APPLICANT BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
SINGH APPU K.	Post-doctoral scientist

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
University of Delhi, India	B.Sc.	06/05	Zoology (Hons.)
Indian Institute of Technology, Roorkee, India	M.Sc.	07/08	Biotechnology
Institute of Microbial Technology, CSIR, India	Ph.D.	02/14	Structural Biology and Thermodynamics Structural
Columbia University, New York, NY	Postdoctoral	02/14	Biology, Biochemistry, Biophysics

A. Personal Statement

The dream goal of my research interest is to develop and combine the knowledge of inextricably linked crystallography and Cryo-EM to facilitate the structure determination of biological molecular membrane protein and assign them with native compositional variation in working architecture. I firmly believe that Cryo-EM and Crystallography can be studied together to get insight into understanding of mechanistic insight on how diverse molecular interactions guide the intricate dynamic process of selectivity and permeation through the mammalian ion channels.

The post-doctoral work involves structure elucidation of the Transient receptor potential (TRP) channels that constitute a large and functionally diverse family of cation conducting channel proteins, which are considered as polymodal cell sensors, implicated in many physiological functions ranging from pure sensory functions such as nociception, taste transduction, thermal sensation, touch, vision, over motor functions such as muscle contraction, vaso-motor control, to homeostatic functions such as Ca2+ and Mg2+ reabsorption and osmoregulation. The malfunctioning of the members of this intriguing ion channel family are highlighted in wide range of pathophysiological and therapeutic conditions. We have solved the first crystal structure of TRPV6 and establish the foundation for the calcium permeation. This work has been published in Nature article, where I am being the co-first author on the paper. In addition, I am lucky enough to have opportunity to work on the AMPA receptor in Sobolevksy's lab. This part of my work elucidates the structural bases of AMPA receptor noncompetitive inhibition by antiepileptic drugs. AMPA-subtype ionotropic glutamate receptors (iGluRs), which mediate the majority of excitatory neurotransmission, and consequently their malfunction is involved in devastating disease such as epileptogenesis and stroke and ischemia. Therefore, dissecting out the molecular mechanisms of their regulation would help in the design of safer and more effective drugs. In this context we have discovered the novel binding site for the noncompetitive inhibitor binding on AMPA receptor that provides important template for finding new therapies to fight epilepsy and other excitatory neurotransmission-related diseases.

During my doctoral studies, I have gained practical working experience of structural (MR, S-SAD, SAD) , Biophysical (ITC, BioCore, Analytical ultra-centrifuge, Fluorescence spectroscopy) expertise to dissect out the mechanism of Protein-DNA, Protein-Ligand, Protein-Peptide interaction and role of ligand binding on the assembly state of protein Fad35R. I have solved the first structure of Fad35R, a TetR type transcription regulator by SAD phasing to 3.4Å (PDB ID: 4G12), which reveal for the first, time formation of alternative dimer through N-terminal DNA binding domain and its role in oligomerization. Beside this, i am lucky enough to get the rare crystallographic snapshot of structural view of strerio-chemical feature of Dug1p di-peptidase (PDB ID: 4G1P) active site in complex with the cleaved product bound di-peptide. My work on cysteine synthase complex(CSC), with a series of structural snapshot of enzyme-inhibitor (PDB ID: 4LI3), enzyme-substrate (PDB ID: 4MII) in pre-reactive form, enzyme-reaction intermediate form (PDB ID: 4LHG), ternary enzyme-inhibitor-substrate(PDB ID: 4MIL) and tetra-nary enzyme-substrate-inhibitor-reaction-intermediate (PDB ID:4MII) reveals a novel mechanism of competitive inhibition between inhibitor and substrate for a same active site in CysK.

B. Positions and Honors

Positions and Employment

2002-2005	Bachelor of Science (Zoology Hons.), University of Delhi, India
2006-2008	Master of Science, Biotechnology, Indian Institute of Technology, Roorkee, India
2009-2014	Doctoral Research Fellow, Protein Science and Engineering Dept. Institute of Microbial Technology, CSIR, India
2014-present	Post-doctoral Research Fellow, Dept of Biochemistry and Molecular Biophysics, Columbia University, New York, NY.

Honors

2009	Awarded Junior Research fellowship and Senior Research Fellowship from February. 2009-2014 by Council for Scientific and Industrial Research (CSIR), Govt. of India.
2009	Qualified CSIR NET JRF (National Eligibility Test for Lectureship/Junior research fellowship), conducted jointly by the Council of Scientific and Industrial Research (CSIR) and University Grants Commission (UGC), India.
2008	Qualified GATE in February 2008 conducted by IITs (Indian institute of technology) and IISc (Indian institute of science) Bangalore .Fellowship awarded during the Master's program In Biotechnology from IITR from 2006-2008.
2008	Qualified JNU-Ph.D-SBT (School of Biotechnology) Fellowship for Junior Research Fellowship
2008	Qualified JNU-Ph.D-SLS (School of Life Sciences) Fellowship for Junior Research Fellowship
2006	Qualified National Scholarship of Joint Admission Test to M.Sc (JAM) for admission to M.Sc

C. Peer-reviewed Publications

1. **Singh, A. K***., McGoldrick, L. L*., Twomey, E. C., and Sobolevsky, A. I. (2018) Structure and gating mechanism of the transient receptor potential channel TRPV3." ***Nature Structural & Molecular Biology***. (Featured as NSMB cover Page, and F1000 article)
2. **Singh, A. K***., McGoldrick, L. L*., and Sobolevsky, A. I. (2018) Mechanism of calmodulin inactivation of the calcium selective TRP channel TRPV6." ***Science Advances*** **4**(8).
3. **Singh, A. K***., Saotome, K*., McGoldrick, L. L., and Sobolevsky, A. I. (2018) Structural bases of TRP channel TRPV6 allosteric modulation by 2-APB. ***Nat Commun*** **9**, 2465

4. **Singh, A. K.**, McGoldrick, L. L., Saotome, K., and Sobolevsky, A. I. (2018) X-ray crystallography of TRP channels. ***Channels (Austin)*** **12**, 137-152
5. McGoldrick, L. L*., **Singh, A. K***., Saotome, K., Yelshanskaya, M. V., Twomey, E. C., Grassucci, R. A., and Sobolevsky, A. I. (2018) Opening of the human epithelial calcium channel TRPV6. ***Nature*** **553**, 233-237
6. **Singh, A. K***., Saotome, K*., and Sobolevsky, A. I. (2017) Swapping of transmembrane domains in the epithelial calcium channel TRPV6. ***Sci Rep*** **7**, 10669
7. **Singh, A. K***., Ekka, M. K*., Kaushik, A*., Pandya, V., Singh, R. P., Banerjee, S., Mittal, M., Singh, V., and Kumaran, S. (2017) Substrate-Induced Facilitated Dissociation of the Competitive Inhibitor from the Active Site of O-Acetyl Serine Sulfhydrylase Reveals a Competitive-Allostery Mechanism. ***Biochemistry*** **56**, 5011-5025
8. Saotome, K., **Singh, A. K.**, and Sobolevsky, A. I. (2017) Determining the Crystal Structure of TRPV6. in ***Calcium Entry Channels in Non-Excitable Cells*****,** CRC Press. pp 275-292
9. Mittal, M., **Singh, A. K.**, and Kumaran, S. (2017) Structural and biochemical characterization of ligand recognition by CysB, the master regulator of sulfate metabolism. ***Biochimie*** **142**, 112-124
10. Yelshanskaya, M. V., **Singh, A. K.**, Sampson, J. M., Narangoda, C., Kurnikova, M., and Sobolevsky, A. I. (2016) Structural Bases of Noncompetitive Inhibition of AMPA-Subtype Ionotropic Glutamate Receptors by Antiepileptic Drugs. ***Neuron*** **91**, 1305-1315
11. Yelshanskaya, M. V., Saotome, K., **Singh, A. K.**, and Sobolevsky, A. I. (2016) Probing Intersubunit Interfaces in AMPA-subtype Ionotropic Glutamate Receptors. *Sci Rep* **6**, 19082
12. Saotome, K*., **Singh, A. K***., Yelshanskaya, M. V., and Sobolevsky, A. I. (2016) Crystal structure of the epithelial calcium channel TRPV6. ***Nature*** **534**, 506-511
13. **Singh, A. K***., Manjasetty, B*., Balasubramani, G. L., Koul, S., Kaushik, A., Ekka, M. K., Singh, V., and Kumaran, S. (2015) Crystal Structure of Fad35R from Mycobacterium tuberculosis H37Rv in the Apo-State. ***PLoS One*** **10**, e0124333
14. **Singh, A. K***., Singh, M*., Pandya, V. K., G, L. B., Singh, V., Ekka, M. K., Mittal, M., and Kumaran, S. (2014) Molecular basis of peptide recognition in metallopeptidase Dug1p from Saccharomyces cerevisiae. ***Biochemistry*** **53**, 7870-7883
15. Biswas, D., Pandya, V., **Singh, A. K.**, Mondal, A. K., and Kumaran, S. (2012) Co-factor binding confers substrate specificity to xylose reductase from Debaryomyces hansenii. ***PLoS One*** **7**, e45525
16. Anand, S*., Singh, V*., **Singh, A. K***., Mittal, M*., Datt, M., Subramani, B., and Kumaran, S. (2012) Equilibrium binding and kinetic characterization of putative tetracycline repressor family transcription regulator Fad35R from Mycobacterium tuberculosis. ***FEBS J*** **279**, 3214-3228
17. Kaur, H., Datt, M., Ekka, M. K., Mittal, M., **Singh, A. K.**, and Kumaran, S. (2011) Cys-Gly specific dipeptidase Dug1p from S. cerevisiae binds promiscuously to di-, tri-, and tetra-peptides: Peptide-protein interaction, homology modeling, and activity studies reveal a latent promiscuity in substrate recognition. ***Biochimie*** **93**, 175-186
18. **Singh A.K***., McGoldrick, L.L*., and Sobolevsky, A.I.(2018) Expression, purification and crystallization of the transient receptor potential channel TRPV6. ***Methods in Molecular Biology*** (Book chapter accepted).

*Authors contributed equally

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Hua Zhu, PhD

eRA COMMONS USER NAME (credential, e.g., agency login): huazhu

POSITION TITLE: Associate Professor of Virology

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Sichuan University, Chengdu, China	B.S.	07/1982	Biology
CCNY, the City University of New York	M.S.	05/1988	Genetics
Columbia University, New York	Ph.D.	05/1993	Biochemistry
Princeton University, New Jersey	Postdoctoral	05/1998	Virology

A. Personal Statement

The goal of the proposed research is to investigate the role of TRPV channels in the thermal perception and its physiological role in the human hemostasis. Over the last 25 years, my research is mainly on the identification and molecular characterization of virulence genes of herpes viurses. The advances in the cryo-EM have led to the surge in determining the structures of different members of TRP channe. Recently the cryo-EM structures of TRPV1 and TRPV2 have been determine, but no structural information exist on heteromeric TRPVs and their temperature activated state, in part because of challenges associated to generate TRPVs heteromers and lack of methods to prepare cryo-EM sample at activation temperature. Understanding of the heteromeric TRP channels opens up a whole new era for TRP channels structural studies and validate their importance in cells physiology. Keeping these challenges in mind, I proposed to carry out the research aimed at dissecting out the molecular principles of the heteromeric assembly of TRPVs and assign them in physiologically relevant working architecture.

B. Positions and Honors

Positions and Employment

1982–1985 Research Assistant, the Institute of Ecology, the National Academy of Sciences, China
1983–1984 Visiting scientist, Department of Biology, Peking University, China
1985–1988 Teaching Assistant, Department of Biology, The City College of New York, New York, NY
1988–1993 Research Graduate Assistant (Laboratory of R. Prywes, Ph.D.), Department of Biological Sciences, Columbia University, New York, NY
1993–1998 Howard Hughes Medical Institute Associate (Laboratory of T. Shenk, Ph.D.), Department of Molecular Biology, Princeton University, Princeton, NJ
1998–2005 Assistant Professor, Department of Microbiology, Biochemistry and Molecular Biology, Rutgers – New Jersey Medical School, Newark, NJ
2005– Associate Professor with Tenure, Department of Microbiology, Biochemistry and Molecular Biology, Rutgers – New Jersey Medical School, Newark, NJ
2005–2006 Adjunct Professor, Department of Biology, Seton Hall University, South Orange, NJ
2006– Adjunct Professor, National Institute of Diagnostics and Vaccine Development in Infectious Diseases, Xiamen University, Xiamen, China

Other Experience and Professional Memberships

1998– Member, The American Society of Microbiology
1998– Member, American Association of University Professors
2005– Editorial Board, International Journal of Virology
2005 American Chemical Society Project SEED mentor
2007 Reviewing committee for the American Cancer Society postdoctoral fellowship
2008– Editor/Editorial Board Member/Editor-in-chief, Journal of Antivirals & Antiretrovirals
2012, 2016 Scientific Review Program at NIH NIAID
2014 Medical Research Council (MRC) Peer Review

Honors

1993 John S. Newberry Prize - for the most promising student of the year, Department of Biological Sciences, Columbia University
1994 Post-doctoral Fellowship Award, New Jersey Cancer Research
1996 Gallo Award, New Jersey Cancer Research Award for Scientific Excellence
1998 Gallo Award, New Jersey Cancer Research Award for Scientific Excellence
2000 Heritage Affiliate Leadership Fellow, American Heart Association
2005 Research Scholar, American Cancer Society

C. Contribution to Science (selected from a total of 90 publications)

1. My early research was involved in studying the transcriptional regulation of proto-oncogenes and tumor suppressor genes, and identified co-activator of proto-oncogenes.
    a. Zhu H, Roy AL, Roeder RG and Prywes R: Serum response factor affects preinitiation complex formation by TFIID *in vitro*. The New biologist 3: 455-64, 1991.
    b. Farmer G, Bargonetti J, Zhu H, Friedman P, Prywes R and Prives C: Wild-type p53 activates transcription *in vitro*. Nature 358: 83-6, 1992.
    c. Zhu H and Prywes R: Identification of a coactivator that increases activation of transcription by serum response factor and GAL4-VP16 in vitro. Proceedings of the National Academy of Sciences of the United States of America 89: 5291-5, 1992.
    d. Zhu H, Joliot V and Prywes R: Role of transcription factor TFIIF in serum response factor-activated transcription. The Journal of biological chemistry 269: 3489-97, 1994.

2. Since 1993, I have been working on herpesviruses. I started with studying human cytomegalovirus (HCMV) immediate-early gene function. Later, I performed pioneer works on global cellular transcriptional responses to viral infection using differential display and gene chip technology. One important discovery from these studies is how HCMV infection activates large numbers of interferon-stimulated genes.
    a. Zhu H, Shen Y and Shenk T: Human cytomegalovirus IE1 and IE2 proteins block apoptosis. Journal of virology 69: 7960-70, 1995.
    b. Zhu H, Cong JP and Shenk T: Use of differential display analysis to assess the effect of human cytomegalovirus infection on the accumulation of cellular RNAs: induction of interferon-responsive RNAs. Proceedings of the National Academy of Sciences of the United States of America 94: 13985-90, 1997.
    c. Zhu H, Cong JP, Mamtora G, Gingeras T and Shenk T: Cellular gene expression altered by human cytomegalovirus: global monitoring with oligonucleotide arrays. Proceedings of the National Academy of Sciences of the United States of America 95: 14470-5, 1998.
    d. Zhu H, Cong JP, Yu D, Bresnahan WA and Shenk TE: Inhibition of cyclooxygenase 2 blocks human cytomegalovirus replication. Proceedings of the National Academy of Sciences of the United States of America 99: 3932-7, 2002.

3. I continuously worked on HCMV and made contributions to the field in varying ways. 1) I demonstrated that HCMV infection itself induces the interferon-stimulated signal pathway important for its own immediate-early gene expression; 2) I constructed a HCMV bacterial artificial chromosome (BAC) and collaborated with my collaborators to systematically delete each HCMV open reading frame and carry out a functional profiling study for identification of HCMV essential, non-essential and tissue tropic genes; 3) Using a SCID-hu mouse model, I demonstrated that the 15-kb UL/b' of HCMV is required for HCMV replication *in vivo*.

a. Netterwald JR, Jones TR, Britt WJ, Yang SJ, McCrone IP and Zhu H: Postattachment events associated with viral entry are necessary for induction of interferon-stimulated genes by human cytomegalovirus. Journal of virology 78: 6688-91, 2004.
b. Netterwald J, Yang S, Wang W, Ghanny S, Cody M, Soteropoulos P, Tian B, Dunn W, Liu F and Zhu H: Two gamma interferon-activated site-like elements in the human cytomegalovirus major immediate-early promoter/enhancer are important for viral replication. Journal of virology 79: 5035-46, 2005.
c. Wang W, Taylor SL, Leisenfelder SA, Morton R, Moffat JF, Smirnov S and Zhu H: Human cytomegalovirus genes in the 15-kilobase region are required for viral replication in implanted human tissues in SCID mice. Journal of virology 79: 2115-23, 2005.
d. Dulal K, Cheng T, Yang L, Wang W, Huang Y, Silver B, Selariu A, Xie C, Wang D, Espeseth A, Lin Y, Wen L, Xia N, Fu T, Zhu H. Functional analysis of human cytomegalovirus UL/b' region using SCID-hu mouse model. Journal of Medical Virology, DOI 10.1002, 2016.

4. I have established a series of advanced technologies for constructing recombinant herpesviruses and performing pathogenesis studies. These include viral gene microarrays, BAC technology, the SCID-hu animal model and a luciferase marker to monitor viral growth *in vitro* and *in vivo*. Developing these methods not only provide very useful tools for studying viral pathogenesis, but also greatly benefit anti-HCMV drug and vaccine development. For example, we have helped a biotech company, Inagen, to perform an efficacy study of their anti-HCMV drug candidate using the SCID-hu model. We also performed a safety assay of Merck's HCMV live attenuated vaccine. Recently, we are working with Merck on a project using HCMV as a vaccine vector.
    a. Dulal K, Zhang Z and Zhu H: Development of a gene capture method to rescue a large deletion mutant of human cytomegalovirus. Journal of virological methods 157: 180-7, 2009.
    b. Tang Q, Zhang Z and Zhu H: Bioluminescence Imaging for Herpesvirus Studies in vivo. In: Gluckman T (ed) Herpesviridae, Viral Structure, Life Cycle and Infections. Nova Biomedical Books, New York, pp 1-16, 2009.
    c. Dulal K, Silver B and Zhu H: Use of Recombination-Mediated Genetic Engineering for Construction of Rescue Human Cytomegalovirus Bacterial Artificial Chromosome Clones. Journal of Biomedicine and Biotechnology 2012 ID 357147, 1-10, 2012.
    d. Spiess K, Jeppesen MG, Malmgaard-Clausen M, Krzywkowski K, Dulal K, Cheng T, Hjortø GM, Larsen O, Burg JS, Jarvis MA, Garcia KC, Zhu H, Kledal TN, Rosenkilde MM: Rationally designed chemokine-based toxin targeting the viral G protein-coupled receptor US28 potently inhibits cytomegalovirus infection in vivo. Proceedings of the National Academy of Sciences of the United States of America. 7:8427-32, 2015.

5. Based on the knowledge and techniques we accumulated from HCMV studies, my lab has started studies on the varicella zoster virus (VZV). My lab is one of the first to construct a VZV BAC. We systematically mutated each ORF of VZV and performed a functional study. We used an *in vitro* tissue culture system and the SCID-hu mouse model to demonstrate that VZV contains 18 dispensable genes and 4 ORFs required for viral replication in skin. More importantly, we also identified the first VZV neurotropic factor, ORF7. The unique set of characteristics lends an ORF7 deletion mutant the potential to become an excellent VZV vaccine candidate. Currently, this chickenpox neuroattenuated 7D (ORF7 mutant) has approved for Phase 1 clinical study.
    a. Zhang Z, Selariu A, Warden C, Huang G, Huang Y, Zaccheus O, Cheng T, Xia N and Zhu H: Genome-wide mutagenesis reveals that ORF7 is a novel VZV skin-tropic factor. PLoS pathogens 6: e1000971, 2010.
    b. Selariu A, Cheng T, Tang Q, Silver B, Yang L, Liu C, Ye X, Markus A, Goldstein RS, Cruz-Cosme RS, Lin Y, Wen L, Qian H, Han J, Dulal K, Huang Y, Li Y, Xia N and Zhu H: ORF7 of Varicella-Zoster Virus Is a Neurotropic Factor. Journal of virology 86: 8614-24, 2012.
    c. Jiang H, Wang W, Jiang X, Zeng W, Shen Z, Song Y, Yang H, Liu X, Dong X, Zhou J, Sun J, Yu F, Guo L, Cheng T, Rayner S, Zhao F, Luo M and Zhu H: ORF7 of varicella-zoster virus is required for viral cytoplasmic envelopment in differentiated neuronal cells. Journal of Virology. doi:10.1128/JVI. 00127-17, 2017.

d. Wang W, Yang L, Huang X, Fu W, Pan D, Cai L, Ye J, Liu J, Xia N, and Tong C, Zhu H: Outer nuclear membrane fusion of adjacent nuclei in varicella-zoster virus induced syncytia. Virology, 512, 34-38, 2017.
e. Wang W, Fu W, Pan D, Cai L, Ye J, Liu J, Liu C, Que Y, Xia N, Cheng T and Zhu H: Varicella-zoster virus ORF7 interacts with ORF53 and plays a role in its trans-Golgi network localization. Virologica Sinica, 32(5), 387-395, 2017.

D. Research Support

Ongoing Research Support

BioViva USA Inc. Zhu (PI) 12/01/2018-11/30/2020
Production and testing of recombinant herpesvirus vectors for antiaging activity.
Role: PI

Completed Research Support

Wantai Biological Pharmacy Enterprise Co. Zhu (PI) 01/01/2011-12/31/2018
Generation and evaluation of a varicella zoster virus with an ORF7 deletion (v7D).
The goal of this study is to generate and evaluate a novel neuroattenuated varicella zoster virus vaccine.
Role: PI

Merck Sharp & Dohme Corp. Zhu (PI) 08/01/2014-07/31/2018
Construction of rhesus cytomegalovirus (rhCMV) vectors for developing an anti-SIV vaccine.
The goal of this study is to construct four different recombinant rhCMV vectors and explore whether a replication defective virus can be used as a viral vector to deliver antigens of other pathogens, such as HIV-1.
Role: PI

SBIR 1R43DK104672-01 Jin (PI) 06/01/2015-5/31/2017
Phase-transition hydrogel microneedle.
The goal of this study is to optimize the phase-transition microneedle (PTM) patch for sustained-release transdermal delivery of insulin to control basal blood sugar in the treatment of diabetes.
Role: Co-PI

Merck Sharp & Dohme Corp. Zhu (PI) 06/01/2011-05/31/2016
Evaluation of a conditionally inactivated HCMV using ddFKBP/Shld-1 mechanism as a vaccine approach.
The goal of this study is to construct recombinant MCVM with ddFKBP/Shld-1 inactivation to evaluate Merck HCMV vaccines.
Role: PI

INAGEN Zhu (PI) 06/01/2010-12/31/2011
Verification of an anti-HCMV drug using the SCID-hu model.
The goal of this study was to perform an efficacy study of anti-HCMV drug candidate INA115E.
Role: PI

R01 AI055381 Zhu (PI) 01/01/2005-12/31/2010
Identification of human cytomegalovirus pathogenic genes.
The goal of this project was to use a Toledo bacterial artificial chromosome (BAC), a highly efficient recombination system, the SCID-hu mouse model and cell culture models to identify important genes for HCMV replication and pathogenesis.
Role: PI

American Cancer Association RSG-05-076-01-MBC Zhu (PI) 01/01/2005-12/31/2009
HCMV in the SCID-hu thymus/liver implant model.
The goal of this study was to investigate HCMV genes for replication in an in vivo model.
Role: PI

R01 AI050709 Zhu (PI) 12/01/2001-02/28/2008
HCMV glycoprotein B-induced signal pathway.

The goal of this project was to study and understand the biological significance of a human cytomegalovirus (HCMV)-induced signal pathway that activates interferon-stimulated genes.
Role: PI

Curriculum Vitae and Bibliography

Dabbu Kumar Jaijyan, BS, MS, Ph.D.dabbu.kumar@gmail.com, +18622981030

Research associate: Dept. of Microbiology, Biochemistry & Molecular Genetics**,** New Jersey Medical School**,** Rutgers Biomedical and Health Sciences**,** International Center for Public Health**,** 225 Warren Street, E350E, Newark, NJ 07103-35

EDUCATION AND TRAINING:

A. Bachelor of Science (B.Sc) (2003-2006), Kirorimal College, Delhi University, Delhi, India
B. Master of Science (Biotech), (2006-2008), Jawaharlal Nehru University, New Delhi, India
C. Doctor of Philosophy (PhD) (2008-2014), National Institute Of Immunology, New Delhi, India
D. Postdoctoral fellow (October 2014- September 2019), Rutgers University, New Jersey, USA
E. Research Associate (July 2019- 2022), Rutgers University, New Jersey, USA

Honors: Selected by Rutgers University as one of the nominee for Blavatnic young scientist award, 2017.

Personal Statement*:* The mechanism underlying the basis of thermosensation appears to be complex and poorly understood, and still controversy remain as to how the gating property of TRPVs is modulated by temperature. Thermal perception is a fundamental physiological process and is important for survival of organism because it influences all biological processes, from enzymatic reactions to protein folding, breeding, behavioral and seasonal changes. Nearly two decades of research poised to identify the molecular detectors which can transduce the temperature variations into the physiologically relevant signals and have unraveled a number of ion channels involved in this process. In recent years, a significant progress has been made to understand the mechanism by which polymodal TRP receptors act as biological thermometers to sense temperature changes. The current proposal has a great potential for discovering the role of TRPV channels in regulating the body's thermal sensation and mechanism.
I have more than 10 years of research experience in the field of Biotechnology. I have great passion for the research as well as teaching. Since 4 years, I am teaching masters and PhD. Students at Rutgers University. I earned my Ph.D. degree from a reputed university in the field of Biotechnology. I have a strong background in constructing gene specific knockout to study phenotype. The TRPV channel conditional knockout will reveals its phenotype and abolished the thermal regulation of the living cells. I am familiar with experimentation to generate recombinant viruses, parasites, animal immunizations, other required expertise to accomplish proposed work which makes me a suitable candidate for this application.

LIST OF PUBLICATIONS

1) *Apicoplast Triose Phosphate Transporter (TPT) gene Knockout is lethal for Plasmodium.* ***Jaijyan DK,*** *Tanushree Banerjee, Namita Surolia,Agam Prasad Singh, Avadhesha Surolia,* ***Mol Biochem Parasitol (2012), 188(1), 44-50.***

2) A Sporozoite- and Liver Stage-expressed Tryptophan-rich Protein Plays an Auxiliary Role in Plasmodium Liver Stage Development and Is a Potential Vaccine Candidate. ***Jaijyan DK,*** *Singh H, Singh AP.* ***J Biol Chem. 2015 Aug 7;290(32):19496-511.***

*3) Malaria Liver Stage Parasites Strategies for Immune Evasion and Host Modulation: Implication for Vaccine Design***.** ***Jaijyan DK,*** *Singh H and Singh AP.* ***Austin J Vaccines & Immunother. 2014;1(1): 5.***

*4) Invasion of hepatocyte by Plasmodium sporozoites requires cGMP-dependent protein and calcium dependent protein kinase-4. Govindasamy, K, Jebiwott, S.1**, Jaijyan, D.K.,** Ojo, K.K.2, Van Voorhis, W.C, Brochet, M.,Billker, O. and Bhanot, P. **Molecular Microbiology, (2016)August 2016, 102(2), 349-363.***

*5) A novel kinase protein regulates the development of liver and mosquito stage of malaria parasite. **Dabbu Kumar Jaijyan,** Praveen K. Verma, Agam Prasad Singh**, Nature Scientific-Reports, Article number 39285, 2016, doi:10.1038/srep39285***

*6) Zika Virus: An Update and Its Implication for Vaccine Development, **Dabbu Kumar Jaijyan,** Jian Liu and Hua Zhu. **DOI: 10.19080/JOJIV.2017.02.555580. Volume 2 Issue 1 2017***

*7) Emergence and Reemergence of Human viral diseases. **Dabbu Kumar Jaijyan** Jain Liu Hua Zhu, **Ann Microbiol Res 2018, 2(1):31-44***

8) Liu J, **Jaijyan DK,** Tang Q, Zhu H**.** 2019. Promising Cytomegalovirus-Based Vaccine Vector Induces Robust CD8(+) T-Cell Response. Int J Mol Sci **20**.

*9) DAN-J domain protein for liver stage malaria vaccine (**under review, Infection & Immunity, 2018) Manuscript submission number IAI000390-18***

Conference papers:

1). Tryptophan rich liver stage specific exported protein is T cell based protective antigen and it is involved in host modulation. **Dabbu Kumar Jaijyan**, Himanshu Singh, Agam Prasad Singh* Infectious Diseases Laboratory, National Institute of Immunology, New Delhi. BITS Conference on Gene and Genome Regulation (BCGGR 2016).

2). Functional characterization of a Plasmodium bergehi Liver stage specific FIKK kinase by **D.K. Jaijyan** and Agam P. Singh in syposium on Host-Parasite Interactions, Biology of: Molecular Mechanisms of Pathogenesis and Treatment of Parasitic Diseases, June 8-13, 2014, Gordon research conference, Salve Regina University, New Port, Rhode Island, USA.

3). A tryptophan rich exported protein plays vital role in the Plasmodium live stage development and shows a potential for liver stage vaccine." Agam Prasad Singh, **Jaijyan DK,** Singh Himanshu. 2013 (24th) Annual molecular Parasitology Meeting 8-12 September 2013. Marine Biological Laboratory in Woods Hole, MA (USA).

4). A human cytomegalovirus (HCMV) model to study the function of HCMV encoded proteins. **Dabbu Kumar Jaijyan** & Hua Zhu, 3rd World Conference on Breast and Cervical Cancer, September 24-25, 2018, Abu Dhabi, UAE. **(Corresponding author)**

5). Unravelling the role of viral mediated Glioblastoma progression using an inducing HCMV model" 16th International Conference on Oncology Nursing and Cancer care" April 01-02, 2019 at Frankfurt, Germany. **(Corresponding author)**

Patent: A Chaperone Family protein based malaria vaccine, **Patent:** IN/PA NO. 810

Invited Talk at international conferences

- Organizing Committee Member for the upcoming "**16th International conference on Oncology Nursing and Cancer Care**" held during April 01-02, 2019 at Frankfurt, Germany.
- Invited speaker for the conference from **Cancer 2019 conference** going to be organized in August 22-23, 2019 in Tokyo, Japan.
- This is to let you know that we are conducting an impactful **International Conference on Cancer and Oncotherapy** being held at London, the UK in the month of October from 14-16, 2019.
- The purpose of this letter is to officially invite you to **"Medical Oncology 2019"** which is going to be held on February 19-20, 2019 in Prague, Czech Republic. The conference will be structured around the theme "Recent development & advancements in Medical & Surgical Oncology".
- **"11th World Hematology and Oncology Congress" (World Hematology 2019)** scheduled during July 23-24, 2019 at Rome, Italy around the theme "Transpiring enigmas in Hematology and Oncology".(Exhibit 103.6)So we invite you to be an Active Organizing Committee the honor of your presence to play an important role in laying a platform to accelerate scientific discoveries and innovations to the conference.
- BIT's 12th Anniversary of Protein & Peptide Conference, **PepCon-2019**, June 14-16, 2019, in Beijing, China
- **"International Conference on Cancer & Oncotherapy"** which is slated to happen from 23-25 OCT 2019" in Rome, Italy.

NCBI submissions

I have successfully submitted large scale mRNA transcriptomic sequence data to NCBI.

Platform Illumina Genome Analyzer IIx (Homosapiens).

1) GSM1289018 HepG2 PbSLTRiP deletion mutant-mRNA sequence
2) GSM1289019 HepG2 Pb268 deletion mutant -mRNA sequence
3) GSM1289020 HepG2 PBANKA-wild-type mRNA sequence
4) GSM1289021 Normal HepG2 cells mRNA

Awards and National Fellowships

1) BioViva's Research Award for anti-aging vaccine development (this work appeared in many news).
2) Proud to be nominated by Rutgers university for Blavatnik Awards for Young Scientist,
3) Postdoctoral research associate (2014-present) at Rutgers, New Jersey Medical School, USA
4) Awarded Junior Research fellowship and Senior Research Fellowship from 2008-2013 by Department of biotechnology (DBT) Govt. of India.
5) Qualified CSIR NET JRF (National Eligibility Test for Lectureship/Junior research fellowship), conducted jointly by the Council of Scientific and Industrial Research (CSIR) and University Grants Commission (UGC), India.
6) Qualified National level fellowship, DBT- JRF conducted by Department of biotechnology (DBT) Govt. of India
7) Qualified National Institute of Immunology National fellowship
8) Qualified GATE in Feb. 2008 conducted by IITs (Indian institute of technology) and IISc (Indian institute of

science) Bangalore.

9) Obtained departmental scholarship (DBT) for M.Sc. at School of Biotechnology, Jawaharlal Nehru University, New Delhi for a period of 2006-2008.

Professional membership

1) **Editor in chief:** Journal of Parasite Research (JPAR), **USA.**
2) **Editor:** International journal of Advanced Microbiology and Health Research, **India.**
3) **Editor:** the International journal of Research Methodology, **India.**
4) **Associate Editor:** LOJ Immunology & Infectious Disease, **New York, USA.**
5) **Reviewer:** The journal of parasitic disease (JOPD), **India.**
6) **Reviewer:** Parasitology Research journal, **Germany.**
7) **World Academy of Science, Engineering and Technology:** a scientific and technical committee & Editorial Board Review member in World Academy of Science.
8) **Organizing member:** an Organizing Committee Member for the upcoming "16th International conference on Oncology Nursing and Cancer Care" held during April 01-02, 2019 at Frankfurt, **Germany.**

Teaching experience

Along with research, since 4 years, I am actively involved as a teacher and a teaching assistant in a 'Molecular Virology' Course. I have guided approximately 150 students. I am taking a lecture on emerging and re-emerging human viral diseases. I have broad expertise in teaching as well as research.

My major duties in the 'Molecular Virology' course at Rutgers University are as described below,

1. I have been independently reviewing the scientific papers submitted by master students.
2. I am reviewing the exams of the master student.
3. I am taking a lecture on 'emerging and re-emerging human viruses' for this course.
4. I am assisting other teachers during the lectures.
5. I am solving the problems or queries of the students via email as well as personal interaction during the course.
6. I am also helping in designing the exam question and making final grades for the students.

Mentorship for students

1. Yvonne Okereke, MD student
2. Kawandeep Singh, Master Student
3. Eve Bae, Master student
4. Tinzin Lama, Master student
5. Darshan Patel, Master student
6. En Chi Wang, Master Student
7. Eshangi Patel, Master Student

Merck Project (May 2016-present) at NJMS, Rutgers University, NJ,USA (2016-present)

At present, I am working on RhCMV and HCMV vaccine project of Merck Company, NJ, USA.

1) I have prepared RhCMV virus with IL10 deletion to study it effect on T and B cell activation in infected host.

2) I have prepared RhCMV UL128-131 fixed region virus corresponding to HCMV UL128-131 so that RhCMV can infect efficiently in epithelial cells to study it vaccine potential.
3) I have prepared RhCMV with IL15 gene to study its effect on immune system of host.
4) I have developed HCMV mutants which are defective in virus replication for vaccine design against HCMV infection.

BioPharm Sol.Inc. Project (2016-present)

1). I have completed a pharmacokinetic study in minipigs to test the therapeutic efficacy of a microneedle technology.
2). I have tested the therapeutic efficacy of a novel nucleic acid delivery method.
3). I have been testing a microsphere technology for the delivery of insulin for diabetic patients.

BioViva USA Inc projects (2018- present)

1). Developing anti-aging therapeutic tool using CMV as a vaccine vector.
2). Developing a therapeutic tool for muscular dystrophy using CMV as a vaccine vector.

Funded Project where Dr. Jaijyan is a key person

1). Funding agency: BioViva USA Inc,
Funding amount: $409,770
ii) BioPharm Solutions Inc: Funding amount was more than $200,000
iii) Funding agency: Merck, $50,000 for each 20mg PP150 antigen
iv) Funding agency: WANTAI, China: $44,000 for SVZV chimeric virus.

Submitted Grants where Dr. Jaijyan is a key person

i) Funding agency: Department of Defense (DoD)
Total budget: 1.2 million dollars,
Rutgers RAPPS ID: FP00014760

ii) NIH RO1collaborative research grant RO1 (3.3 million dollars) between Rutgers (Rutgers Share is 1.1million), Tulane University and Colorado State University.
Rutgers RAPPS ID: FP00005118

iii) Two NIH-SBIR Phase 1 research grant in collaboration with BioPharm Solutions.
Rutgers RAPPS ID: FP0004921, FP00011820 (~$200,000)

iv) Cancer research Irvington fellowship (Dr. Jaijyan is a Project investigator): Total Budget $172,000, Dr. Jaijyan is serving as a PI on this grant and he will be leading this project independently.
Rutgers RAPPS ID: FP00014598

References

1. Professor Sanjey Tyagi, PHRI, New Jersey medical School, Rutgers University, New Jersey, USA, Email ID: tyagisa@njms.rutgers.edu
2. Dr. Agam P Singh, Staff Scientist-V, National Institute of Immunology, New Delhi India. Email ID: singhap@nii.res.in