

BIOGRAPHICAL SKETCH

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NAME Verma, Saguna	POSITION TITLE Assistant Professor, Department of Tropical Medicine, Medical Microbiology and Pharmacology		
eRA COMMONS USER NAME SAGUNAVARMA			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Devi Ahilya University, Indore, India	B.S.	1985	Zoology, Chemistry,
Devi Ahilya University, Indore, India	M.S.	1988	Biochemistry
Devi Ahilya University, Indore, India	Ph.D.	1994	Life Sciences

A. Personal Statement

Dr. Verma is a formally trained virologist and immunologist with expertise in the studies of RNA virus/host interactions and innate immunity. She uses both, in vitro and in vivo mouse models to delineate various signaling pathways that contribute to inflammation in flavivirus infections. The goal of this project is to analyze mechanisms associated with disruption of the blood-brain barrier and its consequence with respect to the entry of West Nile virus in the mice brain.

B. Positions and Honors

Positions and Employment:

1989-1991	Junior Research Fellow, School of Life Sciences, Indore, India
1992-1993	Senior Research Fellow, School of Life Sciences, Indore, India
1994-1999	Project Scientist, Genes and Proteins Laboratory, National Institute of Immunology, New Delhi, India
2000-2001	Guest Lecturer, Vaid's Institute, New Delhi, India
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, University of Hawaii at Manoa, Honolulu, Hawaii
2010-present	Assistant Professor, Department Tropical Medicine, Medical Microbiology and Pharmacology, John A. Burns School of Medicine, University of Hawaii at Manoa, 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 7 th 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 the Eleventh 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

C. Peer-Reviewed Publications

Publications in peer reviewed journals

1. **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. *Biochem Biophys Research Communication* 1990;169:1-7.
2. Pradeep KG, Seerwani N, Laloraya M, Nivsarkar M, **Verma S**, Singh A. Superoxide dismutase as a regulatory switch in mammalian testicular steroidogenesis. *Biochem Biophys Research Communication* 1990;173:302-308.
3. **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. *Biochem Biophys Research Communication* 1990;170:1026-1034.
4. 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. *Biochem Biophys Research Communication* 1990;172:601-606.
5. **Verma S**, Kumar GP, Laloraya M, Nivsarkar M, Singh A. Superoxide dismutase activation in thyroid and suppression in adrenal: Novel pituitary regulatory routes. *FEBS Lett* 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. *Biochem Biophys Research Communication* 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. *Biochem Biophys Research Communication* 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 Reproductive Immunology* 2004;52:164-73.
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 J* 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 Y.Y, Nakano C, Cropp B, Yanagihara R and 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 Y.Y, Chapagain M, Gurjav U, Lum S, Kumar M, Lo H, Nakatsuka A and 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 and 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**, and 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 and Nerurkar VR. Cyclooxygenase-2 inhibitor blocks the production of West Nile virus-induced neuroinflammatory markers in astrocytes. *Journal General Virology* 2011;92(3):507-15.
19. **Verma S**, Hoffmann FW, Kumar M, Huang Z, Roe K, Nguyen-Wu E, Hashimoto AS, and Hoffmann PR. Selenoprotein K knockout mice exhibit deficient calcium flux in immune cells and impaired immune responses. *Journal of Immunology*, January 10, 2011, doi:10.4049/jimmunol

Abstracts presented in conferences: out of total 35

1. Gurjav U*, **Verma S**, Sumibcay L, and Nerurkar VR. Production of dsRNA by human Polyomavirus JC and its role in induction of host defense response. 11th RCMI International Symposium, Honolulu, December 4-7, 2008.
2. Kumar M, **Verma S**, Lo Y.Y, Chapagain M, Gurjav U, Lum S, Lo H, Tanaka A and Nerurkar VR. West Nile virus infection modulates human brain microvascular endothelial cell tight junction proteins and endothelial activation markers. 11th RCMI International Symposium, Honolulu, December 4-7, 2008.
3. **Verma S**, Kumar M, Gurjav U, Lum S and Nerurkar VR. Role of West Nile virus (WNV)-induced matrix metalloproteinases in disruption of the blood-brain barrier. 11th RCMI International Symposium, Honolulu, December 4-7, 2008.
4. **Verma S**, Kumar M, Gurjav U, Lum S and Nerurkar VR. WNV-induced matrix metalloproteinases mediates the degradation of tight junction proteins: Role in the BBB disruption. Annual Meeting of American Society of Virology, Vancouver, July 16-20, 2009.
5. Kumar M, **Verma S** and Nerurkar VR. WNV-induced cyclooxygenase-2 in astrocytes is a critical modulator of inflammation. Annual Meeting of American Society of Virology, Vancouver, July 16-20, 2009.
6. **Verma S**, Kumar M, and Nerurkar VR. WNV-induced cyclooxygenase-2 in astrocytes is a critical modulator of inflammation. Keynote symposium on Cell Biology of Virus Entry, February 16 - 21, 2010, Taos, New Mexico, US.
7. **Verma S**, Kumar M, and Nerurkar VR. Cyclooxygenase-2 inhibitor blocks the production of WNV-induced neuroinflammatory markers in astrocytes. JABSOM BioMed Symposia, April 13, 2010, Honolulu, HI.
8. Kumar M, **Verma S**, and Nerurkar VR. Role of pro-inflammatory cytokines released from WNV-infected neurons in mediating neuroinflammation and neuronal death. JABSOM BioMed Symposia, April 13, 2010, Honolulu, HI.
9. Roe K, Kumar M, Nerurkar VR and **Verma S**. WNV infection alters the expression of tight junction proteins in the mice brain. JABSOM BioMed Symposia, April 13, 2010, Honolulu, HI.
10. Kumar M, **Verma S**, and Nerurkar VR. Role of pro-inflammatory cytokines released from West Nile virus-infected neurons in mediating neuroinflammation and neuronal death. *ASV 29th annual Conference*, Bozeman, Montana, July 17-21, 2010.
11. **Verma S**, Kumar M and Nerurkar VR. Cyclooxygenase-2 inhibitor blocks the production of West Nile virus (WNV)-induced neuroinflammatory markers in astrocytes. 10th International Society of Neurovirology Symposia, Milan, October 12-16, 2010.
12. Kumar M, **Verma S**, and Nerurkar VR. Pro-inflammatory cytokines derived from West Nile virus-infected neurons mediates neuroinflammation and neuronal death. Society for Neuroscience 40th annual meeting, San Diego, November 13-17, 2010.
13. Kelesy R, Kumar M, Nerurkar VR and **Verma S**. In vivo West Nile virus-induced disruption of the blood-brain barrier is characterized by the disruption of tight junction proteins and increase in matrix metalloproteinases. Society for Neuroscience 40th annual meeting, San Diego, November 13-17, 2010.
14. Kumar M, **Verma S**, and Nerurkar VR. Pro-inflammatory cytokines mediate WNV-induced neuroinflammation. 12th RCMI International Symposium on Health Disparities, December 6-9, 2010.
15. **Verma S**, Kumar M, Roe K and Nerurkar VR. WNV alters junctional complexes of the blood-brain barrier. 12th RCMI International Symposium, Tennessee, December 6-9, 2010.
16. Nerurkar VR, Kumar M and **Verma S**. WNV-induced cyclooxygenase-2 promotes inflammation in astrocytes. 12th RCMI International Symposium, Tennessee, December 6-9, 2010.
17. Chapagain ML, Lazaga NB, Kumar M, Volper E, Cropp BS, **Verma S** and Nerurkar VR. Minocycline protects against WNV-associated encephalitis in mice. 12th RCMI International Symposium, Tennessee, December 6-9, 2010.

D. Research Support (Since 2008)

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

Completed Research Support

20050405 (Verma) 07/01/05-04/30/08

Hawaii Community Foundation

Oxidative Stress and its Implications in the Pathogenesis of West Nile Virus Infection

The goal of this project was to delineate the pathophysiological mechanisms underlying oxidative stress-induced disease pathogenesis.

Role: Principal Investigator

20050001 (Verma) 03/01/08-10/30/09

Hawaii Community Foundation

Role of Human Brain Microvascular Endothelial Cells in West Nile Virus Central Nervous System Invasion

The major goals of this project are to determine and delineate the mechanism(s) of infection and injury induced by West Nile virus to human brain microvascular endothelial cells, disruption of the blood-brain barrier and the trafficking of cell-free WNV into the CNS.

Role: Principal Investigator

Clinical and Translational Science Bridging Fund (RCMI) (Verma) 09/01/09-08/30/10

Cyclooxygenase 2 and glial cells – Role in WNVE-associated neuroinflammation

The major goal of this project is to determine the role of WNV-induced COX-2 in triggering pro-inflammatory cytokines and MMPs in the brain glial cells

Role: Principal Investigator