BIOGRAPHICAL SKETCH

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NAME: Prasannalatha Nair, Kala

eRA COMMONS USER NAME: Kala

POSITION TITLE: Postdoctoral Fellow, Neurology and Neurological Sciences, Stanford University School of Medicine

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Start Date	Completion Date	FIELD OF STUDY
Ethiraj College for Women, India	BSc	06/2005	05/2008	Microbiology
University of Madras, India	MSc	06/2008	05/2010	Neuroscience
National Institute of Mental Health and Neuro Sciences, India	Mphil	05/2013	05/2015	Neurophysiology
National Institute of Mental Health and Neuro Sciences, India	PhD	05/2016	09/2022	Neurophysiology
Stanford University	Post-doctoral training	01/2023	Present	Pediatric Epilepsy

A. Personal Statement

I am a dedicated and passionate researcher with a strong academic background in multiple biological disciplines, including molecular biology, neuroscience, and neurophysiology. My research journey began during my master's degree in Neuroscience, where I investigated the neuroprotective effects of Bacopa monniera, a plant extract, on hippocampal damage caused by transient global cerebral ischemia, under the guidance of Dr. Rameshkumar Radhakrishnan. After my master's degree, I gained valuable experience by tutoring Anatomy and Physiology, further fueling my curiosity about the intricacies of the nervous system. I got enrolled in an MPhil program at the esteemed National Institute of Mental Health and Neurosciences (NIMHANS) in India, under the mentorship of Dr. BS Shankaranaryana Rao and Dr. Bindu M Kutty. During my MPhil research, I focused on evaluating the impact of spontaneous recurrent seizures on hippocampal interneuron density. Also, I explored the beneficial effects of non-pharmacological interventions, such as enriched environments, in rescuing interneuron loss. Through this project, I specialized in seizure induction, immunohistochemistry, and stereological analysis. Our findings were published in the Journal of Neuroscience Research in 2021, and I was honored to receive the Dr. R.N. Moorthy Award for securing the top position in my batch. Seeking to broaden my research experience beyond epilepsy, I joined Dr. Vijayalakshmi Ravindranath's lab at the Centre for Neuroscience, Indian Institute of Science (IISc). Here, I investigated the mechanisms involved in the early diagnosis and treatment of Alzheimer's disease using a transgenic mouse model. This experience deepened my interest in understanding the electrophysiological correlates of brain pathology, further motivating me to pursue a Ph.D. in epilepsy research. I successfully cleared the national entrance exams conducted by NIMHANS and the Council of Scientific & Industrial Research (CSIR), India, and was awarded the Rajiv Gandhi National Fellowship for the disabled (RGNFD). Starting my Ph.D. journey at NIMHANS in July 2016, I dedicated my research to understanding the effects of pharmacological and non-pharmacological approaches in mitigating epilepsy-induced comorbidities. During my Ph.D., I focused on investigating the impact of epilepsy on sleep-wake changes during epileptogenesis. Additionally, I explored the mechanistic role of BDNF-TrkB signaling in epileptogenesis and assessed the potential benefits of enriched housing on sleep and electrophysiological alterations. I developed proficiency in various histological, biochemical, and molecular techniques while enhancing my skills in verbal and written scientific communication. Throughout my Ph.D. journey, I made significant scientific contributions and published research articles. Throughout my carrier, my disability has never

stopped me from reaching my goals. Moving forward, my long-term research aspirations is to become an independent researcher, gaining a comprehensive understanding of the key pathological mechanisms underlying epilepsy, and contributing to the development of novel therapeutic strategies for improved patient outcomes.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2015 – 2016 Junior Research Fellow, Centre for Neuroscience, Indian Institute of Science (IISc), Bengaluru, India.
2015 Guest lecturer in anatomy, MMM College of Health Science, Chennai, India
2012 – 2013 Guest Lecturer in anatomy and physiology, RVS college of Nursing, Coimbatore, India
2011 – 2013 Guest lecturer in anatomy, RVS College of Physiotherapy, Coimbatore, India
2010 – 2013 Lecturer in Anatomy, RVS Dental College and Hospital, Coimbatore, India

Honors

2019 Best poster award at S. Srinivasan Knowledge Conclave on New Technologies, NIMHANS, Bengaluru
2017 Best poster award, Proceedings of the International Symposium on Neurodegenerative Diseases, ISND, NIMHANS, Bengaluru,
2015 Dr. R.N Moorthy Award first position in the batch, NIMHANS, India.
2015-2021 Rajiv Gandhi national fellowship for students with disability, University Grants Commission (UGC), New Delhi, India
2015-2021 Council of Scientific and Industrial Research – Junior Research Fellowship
2015-2021 NIMHANS fellowship,

Professional Membership and Activities

2017 – Present Indian Epilepsy Society
2017 – Present Indian Academy of Neurosciences

C. Contributions to Science

1. **Early Career:** During my Mphil, I took a part of ongoing PhD project and evaluated the effect of Enriched environment exposure on interneuron density in chronic TLE rats. Previous studies from both humans and rodent models of TLE reported significant loss of interneurons at chronic epilepsy. Since EE has shown to reduce seizure severity, we moved on to understand whether seizure suppression address the role of EE on interneurons as EE is well known to have neuroprotective effects. I observed that Epileptic rats had differential loss of calcium binding protein expressing interneurons including Parvalbumin and calbindin. Exposure to EE prevented the loss of PV and CB interneurons in CA1 and DG but not in CA3. Further, Synaptophysin, a marker of synaptic protein was significantly decreased in epilepsy was reversed following EE. My results correlated with restoration of basal synaptic transmission observed in slice electrophysiology. Our results were published in the “Journal of Neuroscience Research”.

    a. Salaka RJ, **Nair KP**, Annamalai K, Srikumar BN, Kutty BM, Shankaranarayana Rao BS. Enriched environment ameliorates chronic temporal lobe epilepsy-induced behavioral hyperexcitability and restores synaptic plasticity in CA3-CA1 synapses in male Wistar rats. J Neurosci Res. 2021 Jun;99(6):1646-1665.

2. **Graduate Career:** My graduate research focused on investigating the mechanisms of epileptogenesis, specifically examining the role of the BDNF-trkB signaling pathway in a pilocarpine-induced model of temporal lobe epilepsy (TLE). Initially, we assessed the progression of seizures and the onset of sleep deficits. Our findings revealed that sleep deficits, including both NREM and REM deficits, emerged in the early phase of epileptogenesis and persisted until the chronic phase. Since,

sleep and seizures are interrelated. We speculated that EE could alliviate sleep deficits in addition to reducing seizures. Remarkably, we observed that EE exposure restored REM sleep in epileptic rats. Additionally, EE reversed anxiety and depression-like behaviors in epileptic rats. To decipher the underlying mechanisms of seizure progression, we investigated the role of BDNF-trkB signaling. BDNF-trkB signaling has been reported to increase following status epilepticus (SE), and transient blocking of this increase during SE halted seizure progression. However, the effects of blocking BDNF signaling on associated comorbidities such as anxiety, depression, and sociability were not known and formed the basis of my study. The results of my study demonstrated that blocking BDNF signaling immediately after SE reduced seizure progression, rescued depression, and anxiety-like behaviors, and ameliorated mossy fiber sprouting (a hallmark feature of TLE). One aspect of my study, which focused on the effect of EE on sleep architecture, has been published in the journal "Neuroscience." Other studies are currently under submission or in the preparation stage. Additionally, I actively participated in other projects that have resulted in several other publications.

a. **Nair KP**, Salaka RJ, Srikumar BN, Kutty BM, Shankaranarayana Rao BS. Enriched Environment Rescues Impaired Sleep-Wake Architecture and Abnormal Neural Dynamics in Chronic Epileptic Rats. Neuroscience. 2022 Jul 15;495:97-114.

b. Fernandes V, Preeti K, Sood A**,** **Nair KP**, Khan S, Rao BSS, Khatri DK, Singh SB. Neuroepigenetic Changes in DNA Methylation Affecting Diabetes-Induced Cognitive Impairment. Cell Mol Neurobiol. 2023 Jul;43(5).

c. Salaka RJ, **Nair KP**, Sasibhushana RB, Udayakumar D, Kutty BM, Srikumar BN, Shankaranarayana Rao BS. Differential effects of levetiracetam on hippocampal CA1 synaptic plasticity and molecular changes in the dentate gyrus in epileptic rats. Neurochem Int. 2022 Sep;158:105378

d. Ahire A, **Nair KP**, Shankaranarayana Rao BS, Srikumar BN. The potential involvement of cholinergic system in finasteride induced cognitive dysfunction. Psychoneuroendocrinology. 2021 Feb;124:105066.

3. **Postdoctoral Career:** As a postdoctoral fellow, my research has focused on understanding the impact of seizures on myelination and how activity dependent myelination, in turn, shapes epileptic brain networks. Our previous report has demonstrated that recurrent absence seizures are associated with abnormally increased birth and maturation of oligodendrocyte precursor cells (oligodendrogenesis), and abnormally increased myelination within the seizure network. Importantly, seizure blockade with the drug ethosuximide prevents these abnormal changes in oligodendrogenesis and myelination. Furthermore, blockade of activity-dependent myelination, either through genetic or pharmacological means, reduces seizure burden. Therefore, our hypothesis is that abnormal activity-dependent myelination contributes to excessive thalamocortical network synchrony and seizure progression. In my postdoctoral work, my focus is to understand whether pharmacological / genetic targeting of maladaptive myelination can serve as a potential therapeutic strategy in preventing seizures and associated comorbidities, including sleep disturbances, cognitive impairments, and attentional deficits. Additionally, we aim to evaluate whether similar plasticity mechanisms occur in severe forms of epilepsy, such as Lennox-Gastaut Syndrome (LGS), where treatment options are limited. Through investigating the role of myelination in epilepsy and its potential as a therapeutic target, our research aims to contribute to the development of novel approaches for managing seizures and their related complications. By improving our understanding of the underlying mechanisms, we hope to provide new insights for the development of effective interventions and ultimately enhance the quality of life for individuals living with epilepsy.

2. **List of Published Work in My Biblography**

https://www.ncbi.nlm.nih.gov/myncbi/kala.nair.1/bibliography/public/

D. Scholastic Performance

YEAR	COURSE TITLE	INSTITUTIONS	GRADE
2007	Molecular Biology and Genetic Engineering	ETHIRAJ COLLEGE FOR WOMEN	74
2007	Basics and Applied Immunology		86
2008	Biotechnology		84
2008	Clinical microbiology		76
2009	Neuro Anatomy	University Of Madras	60
2009	Research methods in Neuroscience		62
2010	Biostatistics		56
2014	Cellular and Developmental Neurobiology	NIMHANS	73
2015	Research Methodology		57
2015	Clinical Neurophysiology and Electroencephalography		52

All scores displayed above are scored out of 100. Any score above 50 is considered as a pass.