iodination of tyrosine. *Biochemical and Biophysical Research Communications* 1990;170:1026-1034.
- Kumar GP, Tillo N, Laloraya M, **Verma S**, Singh A. Superoxide radical induces lipid phase transitions that mimics temperature induced phase transition phenomenon of membrane lipids. *Biochemical and Biophysical Research Communications* 1990;172:601-606.
- Verma S**, Kumar GP, Laloraya M, Nivsarkar M, Singh A. Superoxide dismutase activation in thyroid and suppression in adrenal: Novel pituitary regulatory routes. *FEBS Letters* 1991, 282:310-312.

6. Singh A, Kumar GP, Laloraya M, **Verma S**, Nivsarkar M. Superoxide dismutase activity regulation by spermine: a new dimension in spermine biochemistry and sperm development. *Biochemical and Biophysical Research Communications* 1991;177:420-426.
7. Mahopatra B, **Verma S**, Shankar S, Suri A. Molecular cloning of human testis mRNA specifically expressed in haploid germ cells, having structural homology with the A-kinase Anchoring proteins. *Biochemical and Biophysical Research Communications* 1998;244:540-545.
8. **Verma S**, Mohapatra B, Jagadish N, Selvi R, Roy P, Rana R, Lakshmi K, Suri A. Molecular cloning, expression of testicular transcript abundant in germ cells and immunobiological effects of the recombinant protein. *American Journal of Reproductive Immunology* 2004;52:164-173.
9. Shankar S, Mohapatra B, **Verma S**, Selvi R, Jagadish N, Suri A. Isolation and characterization of a haploid germ cell specific sperm associated antigen 9 (SPAG9) from the baboon. *Molecular Reproduction Development* 2004;69:186-193.
10. Chapagain ML, Nguyen T, Bui T, **Verma S**, Nerurkar VR. Comparison of real-time PCR and hemagglutination assay for quantitation of human polyomavirus JC. *Virology Journal* 2006;3:3.
11. **Verma S**, Ziegler K, Ananthula P, Co J, Frisque RJ, Yanagihara R, Nerurkar VR. Altered patterns of cellular gene expression in primary human glial cells transfected with JC virus: Stat-1 and IFN-responsive genes as major targets. *Virology* 2006;345:457-467.
12. Chapagain M, **Verma S**, Mercier F, Yanagihara R, Nerurkar VR. Human polyomavirus JC infects brain microvascular endothelial cells independent of serotonin receptor 2A. *Virology* 2007;364:55-63.
13. Co J, **Verma S**, Gurjav U, Sumibicay L, Nerurkar VR. Interferon- α and $-\beta$ restrict human polyomavirus JC replication in human fetal glial cells: Implication for PML therapy. *Journal Infectious Disease* 2007;196:712-718.
14. **Verma S**, Molina Y, Lo YY, Nakano C, Cropp B, Yanagihara R, Nerurkar VR. Effects of selenium deficiency on West Nile virus replication in an in vitro selenium-deficient model. *Virology Journal* 2008;5:66.
15. **Verma S**, Lo YY, Chapagain M, Gurjav U, Lum S, Kumar M, Lo H, Nakatsuka A, Nerurkar VR. Modulation of human brain microvascular endothelial cells tight junction proteins and cell adhesion molecules by WNV infection: Transmigration across the *in vitro* blood-brain barrier. *Virology* 2009;385:425-433.
16. **Verma S**, Kumar M, Gurjav U, Lum S, Nerurkar VR. Reversal of West Nile virus-induced blood-brain barrier disruption and tight junction proteins degradation by matrix metalloproteinases inhibitor. *Virology* 2010;397:130-138.
17. Kumar M, **Verma S**, Nerurkar VR. Role of pro-inflammatory cytokines released from West Nile virus-infected neurons in mediating neuroinflammation and neuronal death. *Journal of Neuroinflammation* 2010;7:73.
18. **Verma S**, Kumar M, Nerurkar VR. Cyclooxygenase-2 inhibitor blocks the production of West Nile virus-induced neuroinflammatory markers in astrocytes. *Journal of General Virology* 2011;92:507-515.
19. **Verma S**, Hoffmann FW, Kumar M, Huang Z, Roe K, Nguyen-Wu E, Hashimoto AS, Hoffmann PR. Selenoprotein K knockout mice exhibit deficient calcium flux in immune cells and impaired immune responses. *Journal of Immunology* 2011;186:2127-37.
20. Roe K, Kumar M, Lum S, Orillo B, Nerurkar VR and **Verma S**. West Nile virus-induced disruption of the blood-brain barrier in mice is characterized by the degradation of the junctional complex proteins and increase in multiple matrix metalloproteinases. *Journal of General Virology*, 2012; 93:1193-203.
21. Kumar M, Roe K, Nerurkar PV, Namekar M, Orillo B, **Verma S**, and Nerurkar VR. Impaired virus clearance, compromised immune response and increased mortality in type 2 diabetic mice infected with West Nile virus. *Plos One*, 2012;7:e44682. Epub 2012 Aug 31.
22. Kumar M, Roe K, Orillo B, Muruve DA, Nerurkar VR, Gale Jr. M and **Verma S**. Inflammasome adaptor protein apoptosis-associated speck-like protein containing CARD (ASC) is critical for the immune response and survival in West Nile virus encephalitis. *Journal of Virology*, 2013; 87:3655.
23. Kumar M, Roe K, Nerurkar PV, Orillo B, Thompson KS, **Verma S**, and Nerurkar VR. Reduced immune cell infiltration and increased neuroinflammation in type 2 diabetic mice infected with West Nile virus. *Journal of Neuroinflammation*, 2014 Apr 21, 11:80.
24. Roe K, Orillo B, Lum S and **Verma S**. West Nile virus-induced cell adhesion molecules on human brain microvascular endothelial cells regulate leukocyte adhesion and modulate permeability of the *in vitro* BBB model. *Plos One*, 2014 (in press).

D. Ongoing Research Support

Pacific Center for Emerging Infectious Disease Research

08/01/10-07/30/15

NIH - COBRE (Yanagihara)

Project 2: Molecular mechanisms of West Nile virus neuroinvasion (Verma)

The major goals of this project are to analyze matrix metalloproteinase and urokinase plasminogen activator signaling pathway in blood-brain barrier disruption after West Nile virus infection using both, in vitro and in vivo models.

Role: Principal Investigator

NIH - R01AI089999-01 (Hoffman)

08/01/10-07/30/15

Selenoprotein K modulates calcium-dependent signaling in immune cells

The major goals of this project are to determine selenoprotein K (SelK) dependent immune responses and use WNV infection model to characterize role of SelK in disease pathogenesis.

Role: Collaborator

RTRN- RCMI

07/01/13-06/30/14

Epigenetic regulation of innate immune responses to flaviviruses

The goal of this project is to understand the role of epigenetic modulation, specifically histone deacetylases in regulating production of WNV-induced inflammatory cytokines.

Role: Principal Investigator

Hawaii Community Foundation

07/01/14-12/30/15

Role of NLR Family protein NLRC5 in flavivirus pathogenesis

Goal: To understand the role of immune molecule NLRC5 in regulating production of Type I IFN

Role: Principal Investigator