Ramendra N. Saha

Curriculum vitae
February 1, 2018

Contact Information:

Room 346
Science and Engineering Building #1
School of Natural Sciences,
University of California, Merced
5200 N Lake Road, Merced, CA 95343
Phone: (209) 228-2425 (Office)
Laboratory website: http://faculty.ucmerced.edu/rsaha3
Email: rsaha3@ucmerced.edu

Educational Qualification:

- 2006. Ph.D. from University of Nebraska Medical Center, NE, USA
- 2000. MS from University of Calcutta, Calcutta, India. Majored in Zoology with specialization in Molecular Biology and Genetics.
- 1998. BS (Honors) from University of Calcutta, Calcutta, India. [Major: Zoology]
- 1995. BS from University of Calcutta, Calcutta, India.

Employment and Research Positions:

- January 2014-Present Assistant Professor, University of California, Merced, at Merced, CA
- Mar 2007-Dec 2013: Post-doctoral Research Fellow, NIEHS, NIH at RTP, NC
- Dec 2001 – Dec 2006: Graduate Research assistant, University of Nebraska Medical Center, Lincoln, NE, USA
- Jan 2001 - Nov 2001: CSIR Junior Research Fellow. Bose Institute, Calcutta, India.

Grants and Awards:

- 2018. UC Cancer Research Coordinating Committee research grant. Project titled, '*A study of H2A.Z isoforms in Glioblastoma multiforme*.'
- 2016. Hellman Foundation Fellow Award. Project titled, '*Role of epigenetic factors H2A.Z hypervariants in neurogenesis: relevance to Autism and Schizophrenia'*.
- 2015. UC Merced Academic Senate Grant. Project titled, '*CHD8 in neurodevelopment and Autism Spectrum Disorders* '.
- 2014. UC Merced Academic Senate Grant. Project titled, '*Role of epigenetic factors H2A.z hypervariants in neuronal stem cell renewal and differentiation*'.
- 2012. K99-R00 (1 K99 MH096941-01Al). Funded by NIMH, NIH. Project titled, '*Role of H2A.z isoforms in neuronal transcription and synaptic plasticity*'.
- 2010. Intramural Fellows award for research excellence (FARE) award from NIH
- 2009. Intramural Fellows award for research excellence (FARE) award from NIH
- 2009. Post-doctoral Fellow travel award from the Society for Neuroscience (SfN). Received at the 39th annual meeting of SfN in Chicago, Illinois.
- 2005. Young investigator award from The American Society of Neurochemistry (ASN). Received at the 36th annual meeting of ASN in Madison, Wisconsin.

- 2003. (Through 2006) Graduate assistantship scholarship award from University of Nebraska Medical Center.
- 2001. Shyama Prasad Mukherjee (SPM) research fellowship, India. Highest research award offered by Govt. of India [One out of two recipients in Life Sciences (2001)].
- 2000. Council for Scientific and Industrial Research (CSIR)-junior research fellowship (Government of India), India [In lieu of qualifying National Eligibility Test (NET)].
- 1998. National scholarship from Government of India, India

Scientific Training & Experience:

- Mar 2007-Dec 2013: Post-doctoral fellowship with Dr. Serena Dudek, Laboratory of Neurobiology, NIEHS, NIH. Studied neuronal activity-induced immediate early gene transcription mechanisms.
- Dec 2001-2006: Graduate studies; Dr. Kalipada Pahan (University of Nebraska medical Center), Medical Sciences Interdepartmental Area (MSIA) PhD program. Major: Medical Sciences (Area: Neurodegeneration). Dissertation Title: NF-kappaB in brain: a study in the neurodegenerative context.
- Jan 2001-Nov 2001: Junior Research Fellow; Council of Scientific and Industrial Research (CSIR) in Cancer Biology Lab under Dr. Tanya Das in the Animal Physiology Section, Bose Institute, Calcutta.
- Sep 1999-May 2000: Masters Dissertation; Prof. Ashish Kumar Duttagupta in Genetics lab, Department of Zoology, University of Calcutta.

Publications:

Peer-reviewed Original Research Articles:

1. Poston RG, Dunn CJ, Sarkar P, **Saha RN**. Persistent 6-OH-BDE-47 exposure impairs functional neuronal maturation and alters expression of neurodevelopmentally-relevant chromatin remodelers. *Environ Epigenet.* 4(1). pii: dvx020. DOI: 10.1093/eep/dvx020 (2018).
2. Dunn CJ*, Sarkar P*, Bailey ER, Farris S, Zhao M, Ward JM, Dudek SM, **Saha RN**. Histone Hypervariants H2A.Z.1 and H2A.Z.2 Play Independent and Context-Specific Roles in Neuronal Activity-Induced Transcription of Arc/Arg3.1 and Other Immediate Early Genes. *eNeuro*. Aug 24;4(4). pii: ENEURO.0040-17.2017. DOI: 10.1523/ENEURO.0040-17.2017 (2017).
   *Equal contribution
3. Saha RN, Wissink EM, Bailey ER, Zhao M, Fargo DC, Hwang JY, Daigle KR, Fenn JD, Adelman K, Dudek SM. Rapid activity-induced transcription of Arc and other IEGs relies on poised RNA Pol II mechanism. *Nat Neurosci*. 14, 848-856 (2011)*.
   ***Selected and evaluated in Faculty of 1000.** Rated as 'must read', this article is placed in the top 2% of published articles in biology and medicine in the F1000 library.
4. Saha RN, Ghosh A, Palencia CA, Fung YK, Dudek SM, Pahan K. TNF-alpha preconditioning protects neurons via neuron-specific up-regulation of CREB-binding protein. *J Immunol*. 183, 2068-2078 (2009).
5. Saha RN, Jana M, and Pahan K. MAPK p38 regulates transcriptional activity of NF-kappaB in primary human astrocytes via acetylation of p65. *J Immunol*. 179, 7101-7109 (2007).
6. Saha RN and Pahan K. Differential regulation of Mn-superoxide dismutase in neuron and astroglia by HIV-gp120: Implications for HIV-associated dementia. *Free Radic Biol Med*. 42, 1866-1878 (2007).

7. Saha RN, Liu XJ, and Pahan K. Up-regulation of BDNF by TNFalpha: A case for the neuroprotective role of cytokine. *J Neuroimmun Pharm.*1, 212-222. (DOI: 10.1007/s11481-006-9020-8) (2006).
8. Saha RN, Jana M, Anderson J, Liu XJ, and Pahan K. Regulation of inducible nitric oxide synthase in proinflammatory cytokine-stimulated human primary astrocytes. *Free Radic Biol Med.* 38, 655-664 (2005). (First three authors have equal contribution.)
9. Auch CJ, Saha RN, Sheikh FG, Liu X, and Pahan K. Role of protein kinase R in double-stranded RNA-induced expression of nitric oxide synthase in human astroglia. *FEBS Lett*. 563, 223-228 (2004).
10. Jana M, Dasgupta S, Saha RN, Liu X, and Pahan K. Induction of tumor necrosis factor-alpha (TNF-alpha) by interleukin-12 p40 in microglia and macrophages. *J. Neurochem*. 86, 512-528 (2003).

Full manuscripts in pre-print (in revision for peer-review publication):

1. Tyssowski, K. M., Saha RN, *et al.* Distinct neuronal activity patterns induce different gene expression programs. *bioRxiv* (2017). doi:10.1101/146282

Peer-reviewed Review Articles:

1. Saha RN and Dudek SM. Splitting Hares and Tortoises: a classification of neuronal immediate early gene transcription based on poised RNA polymerase II. *Neuroscience.* 247:175-181 (2013) ('Forefront Review Article')
2. Saha RN and Dudek SM. Action potentials: to the nucleus and beyond. *Exp Biol Med (Maywood)*. 233,385-393 (2008).
3. Saha RN and Pahan K. Regulation of inducible nitric oxide synthase gene in glial cells. *Antioxid Redox Signal*. 8:929-947 (2006).
4. Saha RN and Pahan K. Signals for the induction of nitric oxide synthase in astrocytes. *Neurochem Int*. 49:154-163 (2006).
5. Saha RN and Pahan K. HATs and HDACs in neurodegeneration: a tale of disconcerted acetylation homeostasis. *Cell Death Differ.* 13, 539-550 (2006).
6. Saha RN and Pahan K. TNF-alpha at the crossroad of neuronal life and death during HIV-associated Dementia. *J. Neurochem.* 86, 1057-1071 (2003).

Book Chapters:

1. Saha RN and Pahan K. TNF-alpha in CNS: Physiologic and Pathologic roles. *Handbook of Neurochemistry and Molecular Neurobiology.* (Edited by Abel Lajtha) 3rd edition. Springer. 177-202 (2006).
2. Saha RN, Bidasee KR, and Pahan K. CNS cell signaling: Homeostasis, disease and repair. *Neuroimmune Pharmacology* (Edited by Howard Gendelman) 1st Edition. Springer. 2008; 207-225 (2006).

Citation record of Published Articles (Adapted from the Web of Knowledge)**:**

Average citations per publication: 64.14

H-index: 13 (13 publications have been cited 13 or more times)

Contribution to Science:

1. **Activity-induced neuronal gene transcription programs**: Many forms of learning and memory require *de novo* immediate early gene transcription, but the underlying mechanisms are unclear. As a postdoctoral fellow at NIH, I discovered that neuronal activity-induced rapid transcription of immediate early genes (IEG) utilize the RNA polymerase pausing mechanism. It was further noted that not all IEGs employ this mechanism, and those that don't are expressed with delayed kinetics. This led us to postulate that IEGs use various transcription programs to derive the kinetics of their expression. I was the intellectual driving force of these studies and together with the corresponding author, was responsible for every aspect of this project. This contribution enhanced our understanding of neuronal gene transcription mechanisms and has over the past few years led onto several studies by other groups where details of gene transcription mechanisms have been further investigated. I was humbled to see the published form of this study being reviewed post-publication in F1000 where reviewing authors stated, *"…these exciting results reveal a novel mechanism by which neurons can prepare for the rapid induction of IEGs in response to experience, and therefore represent a breakthrough in our understanding of transcriptional control of gene expression in the brain".* Recently, extending our understanding of these processes further, the first peer-reviewed paper from my laboratory demonstrated that the histone H2A.Z hypervariants (H2A.Z.1 and H2A.Z.2) are an important component of activity-induced transcription programs. H2A.Z regulates RNA Pol II pausing at rapid IEG promoters and revealed the possibility of its eviction from the +1 nucleosomes as a causal mechanism of signal-dependent Pol II release.

Relevant references: Item no. 2, and 3 in the 'Peer-reviewed Original Research Articles' section above. Also see, item no. 1 and 6 in the 'Peer-reviewed Review Articles' section above.

2. **Epigenetic disruptions by environmental toxins**: Brominated flame retardants are present in the environment at particularly high levels, especially in the United States and have been implicated by several studies to impair neurodevelopment. However, the details of their mechanistic roles in such disruptions are incompletely understood. Our laboratory has recently reported the effects of one of the most prevalent congeners, BDE-47, and its hydroxylated metabolites on the maturation and function of embryonic rat cortical neurons. These effects include: i) disruption of transcriptional responses to neuronal activity, ii) dysregulation of multiple genes associated with neurodevelopmental disorders, and intriguingly, iii) altered expression of several subunits of the developmentally-relevant BAF (Brg1-associated factors) chromatin remodeling complex, including the key subunit BAF170. Taken together, our data indicate that persistent exposure to 6OH-BDE-47 may interfere with neurodevelopmental chromatin remodeling mechanisms and gene transcription programs, which in turn are likely to interfere with downstream processes such as synapse development and overall functional maturity of neurons. This project unveils a novel dimension of gene-environment interactions.

Relevant references: Item no. 1 in the 'Peer-reviewed Original Research Articles' section above.

3. **Signaling intricacies of gliosis and neurodegeneration**: In a neurodegenerative milieu, glial and neuronal cells experience alternative fate where the former undergoes gliosis and the latter experiences loss of function and cell death. As a graduate student, I contributed in understanding glial and neuronal signaling mechanisms that lead to differential fate among these cells. The consensus before my work considered signaling mechanisms in response to neurodegenerative and pro-inflammatory stimuli to be redundant in neurons and glia. That is not the case; I demonstrated that different pathways were invoked in these cell types in response to same inducers. Differential nodes on these pathways included cellular signaling cascades and epigenetic regulators of gene expression that were engaged and regulated differently in

neurons and glia. My role in these studies as a graduate student included designing and conducting experiments, analyzing data and writing every manuscript myself. Taken together, my studies revealed a basis for differential fate of neurons and glia in neurodegenerative brains. Subsequently, several studies have built upon the idea and reached similar conclusions. Based fractionally on my findings, we now appreciate the differential states and mechanisms of signaling cascades in neurons and glia.

Relevant references: Item no. 4, 5, 6 and 8 in the 'Peer-reviewed Original Research Articles' section above. Also see, item no. 3, 4 and 6 in the 'Peer-reviewed Review Articles' section above.

Teaching experience:

Classroom teaching:

1. BIO 170 (Fundamentals of Neurobiology). UC Merced undergraduate level course. Fall 2014, Spring 2016, Spring 2017, Fall 2017.
2. QSB 275 (Gene transcription and Epigenetics). UC Merced graduate level course. Fall 2017.
3. QSB 211 (Advanced Neurobiology). UC Merced graduate level course. Fall 2015 (Team taught with three other professors)
4. Guest Lecturer (2004-2006) Protein biochemistry [Biochemistry (OB 545)]
   College of Dentistry, University of Nebraska Medical Center, Lincoln, NE, USA
5. Part-time Lecturer. (2000-2001) Cell Biology [Undergraduate level]
   Department of Molecular Biology, Surendranath College, Calcutta, India.

Student Mentoring (Current mentee are in bold. Post-training position for mentees are denoted in italics)

1. **Carissa Dunn** (**2014-Present; *Graduate student, UC Merced, QSB graduate program***)
2. **Robert Poston** (**2015-Present; *Graduate student, UC Merced, QSB graduate program***)
3. **Joshua Segales** (**2017-present; *Undergraduate student, UC Merced***)
4. **Emma Paik-Tesc** (**2017-present; *Undergraduate student, UC Merced***)
5. Alyssa Funk (2016-2017; *Graduate student, UC Merced, QSB graduate program*)
6. Barbara Melo (2017; *Undergraduate student, UC Merced*)
7. Kaitlyn Mahony (2017; *Undergraduate student, UC Merced*)
8. Quintin Kuse (2016-2017; *Undergraduate student, UC Merced*)
9. Eduardo Contreras (2016-2017; *Undergraduate student, UC Merced*)
10. Ryan Wong (2014-2016); *Undergraduate student, UC Merced*)
11. Natalia Gonzalez (2014-2015; *Undergraduate student, UC Merced*)
12. Judith Anderson (2014-2015; *Undergraduate student, UC Merced*)
13. Delia Araujo (2014-2014; *Undergraduate student, UC Merced*)
14. Maivan Le (2014-2017; *Undergraduate student, UC Merced*)
15. Advaita Punjala (2012-2013; Undergraduate STEP student, NIEHS) *UNC, Chapel Hill.*
16. Palmyra Romeo (2012-2013; Post-baccalaureate fellow, NIEHS) *NIEHS*
17. Emma Bailey (2009-2012; Post-baccalaureate fellow, NIEHS), *School of Nursing, UNC Chapel Hill*.
18. Britney McClendon (2009-2010; Undergraduate STEP student, NIEHS). *NIH Bethesda*
19. Charlotte Yang (2009; Summer Internship, NIEHS). *Ph.D. program, Caltech.*
20. J. Daniel Fenn (2008-2009; Post-baccalaureate fellow, NIEHS), *MD program, Ohio State U*.
21. Erin Wissink (2007-2009; Undergraduate STEP student, NIEHS). *Ph.D. program, Cornell U.*
22. Joel Bingham (2002-2003; Undergraduate at College of Dentistry, UNMC). *Dentist, Idaho*

Invited talks

- 2018. Title: “Splitting Hares and Tortoises: Decoding Neuronal Immediate Early Gene transcription.” University of North Dakota, ND.
- 2016. Title: “A tale of two twins: H2A.Z hypervariants in activity-induced neuronal gene transcription.” Texas A&M, College Station, TX.
- 2016. Title: “A tale of two twins: H2A.Z hypervariants in activity-induced neuronal gene transcription.” Genome Center, UC Davis, CA.
- 2016. Title: “A tale of two twins: H2A.Z hypervariants in activity-induced neuronal gene transcription.” Sanford Research Center, Sioux Falls, SD.
- 2015. Title: H2A.Z hypervariants in neuronal gene transcription. QSB retreat. Midpines, CA
- 2014. Title: In the *beautiful* valley of histone hypervariants. QSB retreat. Midpines, CA
- 2014. Title: “Neuronal activity induces transcription of two sub-classes of immediate early genes”. Society for Neuroscience, Washington D.C.
- 2010. Title: Promoter proximal RNA polymerase II stalling may determine temporal expression kinetics of neuronal immediate early genes. *Society for Neuroscience*. 40th Annual Meeting, San Diego, California.
- 2009. Title: Mechanism of immediate early transcription in synaptic plasticity. *Society for Neuroscience*. 39st Annual Meeting, Chicago, Illinois.
- 2009. Title: TNF-alpha pre-conditioning protects neurons via neuron-specific up regulation of CREB-binding protein. *American Society of Neurochemistry*. 41st Annual Meeting, Charleston, South Carolina.
- 2005. Title: Greater availability of NF-kappaB p65:p50 in glia than neurons: Implications for neurodegenerative disorders. *American Society of Neurochemistry*. 37th Annual Meeting, Madison, Wisconsin. (Session Chair: Dr. Babette Fuss)

Scientific Service:

Editorial review Board

- Environmental Epigenetics (Oxford University Press)

***Ad hoc* Reviewer**

- Journal of Neuroscience.
- Journal of Neurochemistry
- PLOS One
- Scientific Reports
- Journal of Neuroimmunepharmacology
- Neurotoxicology
- Journal of Neuroscience Methods
- Military Medical Research