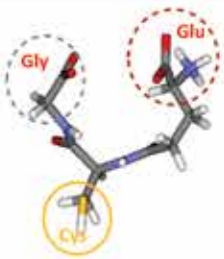

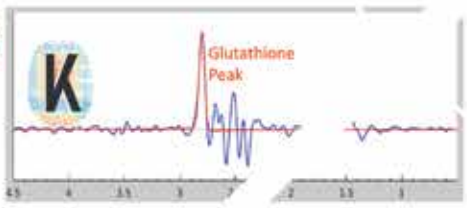

ANNUAL REPORT 2022-23

National Brain Research Centre
NBRC

National Brain Research Centre

An Autonomous Institute of the Department of Biotechnology
Ministry of Science & Technology
Government of India

ANNUAL REPORT 2022-23

NATIONAL BRAIN RESEARCH CENTRE

An Autonomous Institute of the Department of Biotechnology
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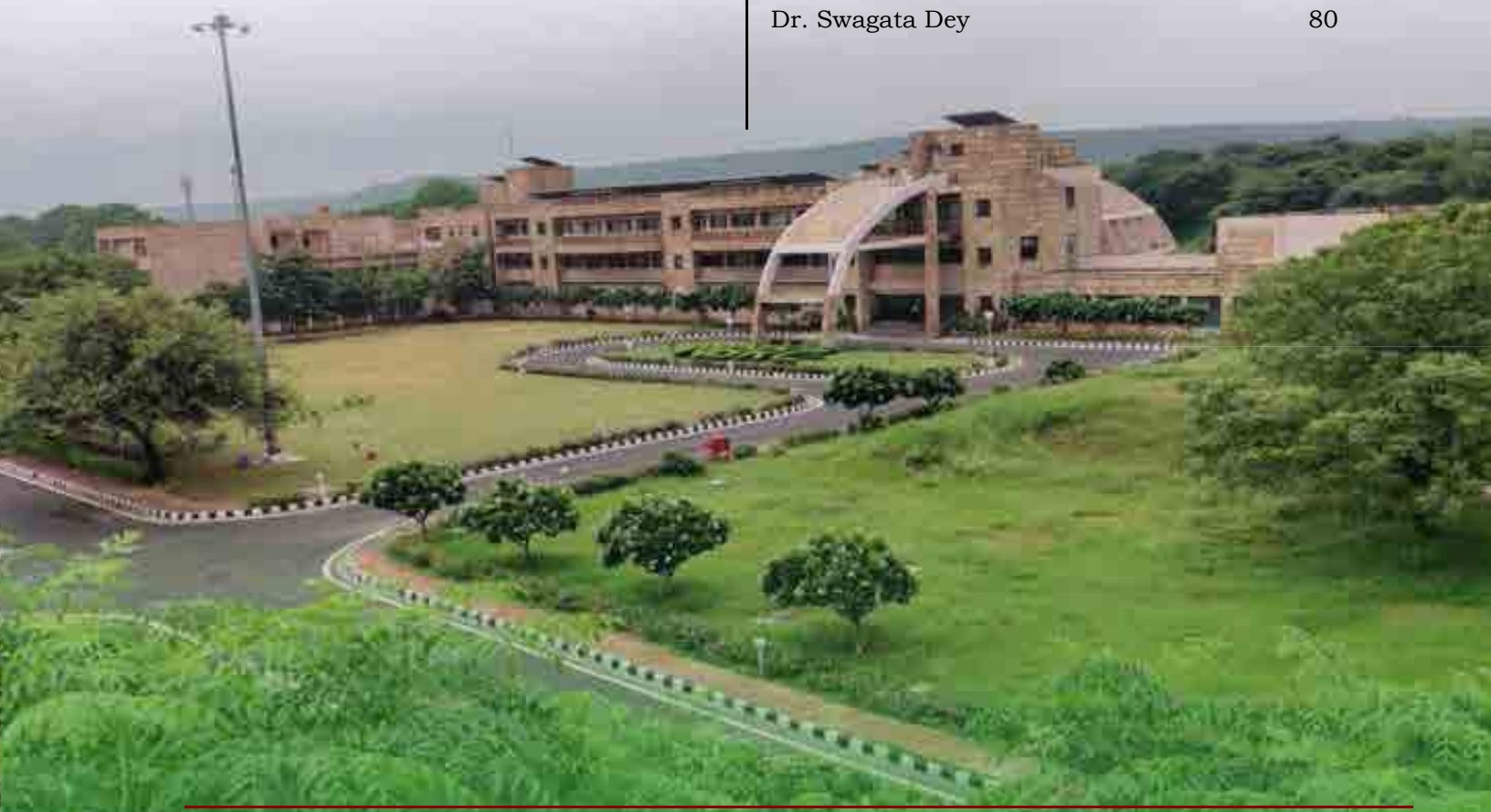
CONTENTS



Compiled & Edited by: Ms. Rashmi Singh, Science Communicator, NBRC.

Lab-based images & others: Ms. Rashmi Singh

Images (NBRC campus & building): Mr. Sibaram Behera, Ph.D. student, Prof. Anindya Ghosh Roy lab

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1997
Announced Nov 14, 1997
1999
Estd. at ICGEB Campus
2002
Deemed University status by HRD
2006
National Neuroimaging Facility Inaugurated
2007
Translational research unit (TRU)
2017
Dementia Science Program
2019
Flagship Program on CMD

Mandate & Objectives

MANDATE

The mandate of National Brain Research Centre (NBRC) is to:

- Pursue research to understand brain function in health and diseases.
- Generate trained human resources with the capability to carry out interdisciplinary research in neuroscience.
- Promote neuroscience in India through networking among institutions across the country.

OBJECTIVES

- Undertaking high calibre research in neuroscience.
- Connecting various national & international scientific research institutions, agencies & laboratories working in the field of brain sciences.
- To become a national apex centre in the field of neuroscience and grow into a world-class institute with state-of-the-art facilities and reservoir of smart databases for brain research.
- To boost socio-economic impact factor on society with fundamental research and findings.
- Establishing one or more satellite centres to serve different regions of the country.

Prof. Krishanu Ray

Director, NBRC

(Professor-H, TIFR, Mumbai)

From Director's Desk

Brain is a fascinating organ, connected to every other organ within the human body. By controlling the sensory information received from various organs in a feedback mode, it acts as an integral element in the management of bodily functions. Besides, the brain function is devoted to aspects of social cognition and decision-making that transcend from individual to collective, inadvertently shaping up the socio-economic system and the surrounding environment. Therefore, knowledge of brain function and health is vital in improving the quality of human life, at both individual and societal levels.

NBRC has made some significant contributions in this direction in the past two decades. Scientists at NBRC have focused their attention on understanding the clinical and fundamental aspects of brain function ranging from cognition to molecular pathology. We are now poised to embark on a new journey to establish one of the premier brain health centers in the country. We envision establishing a unique cognitive research center to study the network activity in both the human and animal brains engaged in visual and auditory perceptions, haptic intelligence, memory, and stress mitigation. A multi-scale approach is indispensable to integrate the systems neuroscience data with molecular neurobiology.

In this context, we are particularly interested to build research consortia on neurodevelopmental disorders (NDD) such as Autism, Epilepsy, Dyslexia, and ADHD. A three-tier program involving fundamental and translational research with Academia-industry partnership and human resource development is envisaged to provide a comprehensive understanding of certain aspects of brain health and deliver tangible societal benefit to the knowledge economy of the nation.

Achievements:

In the past years, our scientists have made significant progress. Our efforts have also yielded a rich set of **719** peer-reviewed publications and 13 patents granted (8 active, 1 lapsed, 4 no longer active) & 4 under review. A summary of the most impactful work is presented below.

a) **Dementia – the science of forgetfulness:** Alzheimer's disease (AD) and similar neurodegenerative disorders affect millions of people worldwide. India has more than 6 million AD patients. The actual cause of AD is unknown and probably multi-factorial. Present medications mainly provide symptomatic relief and do not halt the disease progression. Earlier, it was hypothesized that oxidative stress in the brain's hippocampal area and frontal

cortex regions may be the cause of AD in autopsy studies. Using non-invasive imaging technology, we discovered that significant depletion of the anti-oxidant, glutathione (GSH), in the hippocampal area, is strongly correlated to the impaired cognitive profile of the person, having a mild cognitive impairment (MCI). Subsequently, brain iron levels increased significantly from MCI to AD staging. Data from cohorts comprising healthy volunteers, 100 AD, and 80 MCI patients were collected/curated and imaging parameters were compared with age-matched healthy controls. This breakthrough work was conducted at NBRC in collaboration with AIIMS using state-of-the-art 3T MRI scanner. It also demonstrates an increasing societal engagement in supporting scientific research in the country and vice versa.

b) **Brain** waves are one of the most effective indicators of brain activity. Measured non-invasively using EEG and MEG, it reveals how rhythms of a particular set of frequencies can shape up normal and pathological states of the brain. The modern AI & ML-based data analysis techniques in conjunction with the MRI data have helped us to pin down the origins of these waves and correlate them with specific mental activities such as visual and auditory object recognition and speech comprehension. NBRC scientists have discovered how energy in one specific frequency band (alpha, 8-12 Hz) is important for our attention system, and how individual variability in brain-wide communication in alpha frequencies governs our perceptual states. Further, NBRC scientists working in the area have made a significant discovery using MEG data by showing that alpha communication remains preserved for supporting basic brain functions, under inclement structural degradation during adult lifespan aging from 18-88 years old, and protect certain levels of decision-making efficiency and short-term memory function. In simple terms, an aged individual preserves several cognitive functions such as verbal ability, and fluid intelligence and even gets better with age in complex decision making although the neuron structure goes through lifespan degradation with aging.

c) **Shruti –** the age-old technique of memorizing rhythmic information found resonance in a songbird model. Young male birds learn to sing the tune by listening to their fathers at an early age. Since the signalling molecules are conserved, research studies in this area could play an important role in understating speech and hearing in humans. NBRC scientists have made some progress in identifying some of the key neuromodulatory chemicals in this context. Studies are also being undertaken to understand changes in the brain associated with learning in songbirds.

d) **Neuro-pathology:** NBRC scientists have also made significant inroads in identifying the following features of neurological and neuroinflammatory disorders. These are listed in itemized order.

i) **Host innate antiviral response** might play a critical role in the deterioration of virus-induced neurodegeneration, and subsequent complications. In a clinical setting, NBRC scientists have further demonstrated that the repurposed drug minocycline, an antibiotic, has the potential to reverse/restore the process of neurotropic virus-induced complications.

ii) **Inflammatory and metabolic milieu** in brain tumor progression. NBRC scientists discovered that the interplay between metabolic activity, local cytokine levels, and the genetic and epigenetic landscape of the tumor might play a critical role in the progression of glioblastoma, a devastating brain tumor. In this context, some prognostic molecules are indicated through in vitro research and using patient samples.

Summary of achievements from individual laboratories.

Prof. Pankaj Seth's laboratory has made pioneering contributions to understanding the cellular and molecular mechanisms for virus-induced neurodegeneration. Dr Seth and his research group study how neurotropic viruses such as HIV-1, Zika, and SARS-CoV-2 affect the properties of brain cells and ultimately affect the brain functions of patients affected by these viruses. His group has identified a non-apoptotic pathway that leads to neuronal damage in COVID-19 patients, thereby providing the molecular mechanisms and a better understanding of the Brain fog or neurological sequelae seen in up to 50% of the Long COVID survivors. Most of his findings are validated in post-mortem samples of HIV/AIDS and COVID-19 patients. His laboratory also provides a human neural stem cell platform for understanding various other neurological disorders.

Prof. Anirban Basu's laboratory has been working on deciphering the molecular details of host-virus interactions. Their findings have provided a possible therapeutic target for preventing virus-induced neuronal apoptosis thus improving disease outcome in virus-induced encephalitis. In a collaborative work with RCB and AIIMS-New Delhi, they have shown Bone marrow (BM)-derived extracellular vesicles (EV) modulate the abundance of infiltrating immune cells in the brain and exert an antiviral effect against the Japanese Encephalitis (JV) virus. The studies suggested that BM-derived EVs delay JEV-induced symptoms and death in mice, improve the length of survival, accelerate neurogenesis in primary neuronal stem cells, reduce JEV-induced neuronal death, and attenuate viral replication.

Prof. Pravat K. Mandal's laboratory has established that oxidative stress is one of the possible factors and is believed to play a role in Alzheimer's disease (AD) and it is related to the imbalance of master antioxidant, glutathione (GSH), and metallic deposition in the hippocampus of the brain, responsible for thinking and decision-making. Subsequently, uncontrolled radicals destroy the neuronal cells in the hippocampus area. Prof. Mandal has also found that in the normal person, brain, and blood glutathione levels and metallic profiles are balanced as investigated by using a specialized kit enabled with state-of-the-art imaging and biophysical study for blood GSH and iron levels. This novel study has opened up further investigation for the early detection of AD through these two biomarkers.

Prof. Ellora Sen's laboratory investigates how deregulated metabolism & aberrant inflammation modulate epigenetic landscape to affect genes associated with chemoresistance in glioblastoma-the most malignant of brain tumors. By underscoring the existence of histone modifiers and inflammatory mediator-driven ferritinophagic circuits, their study provides strong evidence for targeting cells toward ferritinophagy-mediated cell death as a treatment regime for gliomas. Their findings have provided novel insight into glioma biology by demonstrating a distinct metabolic-epigenetic landscape in gliomas harboring different molecular signatures, having prognostic values.

Summary of achievements from individual laboratories.

Prof. Ranjit Giri's laboratory is engaged in understanding the mechanisms of perturbation in the genetic expression network of Alzheimer's and prion disease using animal and CNS stem/progenitor cell-based models. His team has found how RIPK-1 functions as a converging point of all death receptors activation. Carboxy-terminal death domain (DD) in RIPK1 binds to the DD of death receptors as well as to adaptor proteins like FADD and TRADD. Death receptors upon ligation with their cognate ligands, recruit RIPK1 either through TRADD dependent and independent manner and dictates multiple cellular pathways related to inflammation, cell survival, and cell death pathways like apoptosis and necroptosis

Dr. Bhavani Shankar Sahu's laboratory investigates the role of Dense core vesicles (DCV) by studying their formation & movement within the cell, and how they spewed out under faulty conditions. The lab is exploring its role in disease conditions such as diabetes, obesity, mental health disorders and other non-communicable diseases.

Dr. M Dhruba Singh's laboratory studies delve into human neurodegenerative & neurodevelopmental disorders using Drosophila disease models.

Prof. Anindya Ghosh Roy's laboratory investigates the functioning of the development and restoration of the nervous system when an injury is caused. Using the nematode Caenorhabditis elegans as a model organism, with a well-established connectome, Prof. Ghosh Roy's lab is working on unraveling the complexity of the human nervous system. With the availability of genetic manipulation and imaging of neurons in live animals, the principles of neuronal development and regeneration are explored.

Prof. Arpan Banerjee's laboratory uses non-invasive technologies like EEG, MEG & fMRI, to decipher the spatial & temporal aspects of information processing within the brain, a fundamentally important property in formulating the basic scientific theories to lay the foundation for investigating the mechanisms of brain dysfunctions in healthy and patients affected with the conditions. It would eventually help in developing neuro-markers for spectrum disorders such as autism.

Prof. Soumya Iyengar's laboratory focuses on the development of brain regions involved in speech and hearing. Using a combination of neuroanatomical and molecular techniques, her lab is studying the development of synapses and different cell types in post-mortem samples of the human auditory cortex from the prenatal period until adulthood. She also works on songbirds (zebra finches), which are vocal learners and excellent model systems to understand brain-behaviour interactions leading to the formation of neural circuits involved in vocalization and vocal learning. Her studies have focused on how a set of neuromodulators (the endogenous opioids) can affect vocalizations and vocal learning. Furthermore, Dr Iyengar's research also delves in studying another songbird house crow model system to understand cognition in avian species. Her lab focuses on studying structural changes in house crow brain regions involved in cognition and reward as well as areas involved in vocalization and hearing.

Prof. Sourav Banerjee's laboratory explores how the dysfunction of neuronal circuits contributes to the wide spectrum of nervous system disorders by studying their formation, maintenance, and functioning in a non-pathological setting. By employing a wide range of biochemical & cell biological techniques, the mechanisms of synapse formation, the regulatory mechanisms of memory storage using non-coding RNA –mediated control of specific protein synthesis, and diet-induced regulatory mechanisms of adult neurogenesis and its implications in remodeling of feeding circuitry are studied in primary culture or in vivo environment.

e) **Neural Stem Cell line:** Scientists at NBRC have developed a stem cell platform to deliver high-impact research outcomes using neural stem cells to understand the mechanisms and basis of brain disorders caused by neurotrophic virus infections in children and young adults. By harvesting the CNS stem cells from transgenic mice expressing mutant genes (APPSwe and PSEN1dE9) linked to Alzheimer's disease, several neurosphere lines have been developed to understand the biology of amyloid plaque formation and associated cellular pathology. This would further our understading in reducing plaque formation in diseased brains.

f) **Molecular Cell Biology of neurons:** Using model organisms, NBRC scientists have unraveled the conserved molecular mechanisms of healing a broken axon and dendrite after a nerve injury. They have identified neuron-intrinsic barriers to the nerve regeneration process in adulthood. In particular, they have shown that regulation of conserved let-7 miRNA, Insulin signaling, and AMP-kinase signaling can promote axon regeneration to help restore the functional loss due to injury. Besides, they have also achieved notable progress in showing- 'How RNA molecules could control synaptic activity during brain development'.

Benefits:

The findings on Alzheimer's and related neurodegenerative disorders have direct application in the diagnosis and preventive therapy of mild cognitive decline in humans. The technology is still under review to be patented.

The findings on brain activity by studying brain waves, have direct implications for MRI and EEG data analysis, a high value in the commercial market.

The assortment of findings discussed under "Shruti, the age-old technique of memorizing rhythmic information, neuro-pathology, neural stem cell line and molecular cell biology of neurons", have multiple application potentials. The main impacts are in the progress of fundamental research.

Human resource development and outreach:

NBRC has fulfilled its mandate as a Deemed-to-be University by training a good number of M. Sc. and Ph. D. students in the past year. We have graduated 08 M. Sc. and 11 Ph.D. students, conducted a major two-week long, hands-on workshop on Animal handling, and certified 74 participants from several other institutions as CPCSEA-certified animal handlers. A multidimensional faculty taught in the workshop and helped the students in acquiring the skills as per international standards. We conducted 20 seminars and public lectures on campus, which were well attended by students and faculty.

In addition, we also conducted 01 quiz contest, 07 campus visits of school and college students, and reached out to local schools to make the students aware of the utility of Brain research. A small museum is established in the Government Model Senior Secondary School, Nuh, Haryana to inform students about the tools used in molecular biology experiments. We also decided to invite requests to establish similar facilities in other schools in the rural districts as part of a structured outreach activity.

In the service platform, NBRC established a 3-Tesla functional Magnetic Resonance Imaging (3T-fMRI) in 2022 and maintains the Magnetoencephalography (MEG) facility on its campus since 2014. Both the MRI and MEG facilities are open to outside users for a service fee. We are operating the MEG facility in collaboration with the All-India Institute of Medical Sciences (AIIMS), New Delhi. The facility serves the need of patients referred from the AIIMS daily. In the past year, we have scanned 346 patients, which helped one of the most accurate diagnoses of the affected foci in the brain. The facility also serves the research community and the data obtained from the facility has been published in 26 peer-reviewed manuscripts. The MRI facility has also earned a modest revenue by offering its services to researchers outside NBRC. In

the future, more such facilities will be offered to the users after catering to the internal needs.

Scientific and Administrative management:

NBRC has concluded its Scientific Advisory Committee meeting on March 10th -11th, 2023. All scientists presented their work to the committee of experts, which scrutinized the achievements and made recommendations. I am happy to note that the committee found good progress and made specific recommendations for further improvements. The guidance of the committee is essential for maintaining the course. It is also important to note that NBRC society has agreed to now merge with the newly envisaged autonomous body – Biotechnology Research Innovation Council (BRIC) - in the coming months. BRIC is a much-needed welcome initiative from the Department of Biotechnology, Government of India. All autonomous institutes of the department have agreed to merge with BRIC to increase the synergy and cooperation in research. NBRC looks forward to its new identity as a BRIC member. It will definitely augment the existing collaboration and initiate new ones with the other BRIC members in the future. As always, the continuous effort and assistance from the administration and support staff at NBRC has sustained in maintaining the aura and esteem of the centre to its best.

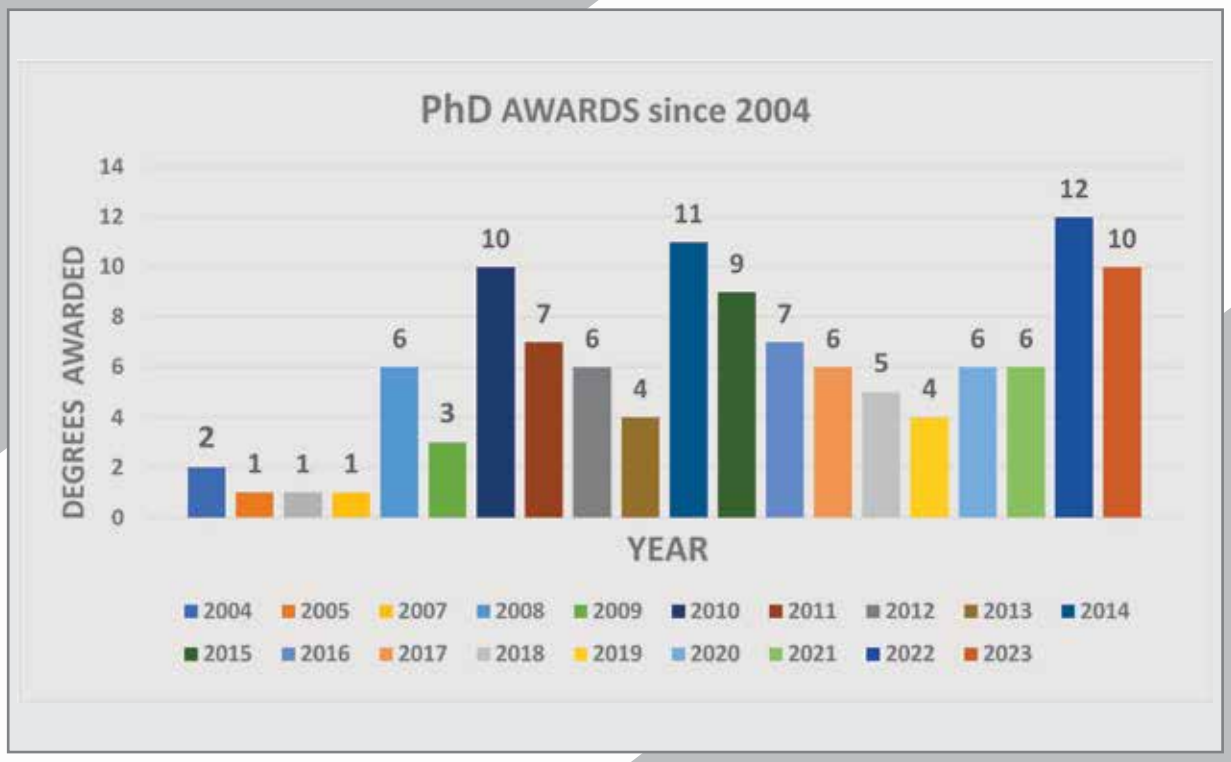
Vision:

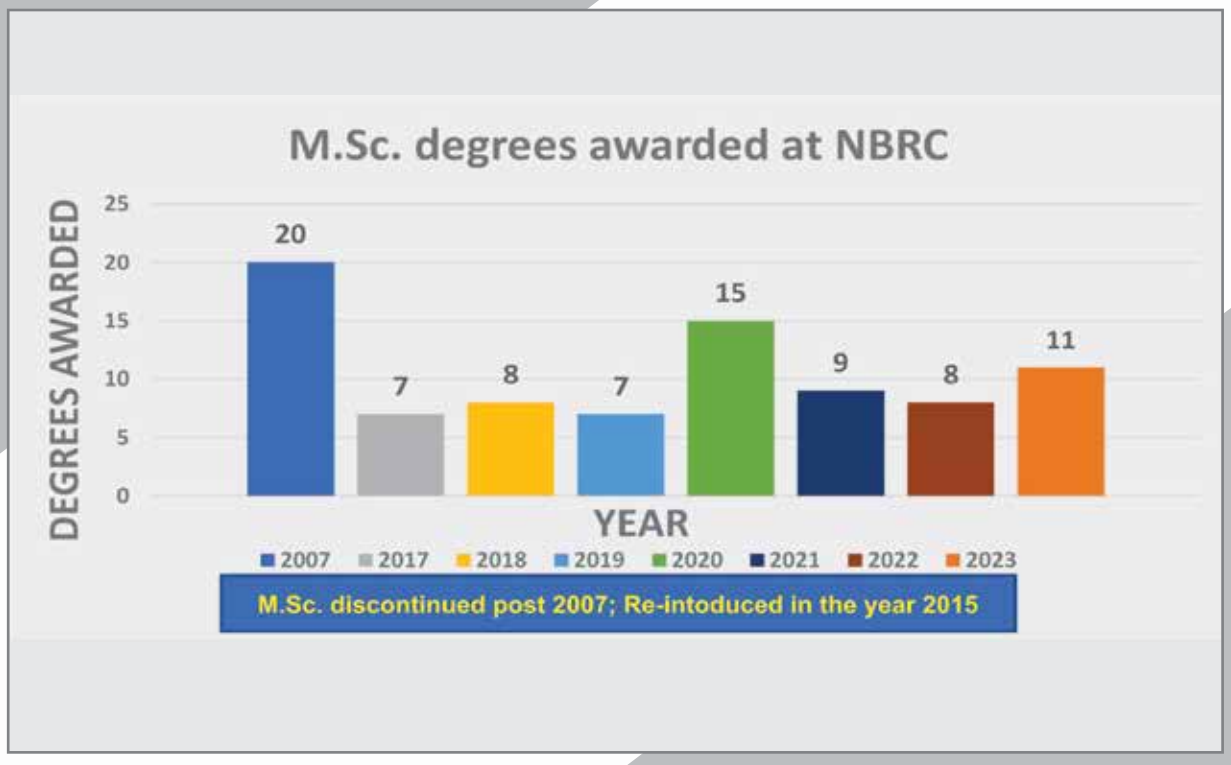
NBRC will be completing 25 years of its existence on 16th December, 2024. This is a momentous occasion for us to take a fresh pledge with renewed vigour. In this context, the faculty of NBRC has started working on a concerted discussion on the future research trajectory of the institute. It is decided that all faculty of the institute will combine their expertise and strength to focus on a singular goal. i.e., to unravel the connectomes underlying the information processing in a brain. In this context, the faculty envisaged embarking on an Advanced Brain Mapping Initiative at NBRC to map the developing and adolescent brains underlying communications and learning. We aim to use non-invasive tools such as the EEG, fMRI, and MEG to map the human brain and compare the data with that from the model animals. Besides, a parallel study on human-induced Pluripotent Stem Cells (hiPSCs) and other model organisms will be initiated to study the molecular biology of the network functions in vitro. We are particularly interested to map the brain and study the underlying molecular biology in the context of NDD such as Intellectual Disability (ID), Dyslexia, and ASD.

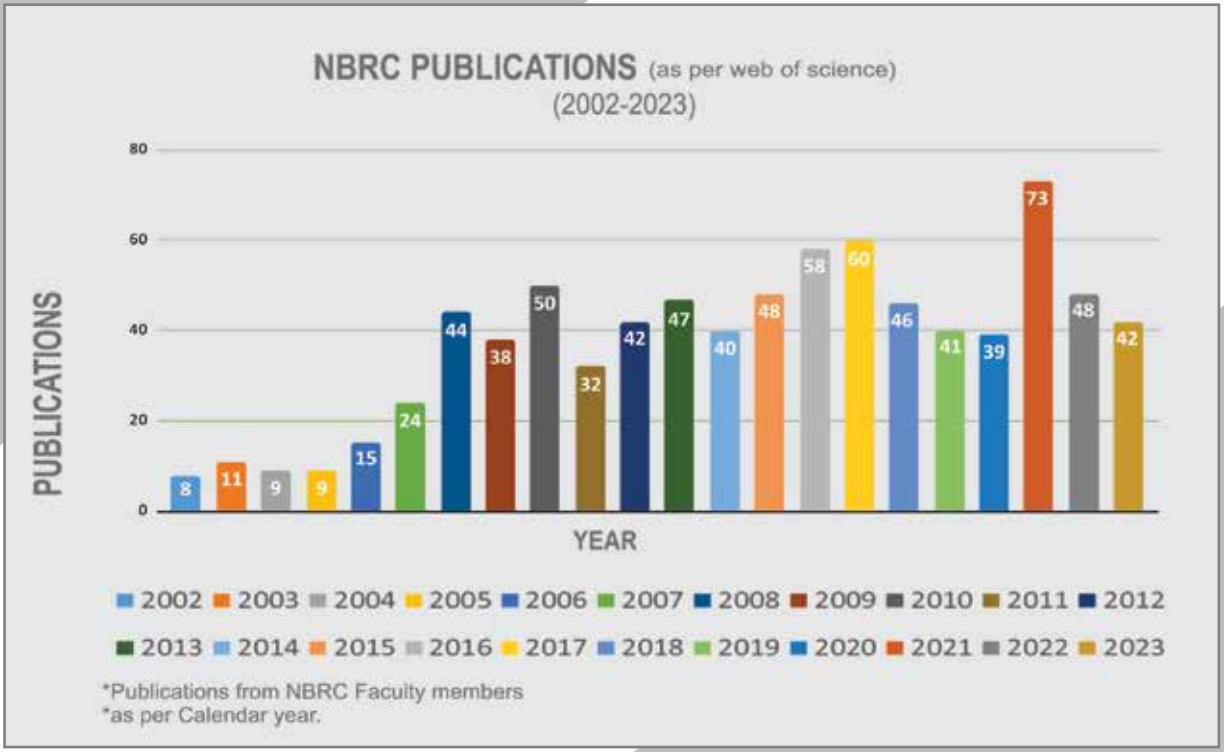
NBRC always maintained high ambition and our researchers have had to manage many challenges to deliver top-class research output in the past. They are now equally enthused to carry on the good work into the next decade. We are now in the course of augmenting and expanding our faculty strength in cognitive neuroscience and physiology. Several new positions are advertised and the selection process has been initiated in the right earnest. In the coming years, we expect to populate the ranks with several new colleagues with the requisite expertise and drive. It will infuse new enthusiasm and energy to further strengthen our resolve for achieving excellence and take a leadership position in the national Brain research field.

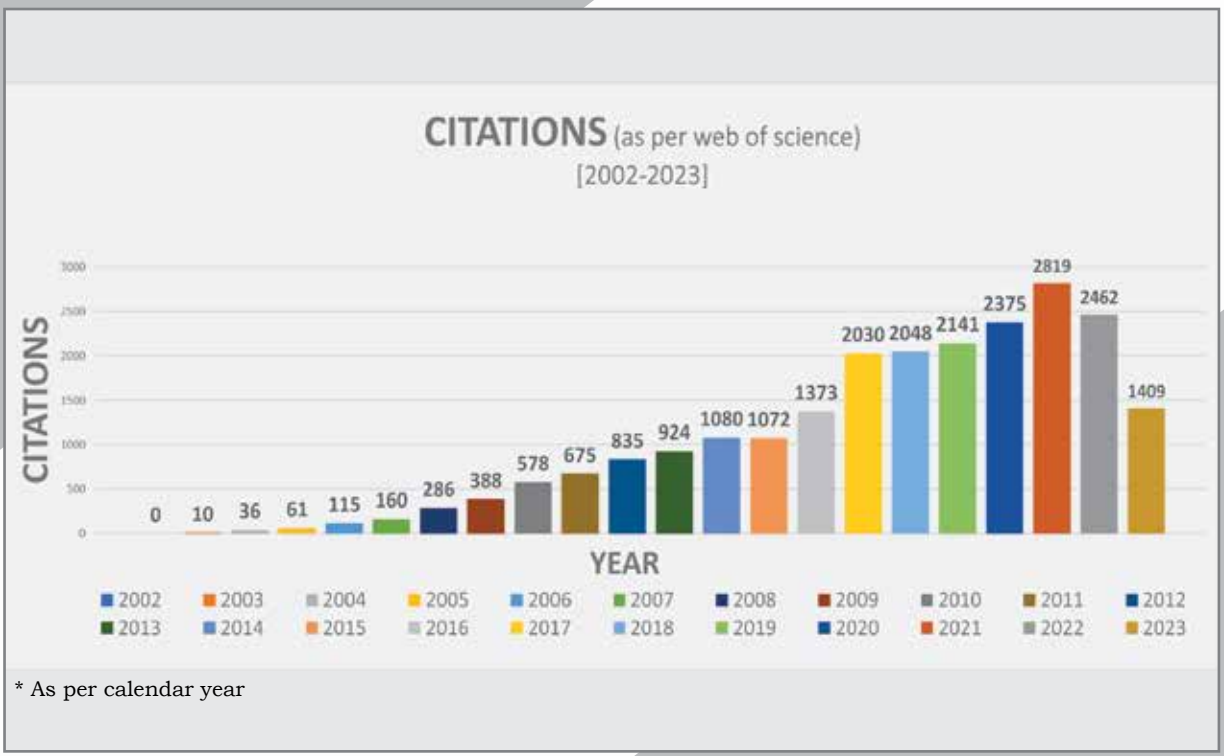
Prof. Krishanu Ray
Director, NBRC
Professor-H, Tata Institute of Fundamental Research, Mumbai

NBRC at a glance

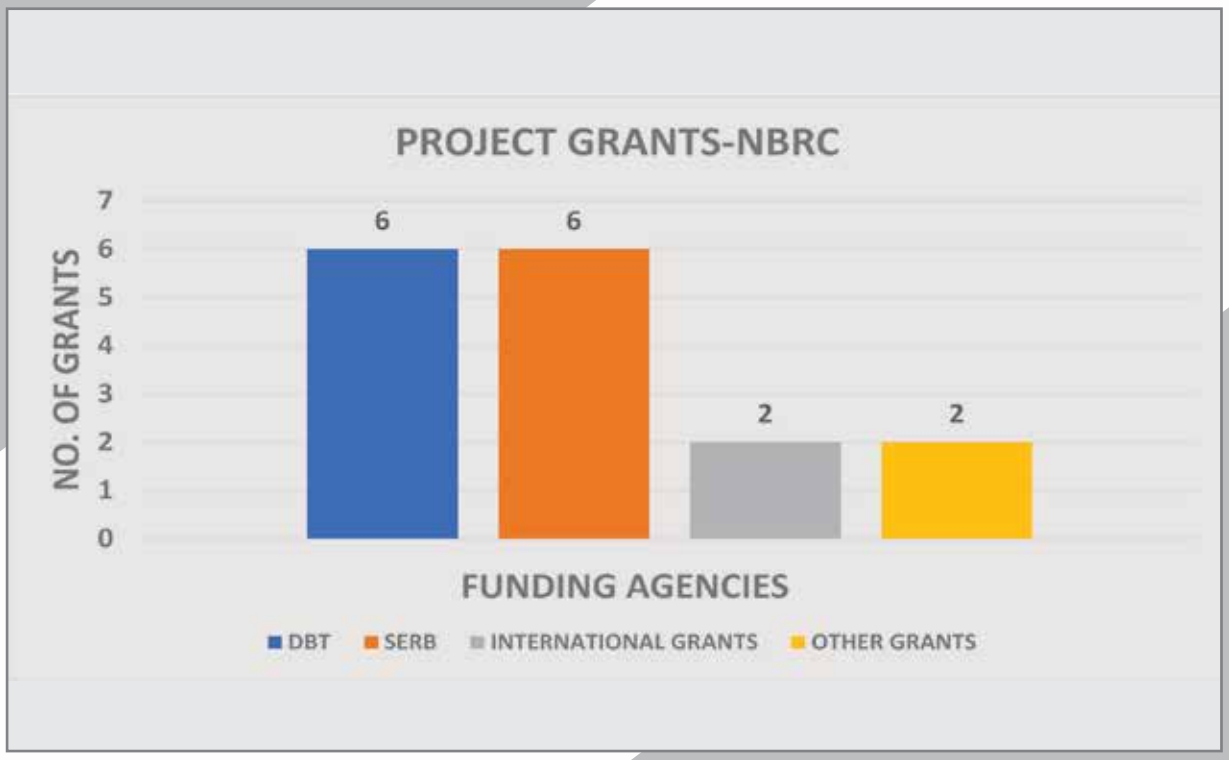








* As per calendar year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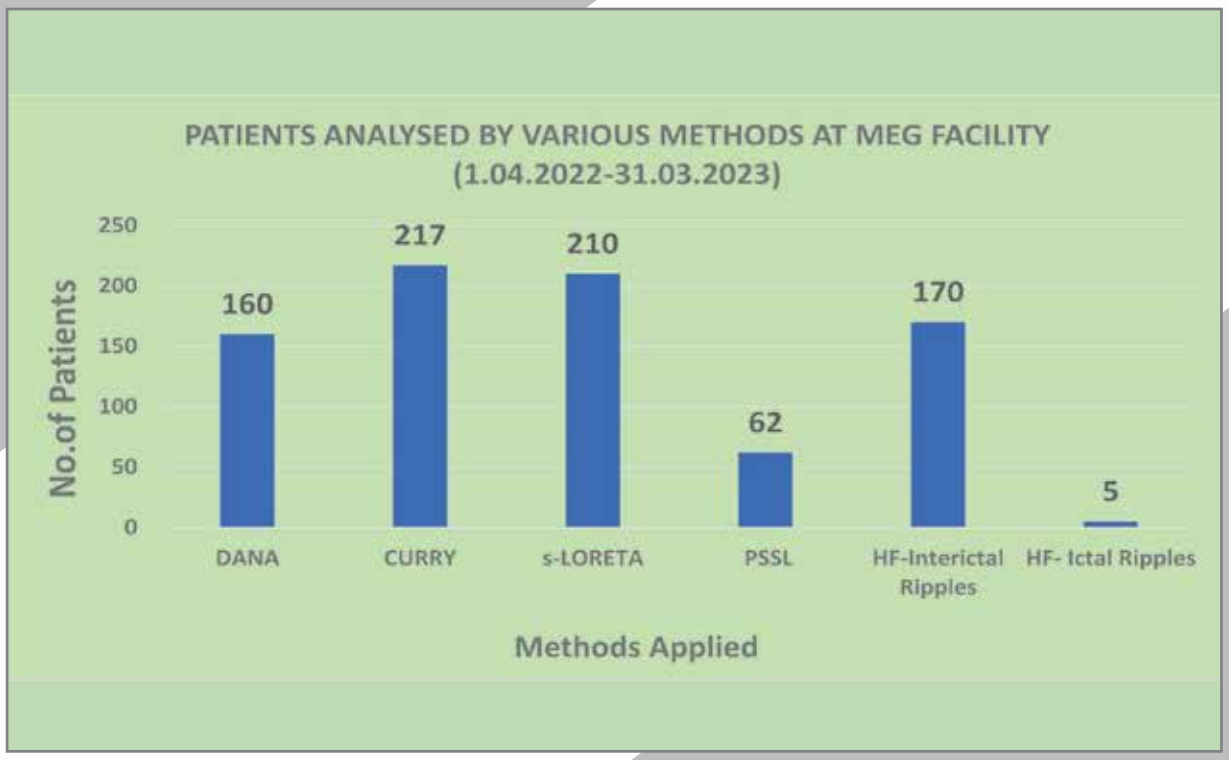
INTERNATIONAL GRANTS
OTHER GRANTS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(1.04.2022-31.03.2023)
No.of Patients
250
200
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217
210
62
170
5
DANA
CURRY
s-LORETA
PSSL
HF-Interictal Ripples
HF- Ictal Ripples
Methods Applied

Scientific Reports

NBRC Laboratory Divisions

"multidisciplinary approaches to understand complex processes forming the basis of brain mechanisms"

Cognitive & Computatn. Neuroscience

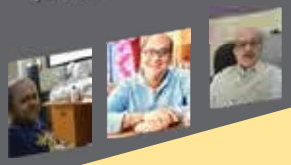
Arpan Banerjee
Pravat K. Mandal

Disease Pathology

Pankaj Seth
Ellora Sen
Anirban Basu
Ranjit K. Giri
*M. Dhruba Singh

Cellular & Molecular Neuroscience

A Ghosh Roy
*Bhavani Sahu
Krishanu Ray

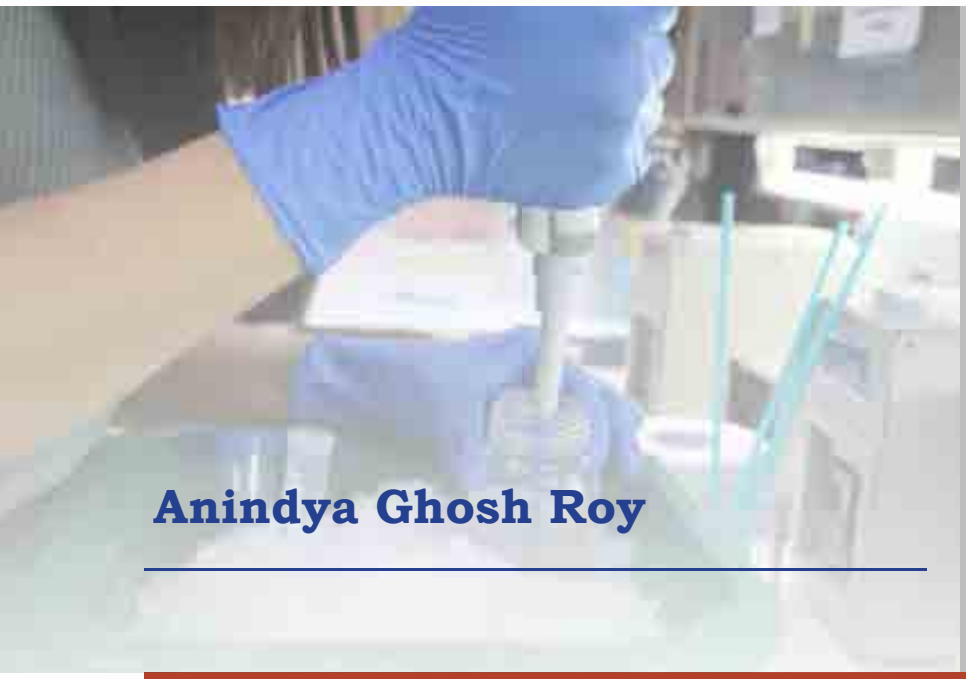


Physiology & Systems

Soumya Iyengar

Behavioral Neuroscience

Sourav Banerjee



Anindya Ghosh Roy

Principal Investigator:
Anindya Ghosh Roy
Cellular & Molecular Neuroscience, Systems Neuroscience

Ph.D. from the Tata Institute of Fundamental Research, Mumbai and postdoctoral research from Columbia University, NY and University of California, San Diego, Anindya Ghosh Roy and his team is involved in understanding the functioning of the development and restoration of the nervous system when an injury is caused.

Research Associate/Post-doctoral Fellows:
Swagata Dey (India Alliance Early career fellow)

PhD Students:
Harjot Kaur, Sibaram Behera,
Sunanda Sharma, Pallavi Singh, and Dhyey Vyas

MSc Students:
Sreyashi Bhattacharjee

Project Assitants:
Kavi Nila, Mydhiy Vasudevan, and Sruthy Ravivarma (SERB grant)

Technical Assistant:
Sumit Mahapatra

Development and repair of neural circuit in *C. elegans*

Background

The goal of our research team is to understand how neurons and neuronal circuits develop and maintain normal function and regenerate.

We are using a variety of approaches to study the development and function of neural circuits in vivo, including genetics, genomics, sub-cellular imaging, laser neurosurgery and optogenetics. Since *C. elegans* is transparent and has a simple nervous system, we can manipulate and observe individual neurons in a living animal.

Focus

We are interested in understanding how neurons are polarized during the initial stages of development, how neural circuits respond to injury in adulthood; and how molecular mechanisms such as cytoskeleton dynamics, RNA based mechanisms, and intracellular signalling affect these processes. One major focus is axon regeneration.

1) Regulation of neuronal microtubule cytoskeleton

Microtubules play an important role in the development and maintenance of the nervous system. It is not clear how microtubules are differentially organized in the dendritic and the axonal compartments of the neuron. We are using *C. elegans* mechanosensory neurons to address these questions. We previously showed that loss of KLP-7, a kinesin-13 family microtubule depolymerizing protein, leads to ectopic neurite extensions in touch neurons, which can be suppressed by the pharmacological destabilization of microtubules (Puri et al., 2021). We hypothesized that a forward suppressor genetic screen in klp-7 mutant might help identify some novel regulators of the neuronal microtubule cytoskeleton. We isolated 26 suppressors from 12,422 F1s in a clonal EMS mutagenesis screening in klp-7(0) background. We mapped these suppressors by combining whole genome sequencing and EMS density mapping using MimodD tools on the Galaxy user interface.

About nine suppressors mapped either into mec-7 (β-tubulin) or mec-12 (α-tubulin) gene. Interestingly, one of the suppressors was mapped to muscleblind-1/mbl-1 gene. MBL-1 is a muscle-blind family protein that regulates alternative splicing, RNA stability and RNA localization. Mutations in mbl-1 have been linked to neuromuscular disorder myotonic dystrophy. We found that loss of mbl-1 affects microtubule dynamics and axonal transport in touch neurons. Moreover, we found that MBL-1 regulates the stability of mec-7 and mec-12 mRNA transcripts in these neurons. Our work elucidated a previously unknown link between RNA binding protein and cytoskeletal machinery for the development and maintenance of the nervous system (Puri et al., 2021, doi: https://doi.org/10.1101/2022.09.07.506915).

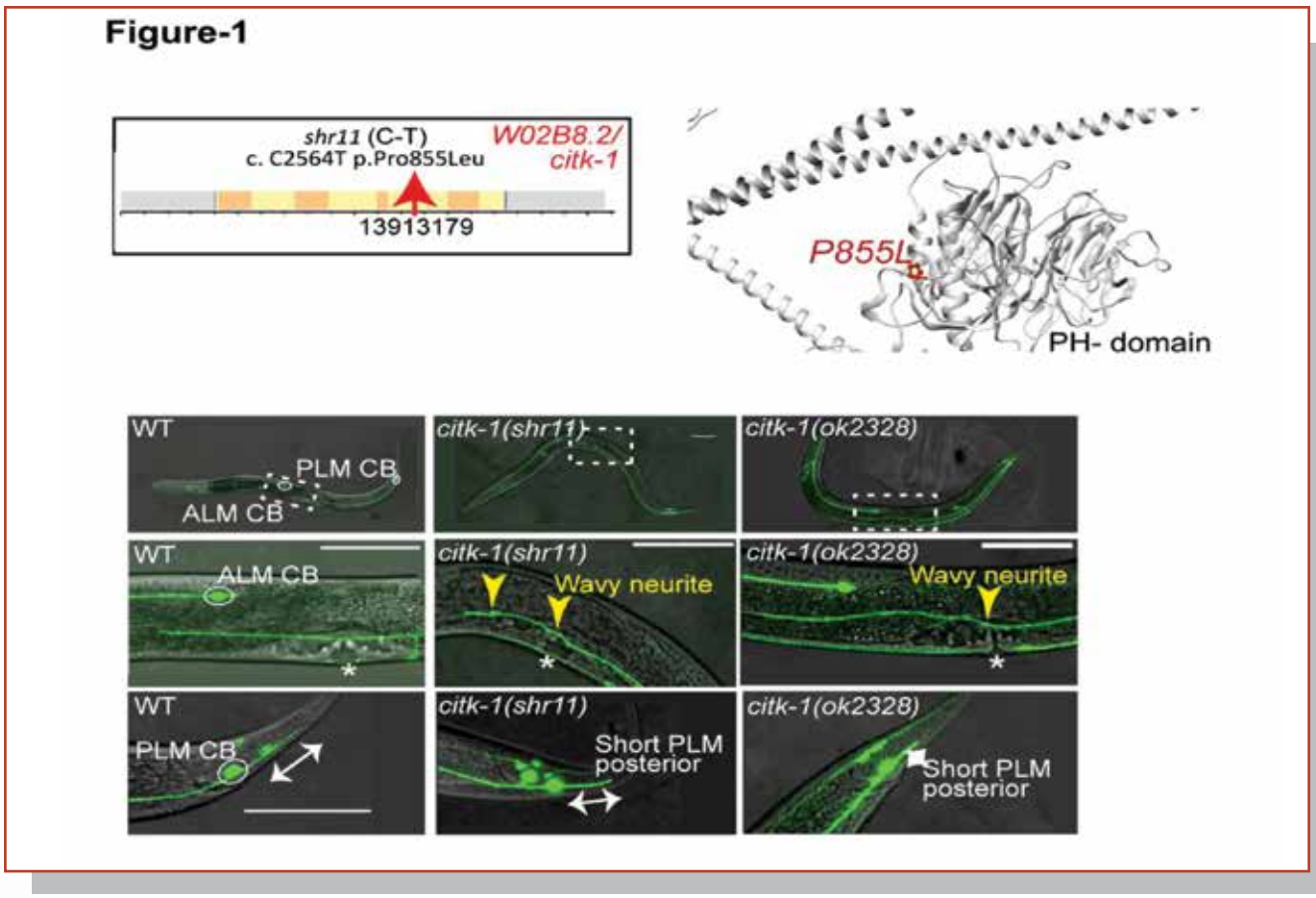


Figure 1: Role of Citron Kinase (CITK-1) in neuronal cytoskeleton.

Mutation in citk-1 gene and neuronal phenotypes seen in citk-1 mutant.

Another suppressor was mapped to W02B8.2/citk-1, an ortholog of mammalian citron kinase gene. Mutations in citron kinase have been associated with microcephaly in humans. Worms have another paralog of W02B8.2/citk-1, which is F59A6.5/citk-2. We observed that loss of either of these genes could independently suppress klp-7(0) phenotype. We also observed that loss of either of citron kinases leads to morphological defects in the PLM mechanosensory neurons of *C. elegans.* The anterior process of PLM neuron is wavy in mutant with occasionally also forming an ectopic branch. Using the plus-end binding EBP-2::GFP reporter, we found that the microtubule dynamics is upregulated in the W02B8.2/citk-1 mutant. Therefore, our work suggests that citron kinase plays a novel role in regulating neuronal microtubule dynamics (Figure-1).

2) Neuronal Regeneration

During the lifetime of an individual, routine activities may cause injury to neuronal circuits, which affect the quality of life or in severe cases can be fatal. Despite a comprehensive understanding of the mechanisms underlying the development of the nervous system, the pathways that repair damage after injury remain poorly understood. This is very important from the point of therapeutics as adult nervous system is extremely refractile to repair after accidental damage. Our past work has helped develop *C. elegans* mechanosensory neuron as a model for axon regeneration studies. The conserved Dual Leucine Zipper Kinase (DLK-1) pathway is essential for axon regrowth. Consequent to these discoveries, several efforts have been made using model systems such as worm, fly,

and fish to understand the neuron-intrinsic mechanisms of axon regrowth. However, mechanistic aspects of functional recovery during axon regeneration was unclear. In our lab at the National Brain Research Centre, we have established a neurosurgery protocol with 2-photon lasers. Further, we have noticed that the axotomy of Posterior touch neuron PLM leads to a dramatic loss of posterior touch sensation. Using this experimental paradigm, we have shown the regeneration potential declines both at anatomical and functional level as the worms age. Furthermore, we screened for known axon regeneration pathways that might improve functional recovery in older age.

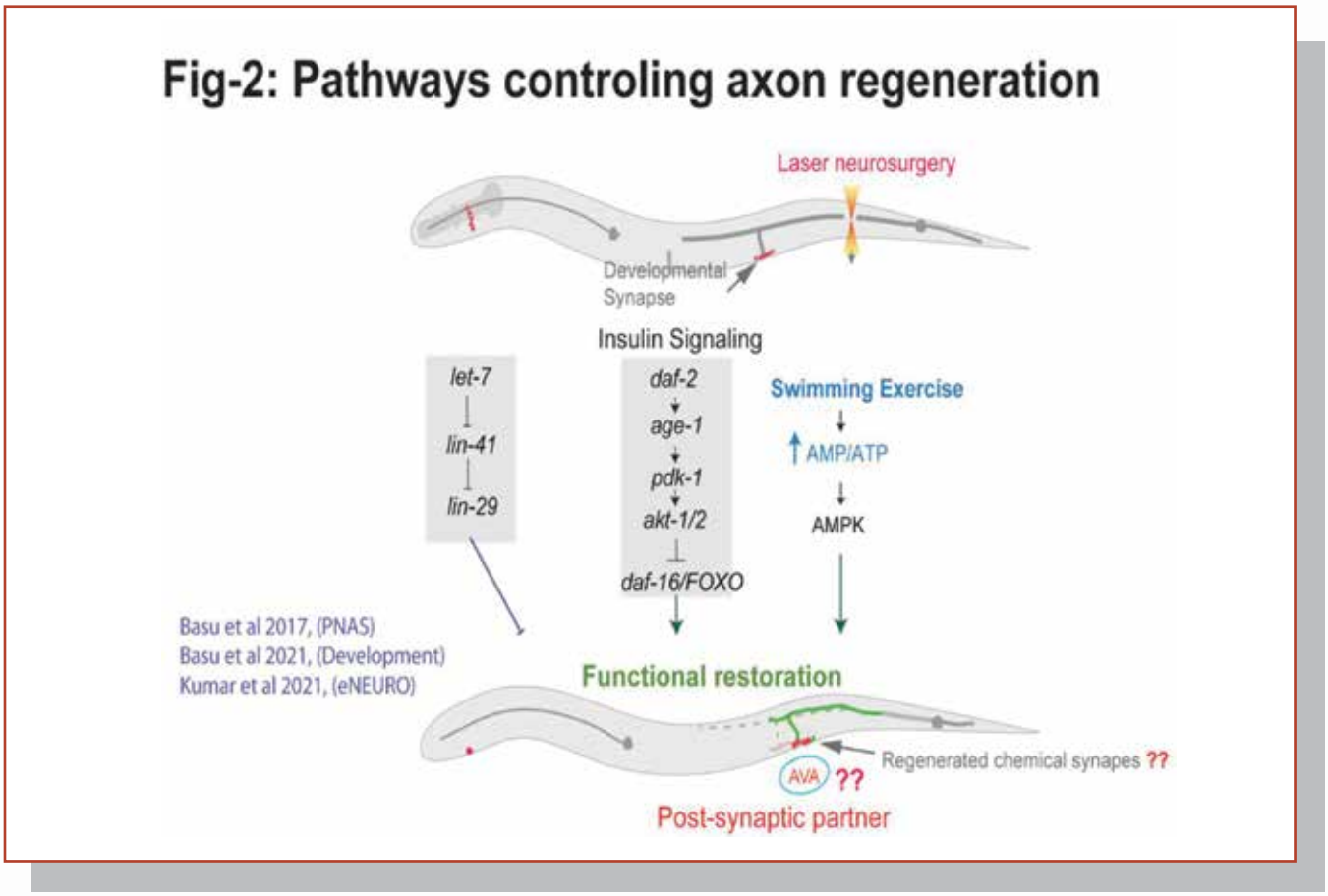


Figure 2: The illustration shows how manipulation of either let-7 miRNA, Insulin signalling (IIs) or AMP Kinase promotes axon regeneration in adulthood.

We have discovered that a self-fusion of injured proximal and distal end leads to rapid functional repair (Basu et al., 2017). We further found that proper targeting and synapse formation of an injured axon is controlled by Insulin signaling (IIS) (Basu et al., 2021). Finally, we have shown recently that axon regeneration can be enhanced by physical exercise (Kumar et al., 2021).

AMPK signaling in Swimming exercise mediated functional improvement

Rehabilitative therapeutic approaches including physical exercise are a promising direction to improve functional recovery. Understanding specific downstream mediators of physical exercise might help to

design a better therapeutic strategy. A single swimming session mimics the key features of the mammalian exercise in *C. elegans* (Laranjeiro et al., 2017).

Using the posterior lateral microtubule neuron (PLM), required for the posterior gentle touch sensation, we previously found that a single swimming exercise session of 90 minutes improves the posterior gentle touch function of day 5 stage worms, which gets normally compromised due to aging. We also found that swimming exercise improves axon regeneration and associated functional recovery after laser-induced axonal injury (Kumar et al., 2021). The metabolic sensor AMPK/AAK-2 is a key mediator of the beneficial effects of swimming exercise (Kumar et al., 2021). Using the established aging and axotomy paradigms in PLM neurons, we tested several upstream and downstream effectors of AMPK signaling. Here, we found that LKB1 serine /threonine kinase orthologue PAR-4, which phosphorylates AMPK upon depletion of ATP is also required for swimming-mediated functional improvement. Among the downstream effectors, we found that DAF-16 (FOXO) and MDT-15 (PGC1α) are required for the swimming-mediated positive effect. The beneficial impact of swimming exercise was not observed when PAR-4/AAK-2/DAF-16 axis was specifically removed from the body wall muscle using RNAi. This supports that the body wall muscle is a key hub regulating the swimming exercise effect. We are currently studying muscle-neuron communication in the context of swimming exercise using tissue-specific RNAi and rescue experiments (Figure-3).

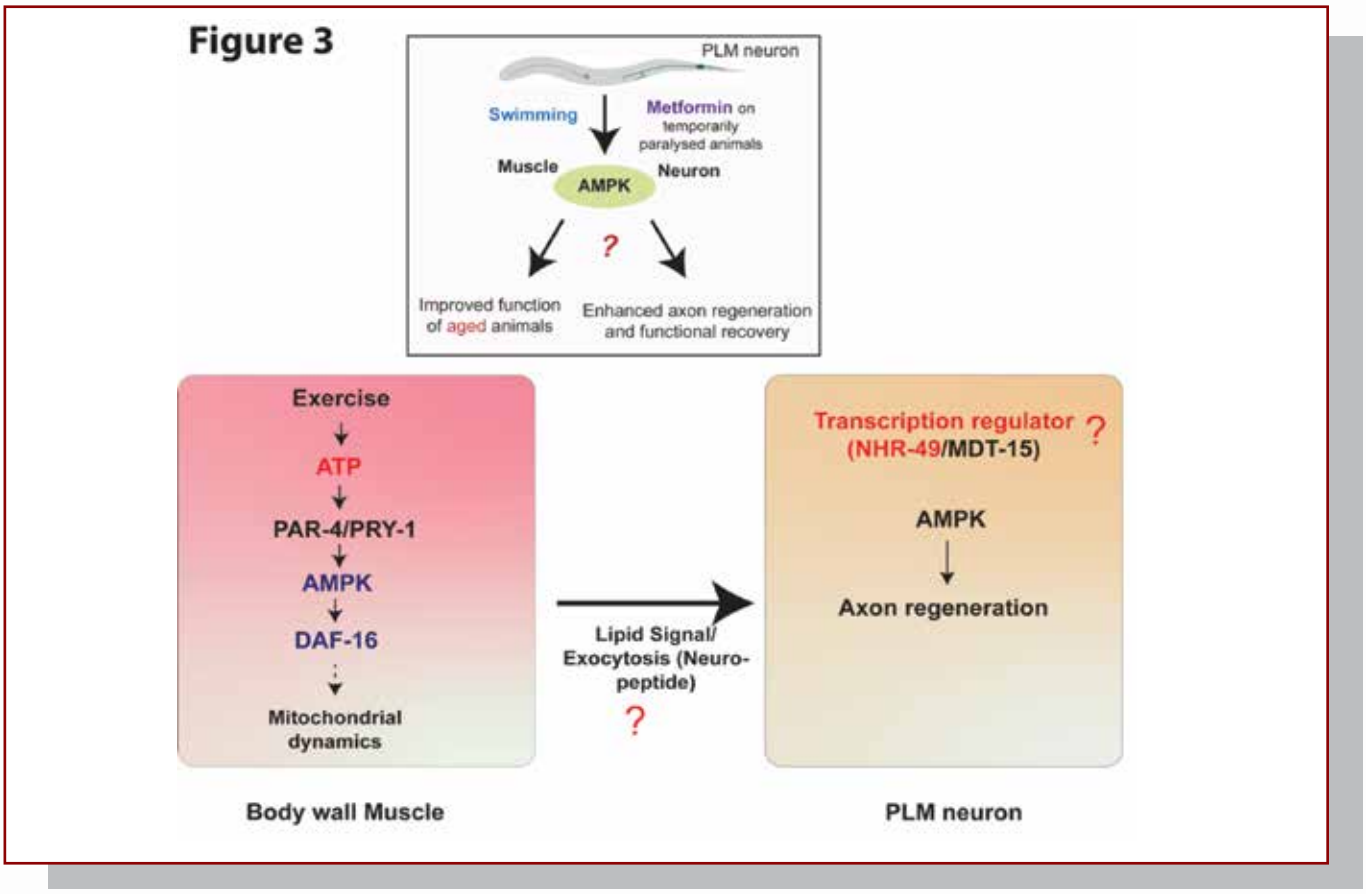


Figure 3: AMPK signalling in body wall muscle regulates functional recovery through DAF-16 and MDT-15

3) Study of Dendrite Regeneration using PVD neuron as Model

The information-receiving units of a neuron, dendrites are equally vulnerable to physical insults. However, less is known about dendrite regeneration (Ramón y Cajal, 1991, Thompson-Peer et al., 2016). To understand the mechanisms of dendrite regeneration, we used PVD neurons, having branched dendrites. The PVD neurons are responsible for harsh touch sensation. After the primary dendrite was severed near the cell body, we observed that the regrowth started from the injured tip and continued following a similar trajectory with complex branching patterns. We found that neither initiation of regrowth nor branching is affected by the axon injury pathways. Surprisingly, we found that a small GTPase CED-10 (RAC) and an upstream GEF TIAM-1 is essential for dendrite regeneration. Our work provides a framework for understanding the cellular mechanism of dendrite regeneration using PVD neuron (Brar et al., 2022, PLOS-Genetics).

Use of ultrafast laser in the past decades have allowed researchers to perform precise injuries to neurites in various model systems (Yanik et al., 2004) for studying the mechanism of neurite regeneration. However, these methods are labor intensive and expensive creating bottlenecks for high throughput assays like RNAi screening for discovering unanticipated pathways.

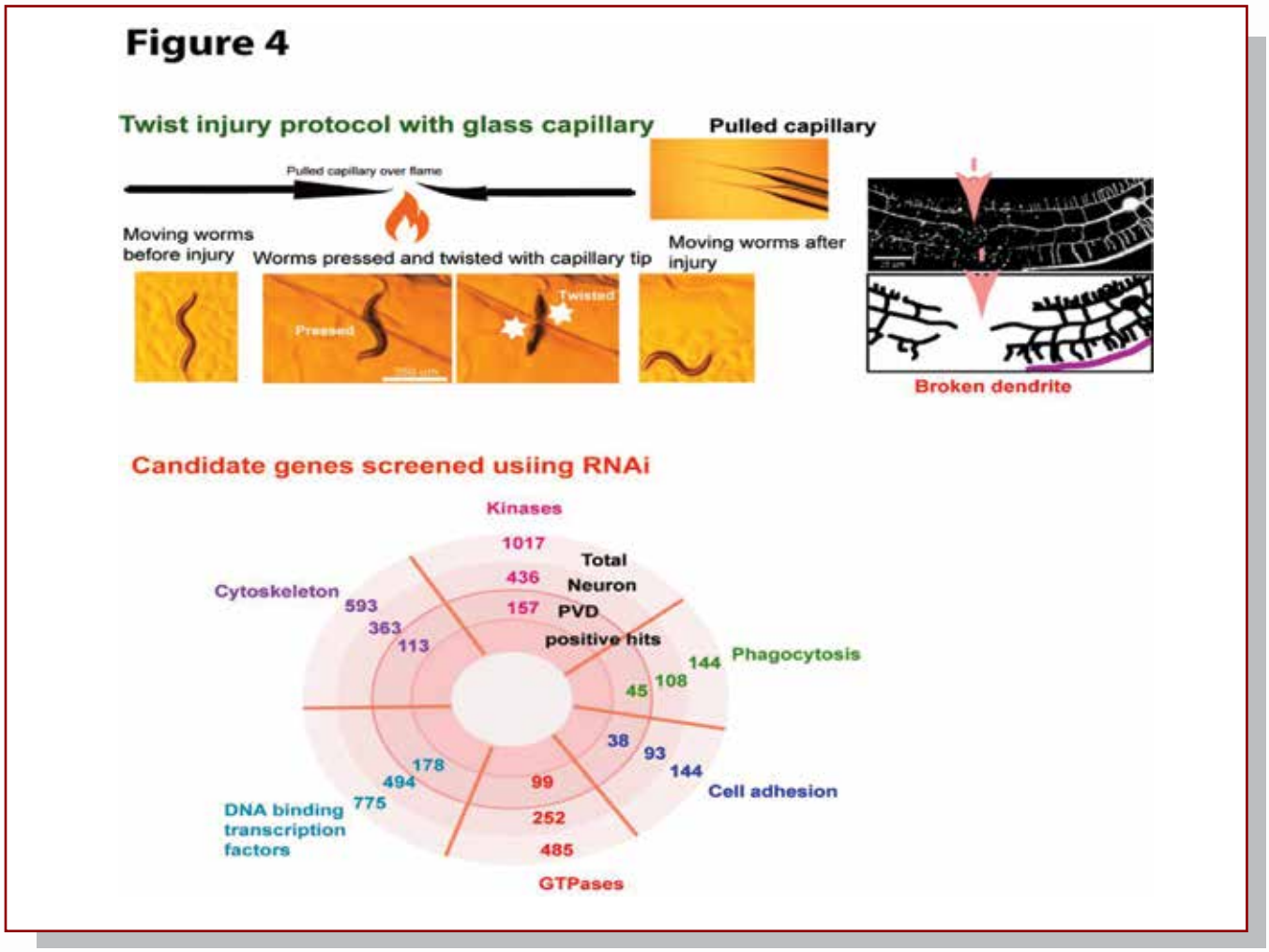


Figure 4: The illustration of new neurite injury protocol and RNAi screening for genes regulating dendrite regeneration in PVD neuron.

In this study, we have devised an inexpensive and efficient method to injure the PVD dendrites precisely without causing any major health hazards. In this method, a drawn capillary is placed and rolled posterior to the vulva causing a twist and break in the major dendrite of PVD neurons. More than 90% of worms survive this injury and other health parameters like reproductive health and locomotion are unaffected. This protocol allows breaking the primary dendrites of PVD neuron at specific sites with 90% success at the rate of 4-5 worms per minute on the NGM plate itself. This overall speed up the injury protocol more than ten times in comparison to dendrotomy with lasers. The outcome of twist injury is comparable to laser-induced dendrotomy in terms of length of longest regenerated neurite, branching and self-fusion events. Dendrite regeneration following the twist injury is dependent on pathways such as CED-10 RAC GTPase and AFF-1 as discovered using laser-assisted protocol before (Oren-Suissa et al., 2017, Brar et al., 2022). This validated our protocol for studying dendrite regeneration using genetic screening. We further discovered that there is a sharp decline in dendrite regrowth potential upon transition from L4 larval stage to day-1 adulthood.

To screen for the genes controlling dendrite regeneration, we developed a RNAi sensitive strain overexpressing sid-1 in PVD. This injury protocol combined with RNAi allowed screening of 300 genes per month. Using this approach, we have identified dendrite regrowth promoting molecules involving small GTPase RAC-2, integrin subunit PAT-2, and apoptosis inducing factor WAH-1, required for phosphatidylserine externalization in non-apoptotic cells.

This study not only opened up avenue for high throughput neurite injury, but also revealed new mechanisms controlling dendrite regeneration.

Collaborators:

Sandhya Koushika, TIFR, Mumbai, India

Sourav Banerjee, NBRC, India

Smarajit Polley, Bose Institute, Kolkata

Kavita Babu, IISER-Mohali

****

Anirban Basu

Principal Investigator :
Anirban Basu
Cellular & Molecular Neuroscience, Translational Neuroscience

Doctoral work from the Indian Institute of Chemical Biology (IICB), Kolkata & post-doctoral work from Pennsylvania State University College of Medicine, U.S.A, Dr. Basu's research is primarily directed towards discovering therapeutic strategies against neuro-inflammatory and neuro-degenerative disorders.

Research Fellows :
Surojit Chakrabarty
Meenakshi Bhaskar
Shivangi Sharma
Stuti Mohapatra
Indira S Priya

M.Sc. (Neuroscience) student :
Triparna Chakraborty

Research Associate :
Atreye Majumdar

Technician C :
Kanhaiya Lal Kumawat

Technician B :
Manish Dogra

Molecular approaches to understand the pathophysiology and pharmacology of infection & inflammatory disorders of Central Nervous System (CNS)

Japanese Encephalitis Virus (JEV) entry into the host is followed by viral replication in the peripheral region, which in turn is accompanied by activation of innate & adaptive arms of the immune system. In the case of adults, the immune system is normally capable of eliminating virus from the circulation thus preventing it from invading the central nervous system (CNS). Whereas in children & geriatric patients, owing to weaker immune response against JEV, the latter enters the CNS, thus initiating a vicious cycle of inflammatory reactions, which ultimately leads to neuronal death and subsequent glial cell activation. This virus-induced encephalitis is considered as the most critical factor resulting in patient mortality in case of JEV infections.

Virus replication inside a host cell is a complex process involving various steps like viral entry, unpacking of viral genomes, genome replication, virus packaging and egress. Each of the aforementioned processes involve activity of a plethora of molecules, which acting in concert result in the successful completion of the intracellular life cycle of virus. Our lab has been working on deciphering the molecular details of various steps of the viral lifecycle thus contributing significantly to the field of host-virus interactions. In recent years, we have used West Nile Virus (WNV) to compare several of our findings from our studies with JEV.

In a recent study, we have established, how miR-451a regulates neuronal cell apoptosis by modulating 14-3-3ζ-JNK axis upon flaviviral infection. We have used both JEV & WNV in this study. Loss of neuronal cells following viral infection-induced neuronal death imposes significant challenges to CNS homeostasis eventually resulting in loss of CNS tissue integrity and poor disease outcome in patients. In our present study, we aim to evaluate the role played by miRNA in modulating neuronal death upon neurotropic flaviviral infections. Infection of neuronal cell-line resulted in upregulation of miR-451a abundance. Upon its upregulation, miR-451a has been demonstrated to target 3'-UTR of 14-3-3ζ transcript culminating into downregulation of 14-3-3ζ at the protein level. In response to 14-3-3ζ protein depletion in the cytosol upon flavivirus infection, increased phosphorylation of JNK protein has been shown to take place thus paving the way for the cell to undergo apoptosis. Reversal of virus-induced miR-451a-upregulation helped abrogate neuronal apoptosis, which is accompanied by a restoration of 14-3-3ζ protein and phosphorylated-JNK abundance to its normal level. Our findings, hence provide a possible therapeutic target for preventing JEV/WNV-induced neuronal apoptosis thus improving disease outcome in flaviviral infection-associated encephalitis.

In another recent work, we have determined that Pyruvate dehydrogenase kinase-1 (PDK-1) promotes neuronal apoptosis upon JEV infection. In present study, we have demonstrated the role played by JEV in modulation of neuronal PDK-1 abundance and its effect upon neuronal health. Infection of neurons by JEV culminates into upregulation of PDK-1 abundance. Albeit inhibition of JEV-induced PDK1-upregulation was accompanied by enhanced JEV propagation in neurons, abrogation of PDK1-upregulation was demonstrated to ameliorate neuronal apoptosis. PDK1 inhibition-associated reduction in neuronal death was observed to be associated with reduced generation of reactive oxygen species (ROS) in neurons. Our study hence provides a possible therapeutic

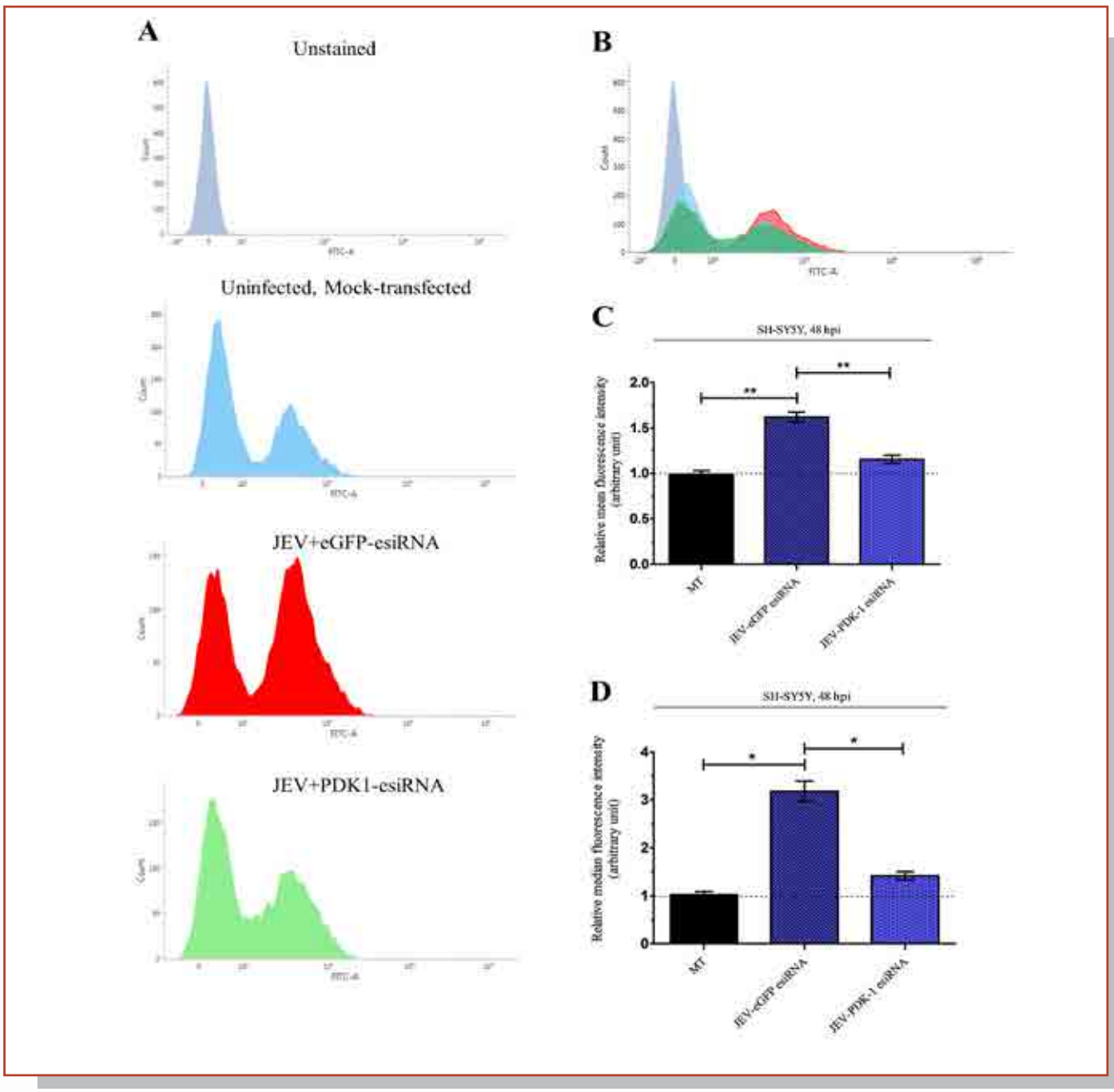


Figure 1: JEV-induced PDK-1 upregulation promotes reactive oxygen species generation in SH-SY5Y cells.

Histogram showing ROS generation by SH-SY5Y cells treated under variable conditions as represented in figure (A) (unstained + uninfected, DCFDA-Stained + uninfected + mock-transfected, DCFDA-stained + JEV-infected + enhanced GFP-transfected, DCFDA-stained + JEV-infected + PDK-1 esiRNA-transfected) and harvested after JEV infection for 48 hours at 3 MOI. (B) Overlap of histograms shown in A denoting difference in ROS abundance in SH-SY5Y cells treated under different conditions. Relative mean fluorescence intensity (C) and relative median fluorescence intensity (D) of SH-SY5Y cells uninfected/ JEV-infected + mock-transfected/enhanced GFP-transfected/PDK-1 esiRNA-transfected (infection performed at MOI 3 and for 48 hours) have been derived from histograms. Bar graphs shown in the figure represent data in the form of mean ± SD from three different experiments. Two-tailed Student's t-test has been used for estimation of statistical difference of values between two groups. **P < 0.01, *P < 0.05.

target, which upon modulation might help combat JEV infection-associated neuronal apoptosis via restoration of JEV-associated ROS generation.

In a collaborative work, we have shown Bone marrow (BM)-derived extracellular vesicles (EV) modulate the abundance of infiltrating immune cells in the brain and exert an antiviral effect against the Japanese Encephalitis virus. The in-vitro and in-vivo studies suggested that BM-derived EVs delay JEV-induced symptoms and death in mice, improve the length of survival, accelerate neurogenesis in primary neuronal stem cells, reduce JEV-induced neuronal death, and attenuate viral replication. BM-EVs treatment upregulated interferon-stimulated genes. Flow cytometry analysis revealed a reduction in the frequency of macrophages. At the same time, CD4+ T cells and Neutrophils were significantly augmented, accompanied by the alteration of cytokine expression with the administration of BM-EVs, reinforcing the immunomodulatory role of EVs during JEV induced encephalitis.

In conclusion, our study describes the beneficial role of BM-EVs in limiting JEV pathology by attenuating virus replication, enhancing antiviral response, and neurogenesis in primary neuronal stem cells. However, BM-EVs do not seem to protect BBB integrity and alter immune cell infiltration into the treated brain.

Collaborators:

Pankaj Seth, and Arpan Banerjee, NBRC

Sudhanshu Vrati, Prasenjit Guchhait, and Arup Banerjee
RCB, NCR Biotech Cluster, Faridabad

Vivek Sharma
Department of Biological Sciences
Birla Institute of Technology and Science
Pilani, Hyderabad Campus, Hyderabad

****

Arpan Banerjee

Principal Investigator :
Arpan Banerjee
Computational Neuroscience, Translational Neuroscience, Systems Neuroscience, Cognitive Neuroscience

Ph.D. from Florida Atlantic University, Boca Raton, USA, Arpan Banerjee's lab at NBRC, is engaged in exploring spatial & temporal organization human brain function from the perspective of large-scale neural networks mechanisms using EEG/ MEG/ fMRI and computational modelling approaches. Understanding such mechanisms paves way for formulating basic scientific theories and laying foundation to investigate the mechanisms of brain dysfunctions.

Post-doctoral fellows :
Dr Soibam Shyamchand Singh
Dr Zinkal Shah
Dr Priyanka Chakraborty
Dr Suman Saha

Ph.D. Students :
Priyanka Ghosh
Neeraj Kumar
Anagh Pathak
Ritu Moni Borah
Nisha Chetna Shashtry
Kirti Saluja
Pratika Siwatch
Shahswati Tripathi
Guncha Bhasin
P.V. Vinitha

Project Assistants :
Shubham Singhal
Samuel Berkins
Varun Madan Mohan

M.Sc. (Neuroscience) Students :
Rishabh Bapat
Tanmay Singhal
Muskaan Verma

Neuro-cognitive network mechanisms using multimodal neuroimaging

Cognitive Brain Dynamics Lab (CBDL) is engaged in basic and translational research using non-invasive neuroimaging tools EEG, MEG, TMS & fMRI. We have primarily two themes of research: 1) Exploring and innovating novel research designs and analysis tools for MEG/ EEG & fMRI recordings and 2) Studying mental health and investigating various functional brain networks related to speech perception and in particular multisensory integration following the approved objectives of this project. Here, we outline the major project updates from the period April, 2022 - March, 2023. The overarching goal of these projects is to develop a network neuroscience methods and mechanistic understanding of neurocompensation across lifespan ageing trajectories. The two projects on which we have focused are related to identifying measures of information communication in complex brain networks and identifying the biological mechanisms of neurocompensation associated with healthy lifespan ageing.

Project 1: A perturbative approach to study information communication in brain networks

Researchers: Varun Madan Mohan

How communication among neuronal ensembles shapes functional brain dynamics is a question of fundamental importance to neuroscience. Communication in the brain can be viewed as a product of the interaction of node activities with the structural network over which these activities flow. The study of these interactions is, however, restricted by the difficulties in describing the complex dynamics of the brain. Thus, a need is indispensable to develop methods in studying these network-dynamical interactions and how they impact information flow, without ascertaining dynamics a priori or resort to restrictive analytical approaches. In this work, we use controlled perturbations in silico to identify regions that influence and mediate information flow in active brain networks. We adapted a recently established network analysis method based on perturbations, it to a neuroscientific setting to study how information flow in the brain can raise from properties of underlying structure. For proof-of-concept, we apply the approach on in silico whole-brain models. We expound on the functional implications of the distributions of metrics that capture network-dynamical interactions, termed net influence and flow (Fig 1). We also study the network-dynamical interactions at the level of resting-state networks. An attractive feature of this method is its simplicity, which allows a direct translation to an experimental or clinical setting, such as for identifying targets for stimulation studies or therapeutic interventions. Specifically, the relation of metrics to interregional communication, functional capabilities, and structure-function mapping in general affords them considerable practical importance, especially for identifying targets for therapeutic interventions.

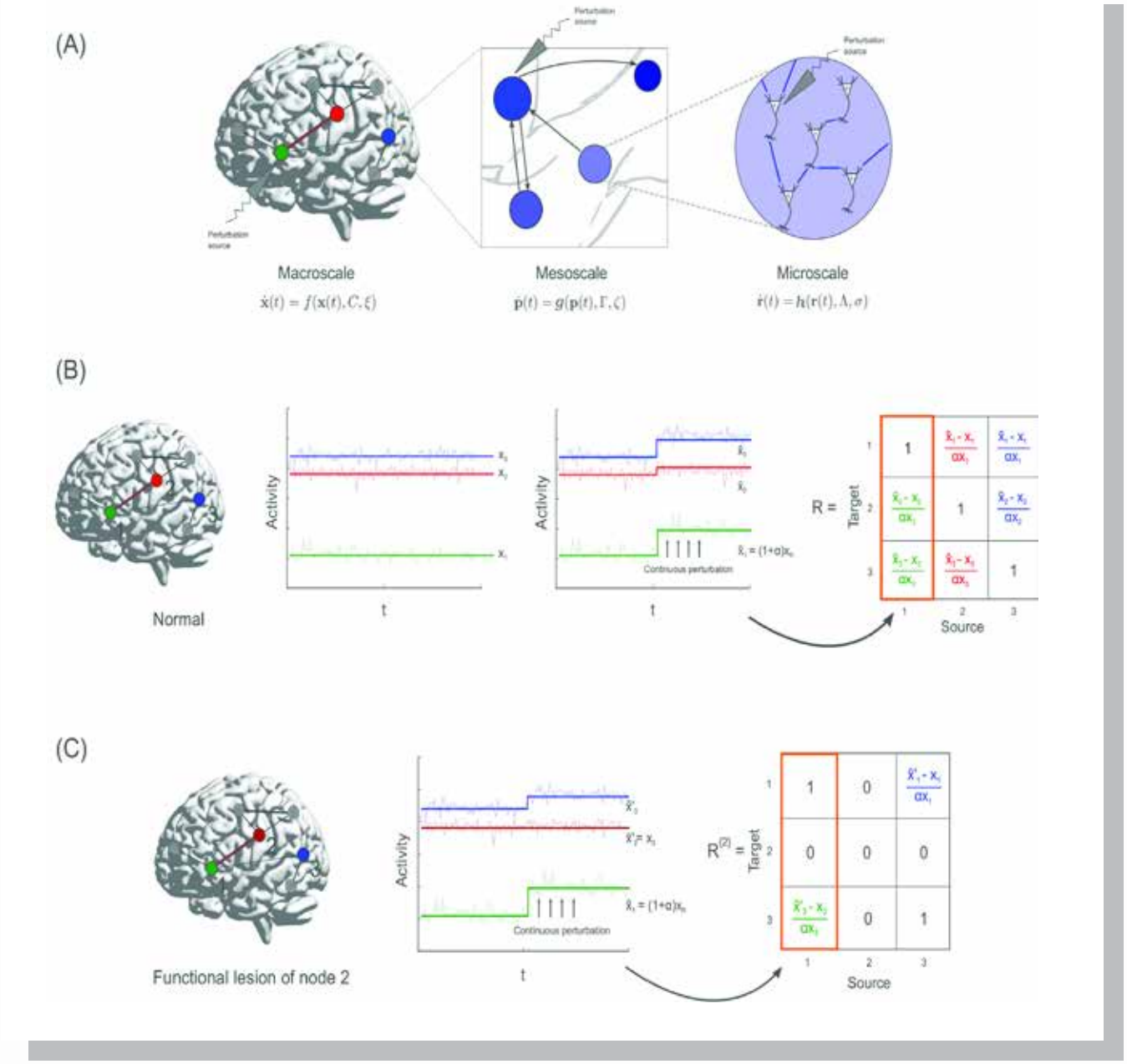


Figure 1: Schematic presentation of perturbation protocol and response matrix before and after freezing node activity. (A) The multiscale scope of the perturbative formalism. Each scale has its own dynamical model evolving over associated networks C, Γ, and Λ. Perturbing the functional units results in changes in activity across the rest of the connected network, in accordance with the dynamics in that scale. This is then translated to a region's influence and role in communication. (B) Nodes 1 (Green), 2 (Red), and 3 (Blue) are active in a whole-brain network. The steady-state values at which they stabilize are given by x1, x2, and x3, respectively. A continuous perturbation of node 1, by an amount α results in the activities of node 2 and 3 to stabilize at new steady-state values, x˜2 and x˜3, respectively. This is used to populate the first column of the linear response matrix (highlighted in orange). The colors of the entries of the response matrix R, correspond to the response calculated for a perturbation of the node associated with the color. (C) In order to gauge the contribution of node 2 in eliciting the responses of the other nodes, we perform a functional lesion (freeze the activity of node 2 at its original steady state). The associated columns and rows of node two are thus 0, indicating that node 2 does not respond to any perturbations. Note that this lesion of 2 leads to a different response of 3 to the perturbation of 1, with a new steady state at x˜′3.

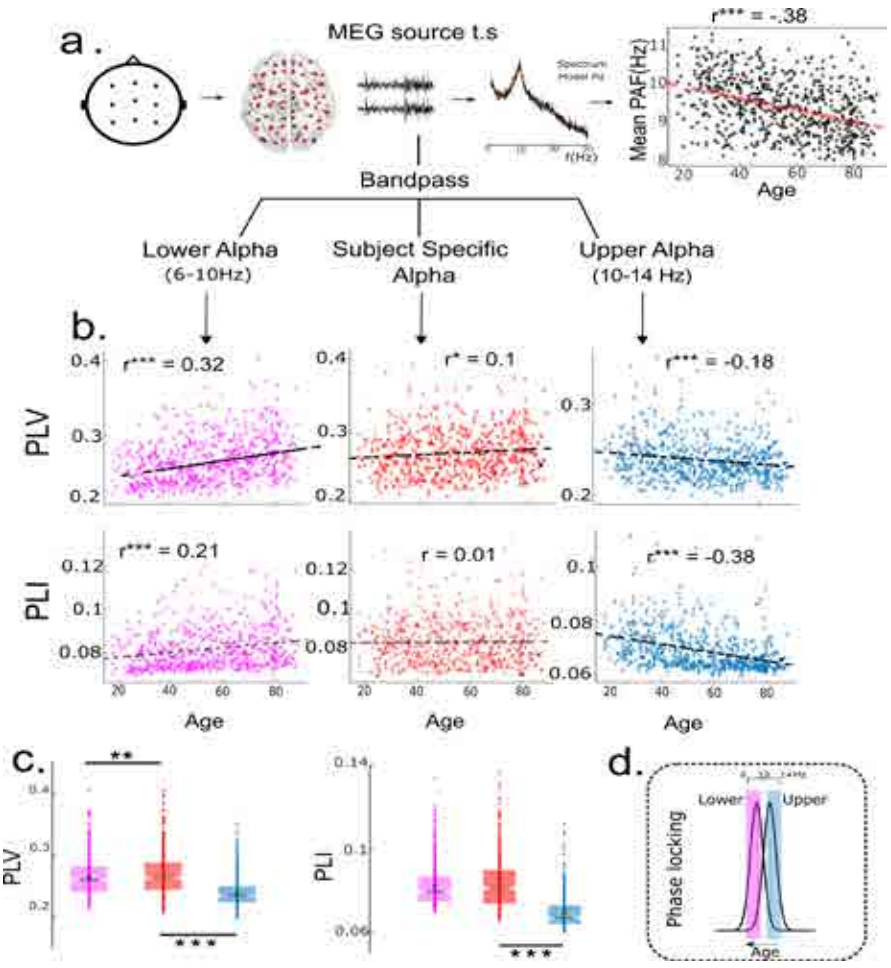


Figure 2: a. Overview of the analysis pipeline: rsMEG sensor space data was projected to source space. PSD for each ROI was extracted using Welch method and modeled as a linear superposition of periodic and aperiodic components. Peak frequency was extracted for each brain region and averaged across ROIs to obtain a single mean peak alpha frequency for each subject. Mean peak alpha frequency was found to be negatively correlated with age. Subsequently, phase locking was estimated for each subject using both PLV and PLI. b. Phase Locking Value (PLV) and Phase Lag Index (PLI) estimated for three frequency bands- LA (6–10 Hz), SSA (PAF − 2 to PAF + 2) and UA (10–14 Hz). c. PLV and PLI box plot for LA, SSA and UA band, for each box N = 627. Width of the notch is proportional to the interquartile range. Dots represent data points. d. Schematic: PLV, PLI analysis suggests frequency reorganization that preserves alpha phase locking at reduced peak frequencies.

Project 2: Biophysical mechanism underlying compensatory preservation of neural synchrony over the adult lifespan

Researchers: Anagh Pathak

Collaborator: Vivek Sharma, Dipanjan Roy

In this study, we propose that the preservation of functional integration, estimated from measures of neural synchrony, is a key marker of neurocompensatory mechanisms associated with healthy human ageing. To support this proposal, we demonstrate how phase-locking at the peak alpha frequency in Magnetoencephalography recordings remains invariant over the lifespan in a large cohort of human participants, aged 18-88 years (Fig 2). Using empirically derived connection topologies from diffusion tensor imaging data, we create an in-silico model of whole-brain alpha dynamics. The model involved a network of Kuramoto oscillators coupled by inter-areal

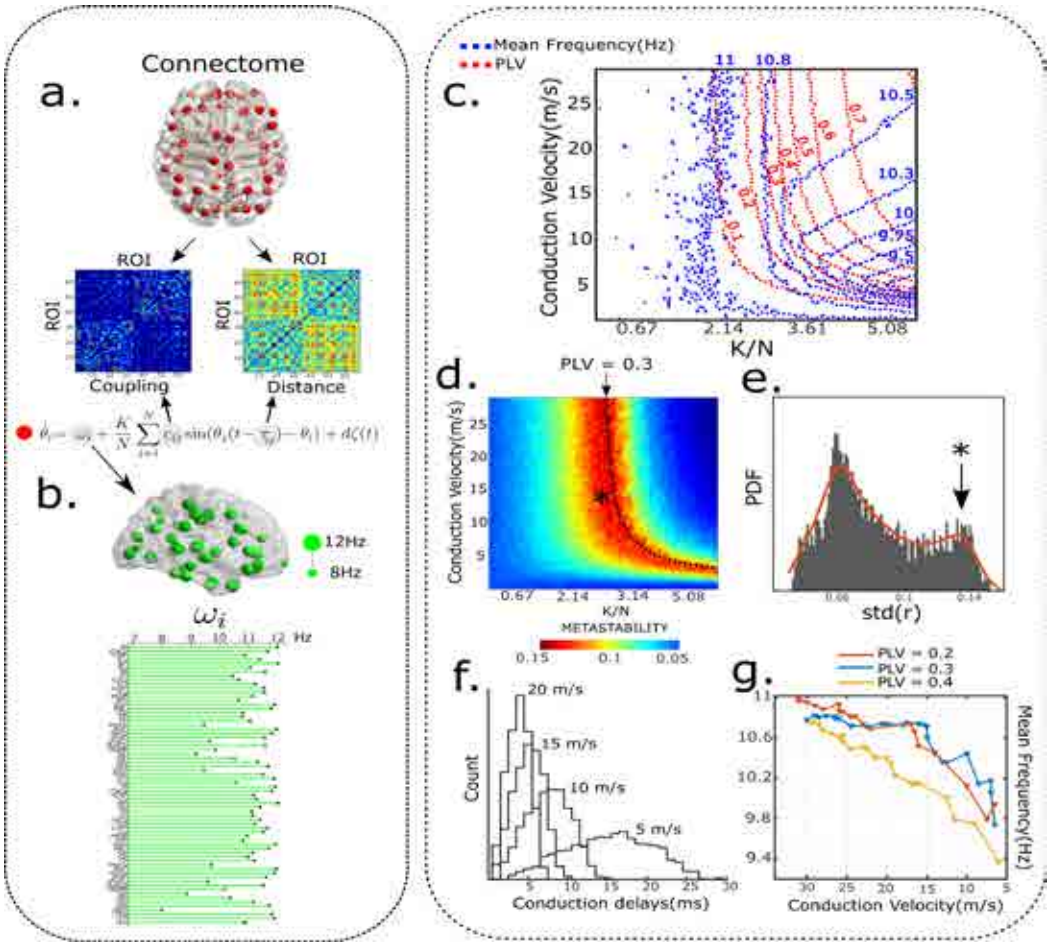


Figure 3: a. Model overview-DTI connectivity and distribution of inter-node distances. Equations governing node dynamics. b. Distribution of natural frequencies. Green spheres represent magnitude of natural frequency. ROI-wise distribution of natural frequencies. c. Contour plot indicating isolines for mean frequency (blue) and PLV (red) as a function of global coupling and conduction velocity, Noise amplitude (d) = 3, ω_max = 12 Hz, ω_min = 8 Hz. PLV and PAF remain constant along isolines. d. Metastability measured as the standard deviation of the order parameter plotted as a function of conduction velocity and global coupling. Dotted line indicates PLV isoline. Asterisk corresponds to region with maximum metastability. e. Distribution of metastability in the parameter space. Asterisk in heatmap corresponds to second mode of the gaussian. f. Distribution of conduction delays (in ms), for conduction velocity = 5, 10, 15.20 m/s. g. Frequency depression along isolines corresponding to PLV = 0.2, 0.3, and 0.4.

pairwise variable coupling constants and time-delays. Using dTI derived realistic synaptic coupling in model equations, we show that enhancing inter-areal coupling can cancel the effect of increased axonal transmission delays associated with age-related degeneration of white matter tracts, albeit at slower network frequencies. By deriving analytical solutions for simplified connection topologies, we further establish the theoretical principles underlying compensatory network re-organization (Fig 3). Our findings suggest that frequency slowing with age- frequently observed in the alpha band in diverse populations- may be viewed as an epiphenomenon of the underlying compensatory mechanism.

Recognitions and Service:

22 January- 31 March, 2023: Visiting Professor at Ashoka University (Spring semester), Taught Mind & Behavior.

15 February- present: Convener, International Electrotechnical Commission

(IEC)/ ISO Working Group on Brain Computer Interfaces JTC 1/SC 43/ WG 2 Applications (Elected position among Permanent member countries of IEC/ ISO).

September 2022- March, 2023: Member, Bureau of Indian Standards (BIS) Panel 7 on Brain computer interfaces.

May 2021- May, 2023: Editorial Board Member, NeuroImage (Elsevier)

2021- present: Associate Editor, Frontiers in Computational Neuroscience

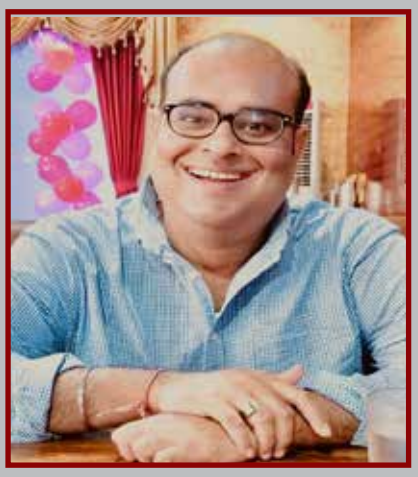
2021- present: Review Editor, Frontiers in Network Physiology & Frontiers in Brain Imaging Methods

Collaborators

Anirban Basu, NBRC
Ellora Sen, NBRC
Dipanjan Roy, IIT Jodhpur
Beena Koshy, CMC Vellore
Brigitte Roder, University of Hamburg
Mohammad Dastjerdi, Loma Linda University

****

Bhavani Shankar Sahu



Principal Investigator:
Bhavani Shankar Sahu
Cellular & Molecular Neuroscience, Translational Neuroscience, Disease Pathology

Ph.D. from IIT Madras in Cell Biology and Molecular Genetics, Postdoctoral fellow with Scottie Robinson, Cambridge University, England (2013-2016) & Alessandro Bartolomucci, University of Minnesota, U.S.A (2016-2019), Dr. Sahu and his team is exploring the role of vesicular trafficking pathways in neurons and neuro-endocrine cells and their physiological consequences in health & diseases.

Research Fellows:
Chandramouli Mukherjee,
Mohima Mukherjee,
Shashank Saxena,
Krittika Biswas,
Souren Sadhukhan,
Vinayak Ghosh,
Aninda Modak,
Shivam Malviya, and
Dr Sushma Dagar.

Technical Assistants:
Mahendra Singh & Manish P

Vesicular trafficking pathways in neurons/ neuroendocrine cells and their physiological consequences

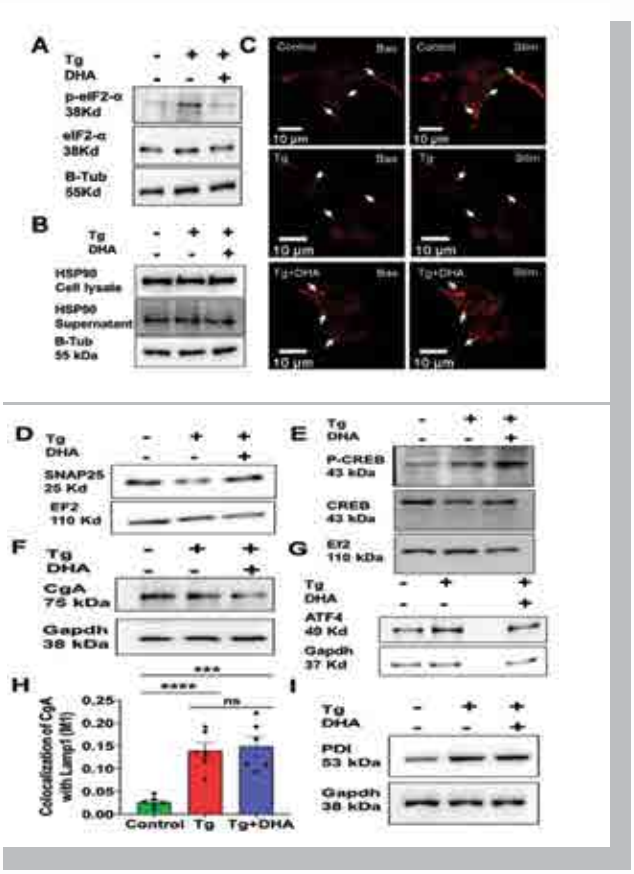
Focus 1- ER stress impedes regulated secretion by governing key granulogenic and exocytotic molecular switches.

Introduction:

Several neuropathological disorders like Alzheimer's, Dementia, Parkinson's Disease, and Huntington's disease (Huntington's chorea) have a common aetiology of protein misfolding. This inevitably leads to stress in Endoplasmic Reticulum (ER), which drives the cell towards apoptotic fate in chronic conditions. On the other hand, dense core secretory granule contains neuropeptides, essential for cell survival. The crosstalk between these two cellular compartments determines the cell survivability, yet the avenue is not well explored.

Aim: To understand the crosstalk between endoplasmic reticulum stress and dense core secretory granule dynamics in professional secretory cells.

Result and Discussion: ER stress was successfully modelled in the professional secretory cell using multiple chemical ER stress inducers- Thapsigargin (TG) and Tunicamycin (TM), and the status of the regulated and constitutive secretory pathway (CSP & RSP) was measured. Though the CSP remains unaltered, RSP shows a significant impairment upon ER stress induction. To rule out the effect of impaired RSP as a direct consequence of chemical stressor, but ER stress in actuality, the stress was rescued using the well-known ER stress attenuator DHA, which efficiently reverses the phenotype to normal condition. To understand the mechanistic underpinning behind the impaired regulated secretion, several exocytotic and granulogenic candidate



A: western blot of p-eIF2a and eIF2a depicts the induction of ER Stress **B** ER stress do not affect constitutive secretion of HSP90, **C** ER Stress impairs RSP D-G Western blot of SNAP25 **(D)** and its up regulator CREB **(E)** and granin CgA **(F)** shows Exocytotic And granulogenic candidate genes, responsible for secretory impairment, where Atf4 **(G)** competitively inhibits the activity of CREB. H-I Co-localization of CgA with Lyso20 shows **(H)** PDI **(I)** drives it's rerouting to lysosome.

genes were checked using western blot & qRT PCR. The level of regulator p-CREB was downregulated due to its competitive inhibition by ATF4. Additionally, DCV matrix proteins Chromogranin A and Secretogranin II levels were also reduced in treatment conditions, but the restoration was insignificant upon DHA treatment. Further, Chromogranin A

showed colocalisation with LAMP1, possibly mediated by an ER-resident chaperone PDI. These studies for the first report demonstrated that the organellar crosstalk amongst two key subcellular organelles, thus regulating a key physiological process.

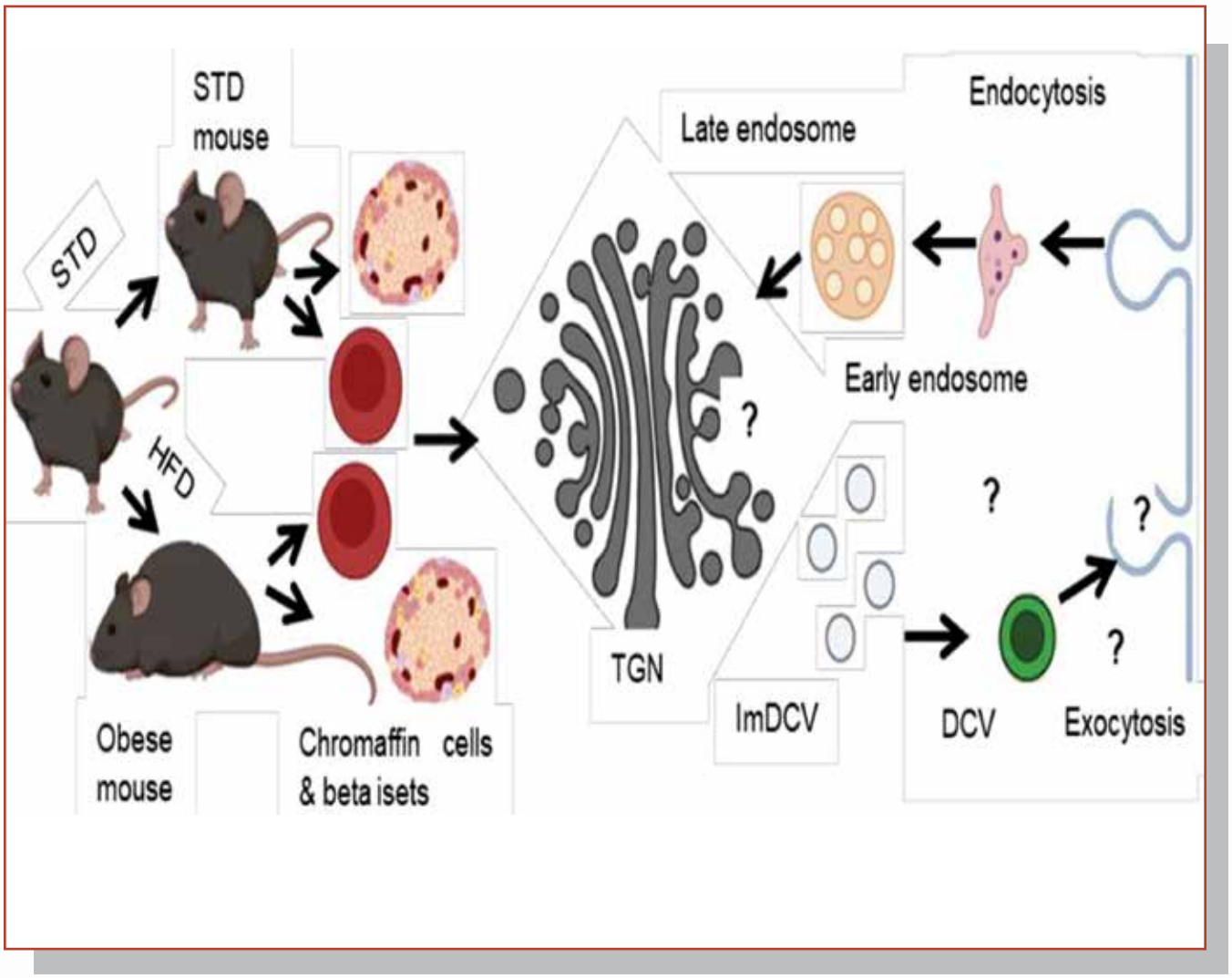


Figure 1: Schematic representation of work flow

Focus 2- Defining the Central Role of obesity-associated metabolic Stress on Regulated Exocytosis

Obesity is a complex disorder caused by excessive fat or adipose tissue accumulation, which can impair health. Several diseases are associated with obesity, including cardiovascular disorders, Type-II diabetes, and neurological disorders. For our study, we used highly palatable food to simulate obesity in the mice, using glucose tolerance tests as parameters to investigate obesity-induced conditions within the body. We isolated chromaffin and islet cells to assess the functional status of regulated secretion after successfully modelling diet-induced obesity in mice. Live cell imaging revealed augmented exocytosis as evident by increased exocytosis of Neuropeptide Y-pHluorin (for DCV) in obese mice. Subsequently, the extracellular calcium flux was examined as it plays a critical role in regulated exocytosis; however, no significant changes were observed. To understand the molecular basis of this abnormal release

of NPY-pHluorin and map the associated pathways, changes in the transcriptional profile of the adrenal medulla were inspected using RNA-Seq. The size of dense core vesicles (DCVs) was also studied under electron microscopy. An increased DCV core size of

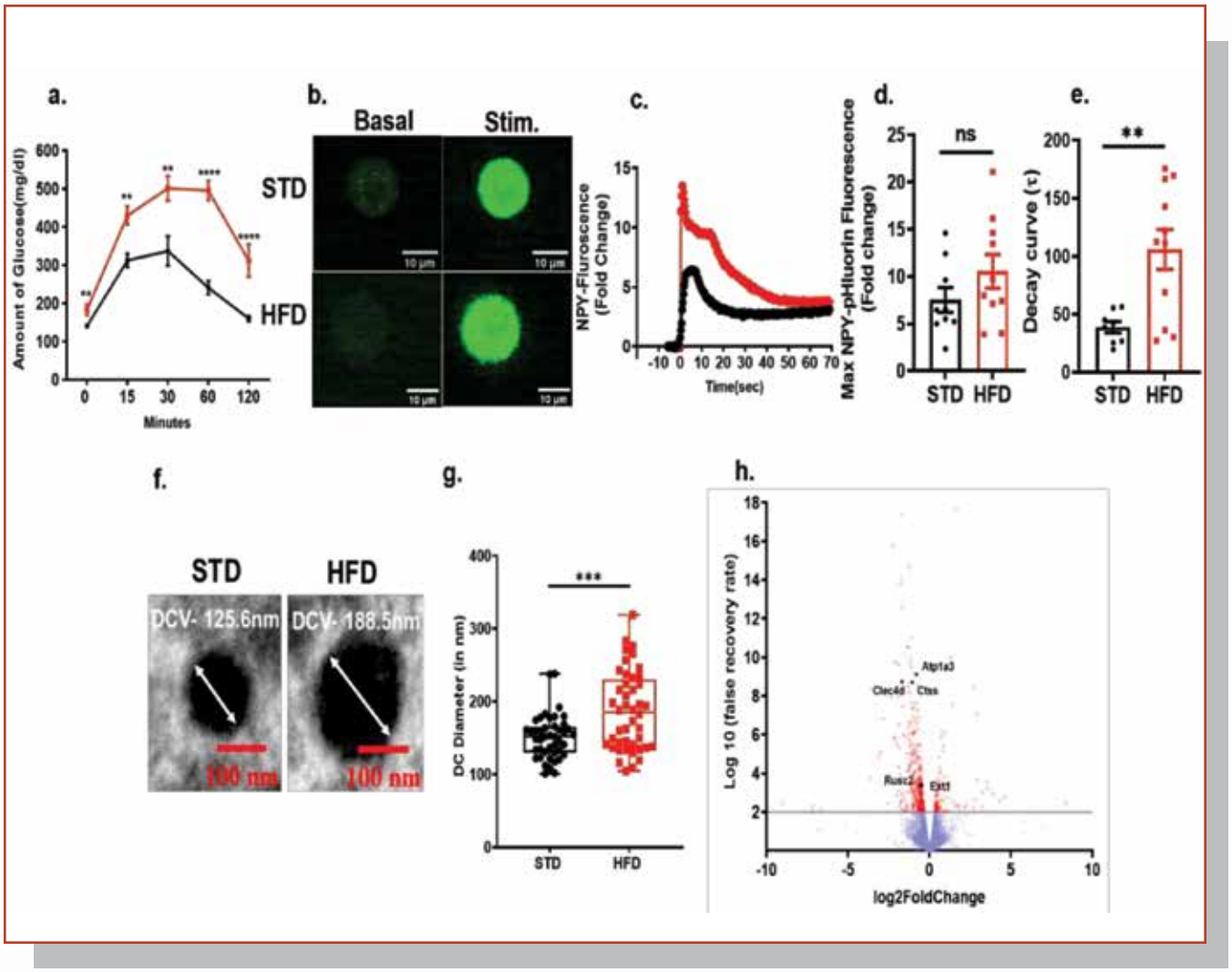


Figure 2: High-fat diet-induced obesity results in abnormal secretion of NPY-pHluorin in chromaffin cells of C57 mice. (a.) C57 mice were fed a standard chow diet (STD) or high-fat diet (HFD) for 15 weeks, and then a glucose tolerance test was performed, indicating the establishment of glucose insensitivity. (b-e.) Adrenal chromaffin cells isolated from STD and HFD-fed mice were transfected with NPY-pHluorin, and the time-lapse movie was recorded using spinning disk confocal microscopy (n=10). (b) Representative images of NPY-pHluorin expressing chromaffin cells from STD and HFD-fed mice. (c.) Example time courses of mean NPY-pHluorin fluorescence intensities (normalized to basal NPY-pHluorin intensities) in cells from control animals (black) and obese animals (red) (d.) Quantification of the maximum NPY-pHluorin fluorescence intensity at the end stimulation for cells from control mice (STD, black) and obese mice (HFD, red). (e.) Quantification of NPY-pHluorin signal decay time constant (tau, monoexponential fit). (f.) Representative images showing a single dense-core vesicle from STD (left) and HFD (right) adrenal medulla samples (n=2). Scale bar: 100 nm. (g.) Quantification of the dense-core vesicle diameter indicating larger vesicle diameter in chromaffin cells from obese mice as compared to control chromaffin cells (STD). (h.) Differential expression of various genes from Adrenal chromaffin cells (N=3). Each point represents a gene. [n=number of cells, N=number of experiments, ns= non-significant, **=P ≤ 0.01, ***=P ≤ 0.001]

40% in chromaffin cells of obese mice was found. In transcriptomic data, significant changes were discovered in several genes that play important roles in exocytosis and endocytosis.

Futuristically, Dr. Sahu's research lab aims to carry out ELISA in plasma and cultured pancreatic islets to investigate the physiological status of regulated exocytosis in islets, and to examine the functional status of endocytosis. It aims to model the obesity-induced metabolic stress in PC12 cells using palmitate (one of the most abundant lipids in obesity) and to study the functional status of regulated exocytosis. Finally, the lab is planning to carry out genetic manipulations for the several selected target genes with significant differential expression from the transcriptomic data. These studies will enable researchers to identify key molecular players and their contribution to obesity-induced metabolic stress-mediated impairment of regulated exocytosis.

Collaborators:

Gyan Prakash Modi, IIT, BHU
Sanjeev Upadhyay, MSU, Baroda
Mohammad Saleem, NISER
Yusuf Akhter, BBAU, Lucknow
Dhruba Singh, NBRC, Haryana

****

Mayanghlambam Dhruba Singh

Principal Investigator :
Mayanghlambam Dhruba Singh,
Cellular & Molecular Neuroscience, Translational Neuroscience, Disease Pathology

Ph.D. from University of Delhi, South Campus (2014) & post-doctoral from Pennsylvania State University & University of Florida, U.S.A (2015-2020), Dr. Dhruba research studies delve into human neurodegenerative & neurodevelopmental disorders in Drosophila disease models.

Research Fellows :
Post-doc student
Nisha

Ph.D. students
Deepti Thapliyal,
Athira Sarath &
Dipti Chakraborty

Technical Assistants:
Hari Shankar- (Technician A)
Mithilesh Kumar- (Technician B)

Project assistants:
Bhavya Gohil & Sanchi Ahuja

Study of human neurodegenerative disorders using Drosophila model system

Dr. Dhruba's reasearch lab studies the human neurodegenerative and neurodevelopmental disorders using Drosophila model system, focusing on three neurodegenerative disorders- Huntington's disease, Alzheimer's disease, and Spinocerebellar ataxia-3. These disorders are adult onset and progressive in nature, causing loss of neurons in the brain. Besides, these disorders also trigger cognitive decline, dementia, and movement disorders. In the absence of potential therapeutic drugs, reducing the progression of these disorders is challenging. But the therapeutics approved could only reduce the symptoms of the disease. Dr. Dhruba's lab is trying to find the genetic and molecular targets against the development of neurodegenerative disorders. Using Drosophila disease models, the lab is engaged in identifying the molecular targets by performing genetic screens. To express human disease transgenes, the UAS-Gal4 system was used, to allow the expression of any transgenes in a tissue-specific manner. For genetic screening, the Drosophila eye is used as a model tissue due to overexpression of disease transgenes, causing the perturbation of ommatidial cells, giving rise to the rough eye appearance. For example, overexpression of huntingtin protein with 93 poly(Q) repeats causes roughness and loss of pigmentation in the Drosophila external eye surface. Moreover, the Drosophila eye is not indispensable for survival; therefore, the expression of mutant human genes does not cause lethality.

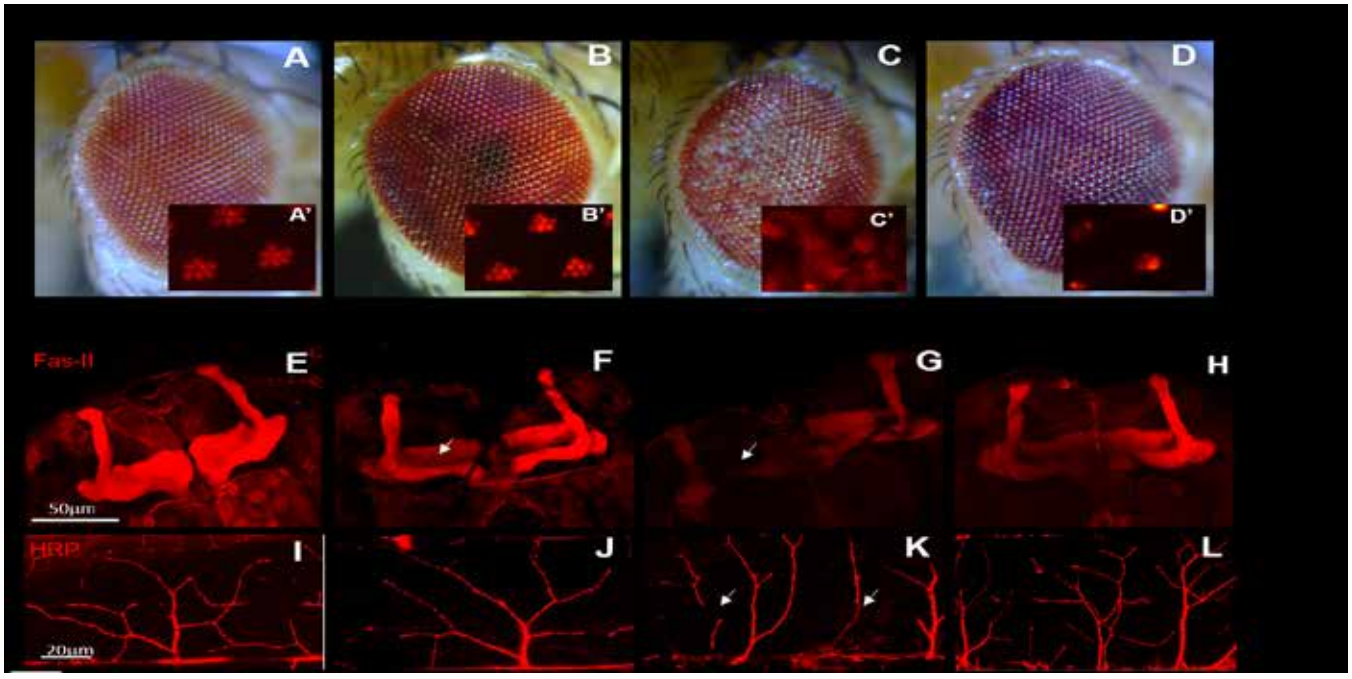


Figure 1. Knockdown of PTEN suppresses neurodegeneration in Huntington's disease model. (A-D) Drosophila external eye. Rough eye caused by overexpression of mutant Htt containing 93 and 138 poly(Q) repeats is rescued by knockdown of PTEN. (Inset A'-F') Photoreceptor neurons visualized by pseudopupil technique. (E-H) Structure of mushroom body. Htt-93Q causing degeneration of the mushroom body, prevented by the knockdown of PTEN. (I-L) HRP stained motor neuron of the thorax region of adult flies. Htt-93Q induces motor neuron degeneration, reinstated by the knockdown of PTEN in diseased flies.

Genetic screens were performed using the eye's external surface as the readout of phenotype to discover novel genes, which could ameliorate the disease phenotype. The discovery of modifier genes and pathways will advance disease-modifying therapies in the future. In the Drosophila model system, the availability of a repertoire of transgenic lines allows the discovery of disease-modifying genes relatively quicker. Our screen has identified genetic modulators of Ataxia-3, Huntington's disease, and Alzheimer's disease. Our current focus is on the protective role of Phosphatase and tensin homolog (PTEN) in the modulation of Huntington's disease. PTEN is involved in PI3K/AKT signaling pathway, essential in cellular growth and survival. Knockdown of PTEN in the mutant flies expressing HTT-93Q causes reduced rough eye phenotype and loss of pigmentation (Fig. 1 A-D). The number of photoreceptor neurons, which transmits the visual signal to the brain is also substantially improved (Fig. A'-D'). Furthermore, in the brain tissue, overexpression of Htt-93Q causes loss of neuronal tissue in the mushroom body structure of the brain (Fig. E-F). These losses of neuronal structures were suppressed by the knockdown of the PTEN (Fig. E-H). Loss of axonal branches was observed in the motor neurons of the Dorso-lateral muscle of the adult fly (Fig. I-J). These degenerations of motor neurons were suppressed by the knockdown of PTEN (Fig. I-L). The study suggests that PTEN is a potential therapeutic target for Huntington's disease.

Collaborator:

Dr. Bhavani Shankar Sahu, NBRC, India.

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Ellora Sen

Principal Investigator:
Ellora Sen
Cellular & Molecular Neuroscience, Translational Neuroscience, Disease Pathology

PhD Indian Institute of Chemical Biology, Calcutta. Post-doctoral Research Department of Microbiology & Immunology, Pennsylvania State University, College of Medicine, USA, Ellora Sen & her team at NBRC's Disease Pathology Research Division is investigating on how deregulated metabolism & aberrant inflammation modulates epigenetic landscape to affect genes associated with chemoresistance in glioblastoma- the most malignant of brain tumors.

Research Fellows:
Shruti Patrick,
Kirti Lathoria,
Shalini Sharma,
Sonia Umdor

M.Sc. Student:
Debadrita Mondal

Technical Assistant:
Shanker Datt Joshi

Lab attendant:
Rajesh Kumar Kumawat

Targeting epigenetic-metabolic landscape of gliomas: Implications in chemotherapy

Background and significance

Tumors are characterized by dysregulated metabolism, aberrant inflammation and altered epigenetic landscape. Our research focuses on understanding how overlap of metabolic, inflammatory and epigenetic pathways affect genes associated with resistance to chemotherapeutics in glioblastoma (GBM) - the most malignant of brain tumors. Several studies have delineated the molecular circuitry linking specific genetic alterations with distinct metabolic phenotypes. The effect is bidirectional as metabolic reprogramming results in modification of the cancer genome through epigenetic, transcriptional and post-translational modifications. For example, the mutated form of isocitrate dehydrogenase 1 (IDH1) synthesizes an abnormal metabolite D-2-hydroxyglutarate, which acts as a competitive inhibitor of multiple chromatin-modifying enzymes. Such mutations result in alteration of chromatin structure and gene activity, culminating in altered phenotype. Our long-term goal is to: (i) understand the importance of epigenome-metabolism axis in the context of IDH1 mutation in glioma, and (ii) identify clinically actionable targets that impinge on this epigenome-metabolism axis. Since rewiring of metabolic reprogramming with epigenetic landscape in gliomas bearing diverse driver mutations can differentially influence chemoresistance, understanding how such metabolic vulnerabilities can be exploited therapeutically to confer chemosensitivity warrants investigation.

i. Gliomas bearing IDH1 mutation (IDH1-R132H) are characterized by altered histone methylation. On investigating the status of PRMT1 (protein arginine methyltransferase 1 associated with crucial cellular events such as tumorigenesis and death) in IDH1-R132H glioma patients, we found a diminished expression of this histone methyltransferase and its associated active asymmetric dimethyl epigenetic mark H4R3me2a. This was found to be concurrent with reduced expression and secretion of innate-immune molecule-long pentraxin 3 (PTX3), a key secretory factor involved in cancer-related inflammation. PTX3 and PRMT1 expressions were positively correlated, and the reduced expressions of both were found to be associated with better prognosis in glioma patients. Diminished recruitment of PRMT1 and H4R3me2a at YY1 site of PTX3 promoter contributed to its diminished transcriptional activation and secretion in IDH1 mutants. PTX3 negatively regulated autophagic flux as demonstrated by pharmacological and genetic ablation of PTX3. In addition to negatively regulating autophagic flux, PTX3 also affected genes associated with ferritinophagy independent of the genetic landscape of glioma cells. Importantly, PRMT1 potentiated the ability of PTX3 to sensitize glioma cells to ferroptosis inducer. Analysis of glioma patient data further confirmed the correlation of PRMT1 and PTX3 with autophagic markers in glioma patients and along with their prognostic significance. The study therefore, suggests the PRMT1-PTX3-driven ferritinophagic circuit to be of clinical importance and provides strong evidence for targeting cells towards ferritinophagy-mediated cell death as a treatment regimen for gliomas. Since the status of histone methyltransferase PRMT1 and its associated histone activation mark renders IDH1 mutant and wild-type gliomas differentially susceptible to PRMT1 and PTX3 inhibitors, assessment of such distinct epigenomic architecture could serve as a predictive biomarker in determining responsiveness to chemotherapeutics **(Lathoria et al., Autophagy, 2023).**

ii. Gliomas harbouring mutations in IDH1 are characterized by greater sensitivity to chemotherapeutics. These mutants also exhibit diminished levels of transcriptional coactivator YAP1 (Yes-associated protein 1), an important regulator of mitochondrial dynamics and redox homeostasis in IDH1. Enhanced DNA damage in IDH1 mutant cells, as evidenced by elevated αH2AX formation and ATM phosphorylation, was accompanied by reduced FOLR1 (folate receptor 1) expression. Diminished FOLR1 concomitant with heightened αH2AX levels was also observed in patient-derived IDH1 mutant glioma tissues. Chromatin immunoprecipitation, overexpression of mutant YAP1, and treatment with YAP1-TEAD (TEA domain transcription factors) complex inhibitor verteporfin demonstrated regulation of FOLR1 expression by YAP1 and its partner transcription factor TEAD2. TCGA data analysis demonstrated better patient survival with reduced FOLR1 expression. Depletion of FOLR1 rendered IDH1 wild-type gliomas more susceptible to temozolomide-mediated death. Despite heightened DNA damage, IDH1 mutants exhibited reduced levels of IL6 and IL8 – pro-inflammatory cytokines known to be associated with persistent DNA damage. While both FOLR1 and YAP1 influenced DNA damage, only YAP1 was involved in regulating IL6 and IL8. By identifying the influence of YAP1-FOLR1 link in DNA damage, our findings suggest that simultaneous depletion of both could amplify the potency of DNA damaging agents while concomitantly reducing the release of inflammatory mediators. Given the involvement of FOLR1 depletion in augmenting the efficacy of temozolomide, this study highlights the novel role of FOLR1 as a probable prognostic marker in predicting responsiveness of gliomas to temozolomide and other DNA damaging agents **(Patrick et al, under revision)**.

Collaborator

Dr. Vaishali Suri, Professor, Neurosciences Centre, AIIMS, New Delhi.

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Pankaj Seth

Principal Investigator:
Pankaj Seth
Cellular & Molecular Neuroscience, Translational Neuroscience, Disease Pathology

Ph.D. (Medical Biochemistry), CDRI, Lucknow and Postdoctoral Fellow from the Department of Pathology, Uniformed Services University of Health Sciences, Bethesda, U.S. (May 1996-Jan 2002), Prof. Pankaj Seth and his research group studies on how neurotropic viruses such as HIV-1, Zika and SARS-CoV2 affect properties of brain cells and ultimately affect brain functions of patients affected by these viruses.

Research Fellows:
Chitra MS Singal,
Hriday S. Pandey,
Himali Arora,
Bindu,
Guneet Kaur and
Archana Mehta

Masters Dissertation:
Janhvi Dhongdi, Sudipto Chaki

Project Assistants:
Pallavi Pant,
Ajay Pal,
Saumya Rastogi

Technical Assistants :
Durgalal Meena and Naushad Alam

Cellular & Molecular Mechanisms of HIV-1, Zika and SARS-CoV2 Virus Induced Neuropathogenesis

In last two decades our laboratory has significantly contributed to the understanding of virus induced neuropathogenesis, particularly the neurological deficits caused due to HIV-1, Zika and recently the novel corona virus, SARS-CoV2.

Zika virus (ZIKV) is an enveloped Flavivirus belonging to family Flaviviridae, spread through mosquitoes. The Zika virus outbreaks have affected population in several countries, including India. Zika virus causes in utero developmental disorder - microcephaly, resulting in an abnormally small head size in 7-10 percent of infants born to mothers, infected with ZIKV during their first trimester of pregnancy. A clear understanding of pathways leading to microcephaly is critical to prevent such in utero defects during fetal development.

One of the biggest challenges for studying virus induced neuropathogenesis in humans is to develop physiologically relevant experimental models that represent the disease and offer insights into the cellular and molecular mechanisms of disease pathogenesis. This laboratory has significantly contributed in this area and has developed a well characterized model of primary cells of human brain derived neural stem cells. We routinely differentiate human astrocytes, neurons and oligodendrocytes from hNSCs. We continue to improve our existing models as well as develop new ones that could be used to study the behaviour of viruses and their proteins affecting properties and function of human brain cells. In this direction, we further improved a model of human blood brain barrier (BBB) that comprises primary cultures of human brain microvascular endothelial cells (BMECs) and human astrocytes, for studying effects of Zika virus proteins on BBB. We checked the integrity of the BBB by high Trans Endothelial Electrical Resistance (TEER), and inability of fluorescence dye to cross the barrier. We used this contact-based two cell model for studying if ZIKV proteins induce alterations in tight junction proteins and for identifying microRNAs (miRNA) that may alter BBB integrity following exposure to ZIKV proteins. Our work with BBB provided novel findings that suggest that the ZIKV E protein is affecting the expression of tight junction proteins such as ZO-1, Claudin and Occludin at mRNA and protein levels, thereby altering the BBB integrity. Our data suggests activation of BMECs on overexpression of ZIKV E protein, as proinflammatory cytokines and chemokines (IL-6, IL-8, IL-1β, CCL5, and CXCL10) were increased. Along with increase in inflammatory molecules, BMECs also showed increased levels of other endothelial barrier disrupting molecules such as cell adhesion molecules- ICAM-1, VCAM-1 and PTGS2. Interestingly, the ZIKV E protein also induced activation of astrocytes that was reflected during the increase of astrocytic marker glial fibrillary acidic protein (GFAP) and Vimentin (Vim), as well as cytokines (IL-6 and IL-8) and chemokine (MCP-1/CCL2). We also noticed increased concentration of extracellular glutamate following exposure to ZIV E-protein. Collectively, the activation of BMECs and astrocytes, downregulation of tight junction proteins add lowering of TEER and increase in dye transfer through the barrier indicated that ZIKV E protein affects BBB integrity and contributed to ZIKV neuropathogenesis.

In addition to this, laboratory also studied the effects of non-structural proteins (NSPs) on human brain cells. Currently, we are studying the effect of NSP-4A and NSP-4B by their co-transfection in hNSCs and human astrocytes. We observed that the co-transfection of NSP4A and NSP4B altered the fate of human neural stem cell by arresting proliferation and inducing premature

neurogenesis. Transfection of hNSCs with NSP4A+NSP4B expression vector resulted in increase in autophagy and dysregulation of notch signaling. This resulted in pre-mature neurogenesis. Overexpression of NSP4A and NSP4B altered the regulation of downstream genes that regulate cell proliferation. Furthermore, pre-exposure to a potent autophagy inhibitor, 3 methyl-adenine (3-MA), rescued the Notch1 expression, enhanced proliferation and reduced premature neurogenesis, which confirmed the role of autophagy in ZIKV NSP4A and NSP4B. In depth, studies into understanding the role of these two non-structural proteins revealed involvement of mitochondrial fission and oxidative stress, which were detrimental for hNSC proliferation.

For studying the cellular and molecular mechanisms of HIV-1, Zika and SARS-CoV2, we used a well characterized in vitro model of primary cultures of human fetal brain derived neural stem cells (hNSCs), established earlier by us. The lab is investing its efforts into understanding how hNSCs and astrocytes mediate neuronal damage using neuron glial co-cultures. We adopt cell and molecular biology approaches that include - live cell calcium imaging in human brain cells, time lapse microscopy, miRNA sequencing based assays, gene expression studies as well as bioinformatics tools. Wherever possible, we also validate the in vitro findings in post-mortem brain sections of patients that are available through the NIMHANS human brain bank.

Furthermore, populations across the world are facing problems of Post-Acute COVID Syndrome (PACS) following the global pandemic, COVID-19. The SARS-CoV2 causes the Brain Fog, common in Long COVID cases that experience one or several of the following symptoms; such as lack of concentration, sleep disorders, prolonged period of loss of smell and taste, headache, difficulty in focusing, memory recall and several other neuropsychiatric disorders, such as depression, hallucinations etc. The prevalence of Brain Fog / NeuroCOVID has been reported in around 50% of Long COVID patients. Our laboratory is studying the role of several proteins of the SARS-CoV2 to gain insights into the mechanisms of Brain fog in Long COVID patients. We have narrowed down the neuronal damage to three major proteins (Orf6, NSP6 and NSP8) of the SARS-CoV2 and currently carrying out in-depth experiments in human neurons. Live virus experiments with SARS-CoV2 and human neurons are in progress and will be reported in subsequent reports. We are also validating the in vitro findings in post-mortem brain sections of COVID-19 cases.

Book Chapters:

1. P. Pant and **P. Seth**. Basic Biology of Astrocytes. In: Basic Biology of Glial Cells: Recent advances. Eds Ishan Patro, Pankaj Seth, Nisha Patro and Prakash N Tandon. Publishers Springer 2022; ISBN: 978-981-16-8313-8

2. P. Pant, G. Kaur and **P. Seth**. In vitro models of astrocytes - an overview. In: Basic Biology of Glial Cells: Recent advances. Eds Ishan Patro, Pankaj Seth, Nisha Patro and Prakash N Tandon. Publishers Springer 2022; ISBN: 978-981-16-8313-8.

Collaborators:

A. Basu, SK Sharma and S. Sinha, NBRC, Manesar, India.

S. Sharma, and A. Singh, Civil Hospital, Gurgaon, India.

A. Mahadevan, NIMHANS, Bangalore, India.

C. Sachidanandan, IGIB, New Delhi, India.

A Awasthi, THSTI, Faridabad, India.

S. Vrati, RCB, Faridabad, India.

S. Singh, BHU, Varanasi, India.

S. Sen, AIIMS, New Delhi, India.

C. Mukhopadhyay, Jawaharlal Nehru University, New Delhi, India.

A. Nath, D. Wang, National Institutes of Health, Bethesda, USA.

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Pravat Kumar Mandal

Principal Investigator:
Pravat Kumar Mandal,
Computational Neuroscience, Translational Neuroscience

(Scientist VII & Honorary Professor at Florey Institute of Neuroscience and Mental Health, Australia).

Dr. Mandal, an expert of Neuroimaging methodology developments and inventor of anti-oxidant glutathione as an early diagnostic biomarker for Alzheimer's disease. His work on development of Indian Brain template, BRAHMA, database, and analytics "SWADESH". His work on brain signal methodology development "KALPANA" was awarded US patent.

Research Fellows:
Dr. Komal Jindal (Research Scientist)
Dr. Shallu Sharma (Research Scientist)
Ms Anshika Goel (Senior R&D Engineer)
Mr. Saurav Roy (Research Scientist)
Ms Shradha Gaur (Neuropsychologist)

Technical Assistants:
Ms Avantika Samparkia (PA)
MS Rimil Guha Roy (PA)

Susceptibility Biomarker of Alzheimer's disease from Neuroimaging data using 3T MR scanner

Alzheimer's disease (AD) is an irreversible progressive neurological disorder leading to the gradual deterioration of cognitive functions and activities in day-to-day life. The exact cause of the disease is unknown, and no definite cure of AD is yet ascertained. Existing medications and recently approved drugs provide a temporary symptomatic relief, and none of them reverse the disease process to normal functioning. Two causal hypotheses, the amyloid beta (Aβ) cascade and the tau propagation hypothesis, have been considered pivotal in the progression of AD for the past three decades. One of the older hypotheses on AD, the oxidative stress (OS) is gaining huge attention. On the current imaging-based work at our lab, we have proposed a working model for AD, indicating occurrence of OS phenomena prior amyloid deposition and tau phosphorylation inside human brain. The work flow representation is as below.

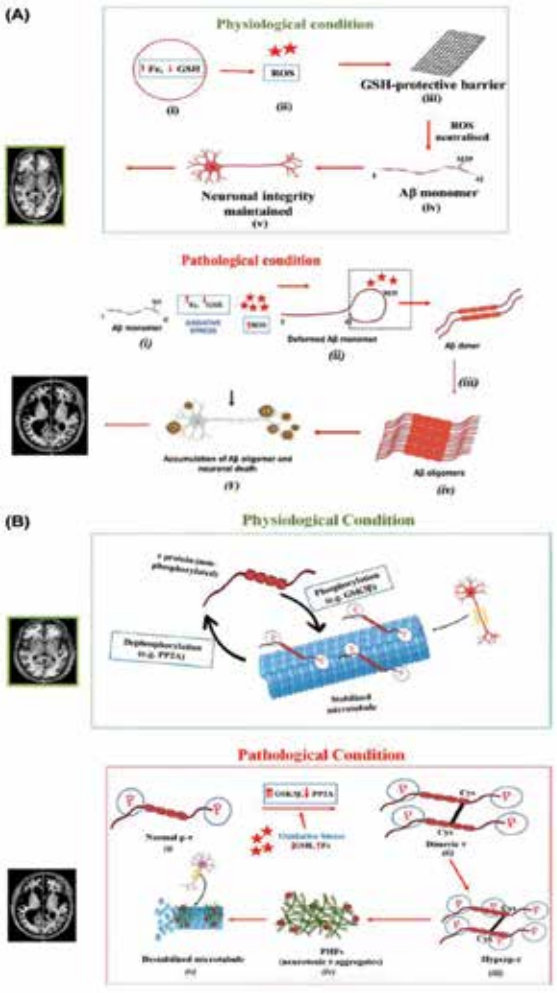

Figure1. Model highlighting the impact of OS on amyloid plaque formation, tau hyperphosphorylation, and role played by GSH during the process.

Though other antioxidants also act rigorously to combat OS, we are solely focused on GSH and its contribution in ameliorating OS. Representative magnetic resonance imaging (MRI) images of normal and AD brain are taken from NINS laboratory. (A) Amyloid related processes. Physiological conditions: Under normal physiological conditions and basal levels of OS (i), (ii), GSH forms a protective barrier against ROS and retains its structural integrity and functionality (iv). Absence of plaque formation maintains neuronal integrity (v); healthy brain architecture and normal functionality is thus preserved. Pathological conditions: Depleted GSH levels and an increasing iron load leads to an imbalance in redox homeostasis, ultimately leading to a concurrent accumulation of free radicals (i). Depleted GSH levels, in this case, cannot form an effective filtration barrier against ROS (ii). Some of the radicals gain the propensity to interact with the M-35 residue of Aβ peptide and oxidation of the M- 35 residue of Aβ (v) gives rise to structural modification. Oxidation of M-35 subsequently leads to the formation of Aβ dimers (iii) and the formation of higher order oligomeric Aβ structures (iv). This extracellular toxic oligomeric Aβ

accumulation on neurons leads to neuronal death (v) and eventually neurodegeneration in the AD brain. (B) Tau related processes. Physiological conditions: In normal conditions, when redox homeostasis is maintained, the rate of phosphorylation and dephosphorylation of tau is also under homeostasis. Tau is usually phosphorylated in its proline-rich region by kinases. However, phosphorylation is negatively related to tau function, and hence to maintain proper functioning of tau, it needs to be dephosphorylated. This cyclic homeostatic process enables tau protein to remain bound to the axonal microtubules and carry out its normal physiological function by promoting microtubule assembly and stabilizing microtubules. Pathological conditions: Under OS conditions, depleted levels of the GSH and an increase in the pro-oxidant iron can stimulate the structural conversion of normal phosphorylated tau (i). The cysteine residues of tau can form intermolecular disulfide bridges, leading to a dimeric state. This can lead to accumulation and formation of NFTs (ii). OS also affects phosphorylation–dephosphorylation signalling pathways, dysregulating the rate of enzymatic reactions. GSK3β, the major phosphorylating enzyme, is highly upregulated, while PP2A, the major dephosphorylating enzyme, is downregulated. This imbalance leads to hyperphosphorylated tau (iii). Hyperphosphorylated tau dissociates from microtubules and can form insoluble aggregates, PHFs (iv), which can then destabilize microtubules, ultimately leads to neurodegeneration (v).

Based on our brain-imaging and blood-based test, following are the specific patterns of early diagnostic biomarker of AD, which are established (Figure 2).

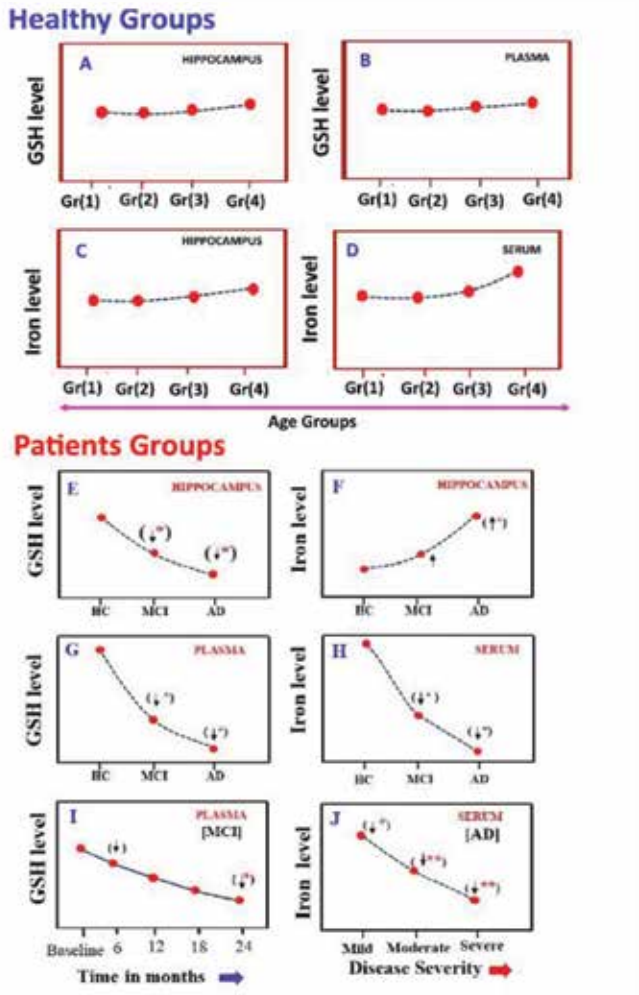

Figure 2: Distribution pattern of GSH and iron level of hippocampus and blood (plasma/serum) in healthy subjects and patients. Part A refers to left hippocampal GSH levels from four age groups of HC subjects, and part B refers to plasma GSH levels in the same study groups. Parts C and D refer to left hippocampal susceptibility and blood (serum) iron levels from the same study groups of healthy subjects (Gr(1), 20–30Y; Gr(2), 31–40Y; Gr(3), 41–50Y; Gr(4), 51–73Y). Parts E and F refer to GSH levels and iron levels in the hippocampus regions for the same study participants who were assessed, where again moving across HC to MCI to AD, a significant decrease in the GSH level and a significant increase in the iron level were observed. Parts G and H refer to modulation of plasma GSH and serum iron levels from study participants. Part I refers to longitudinal variations of GSH level in blood (plasma) of MCI patient within two years' time frame. Part J refers to depletion of iron level in the blood (serum) of AD patients with degree of severity from mild to moderate to severe. GSH level in blood sample of unknown patients will be sufficient to confirm early AD after the on going validation study is complete.

Way forward and future direction: This in-depth clinical research has paved the way for glutathione as a measure to halt progression of the disease. A randomized clinical trial is already cleared by the drug controller general of India to be conducted at NBRC.

Collaborators:

1. Prof. (Dr.) Manjari Tripathi, MD, DM
   Department of Neurology,
   All India Institute of Medical Science (AIIMS), New Delhi

2. Prof. Joseph Maroon, MS, Clinical Professor
   Department of Neurosurgery,
   UPMC, Pittsburgh, PA, USA.

3. Dr. Arun Garg, MD, DM
   Dept. of Neurology
   Medanta Medicity
   Gurugram, Haryana.

4. Dr. Lars Ersland, Professor,
   Dept. of Clinical Engineering,
   Haukeland University Hospital,
   Bergen, Norway.

5. Dr. Ashley Bush,
   Head, Oxidation Biology Unit - Melbourne Dementia Research Centre,
   Florey Institute of Neuroscience and Mental Health,
   Melbourne, Victoria, Australia.

6. Prof. (Dr.) Peter Barker,
   Deptt. Radiology and Radiological Science – Neuroradiology,
   Johns Hopkins, Baltimore,
   Maryland, USA.

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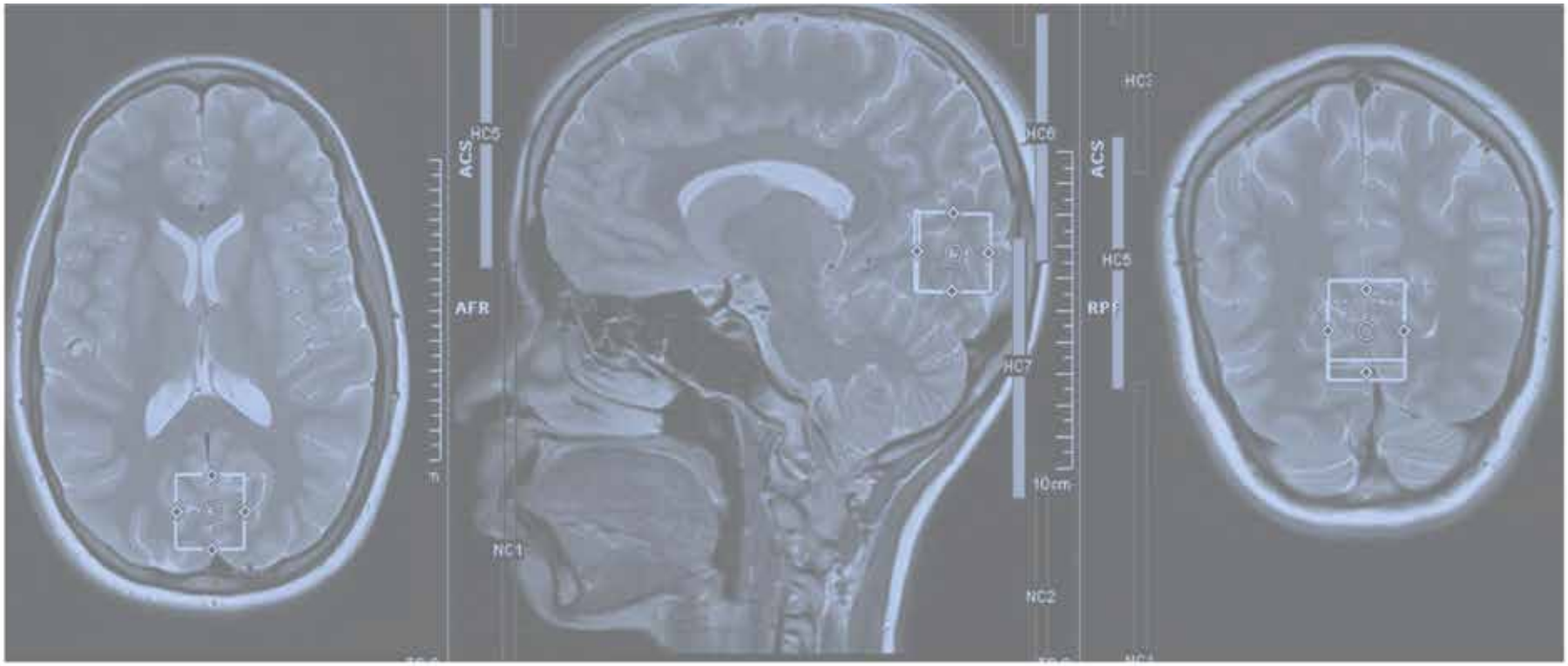

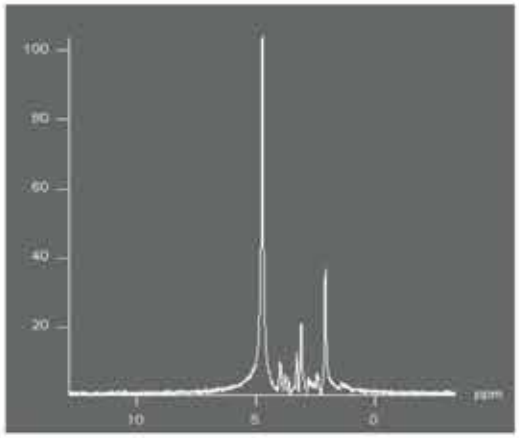

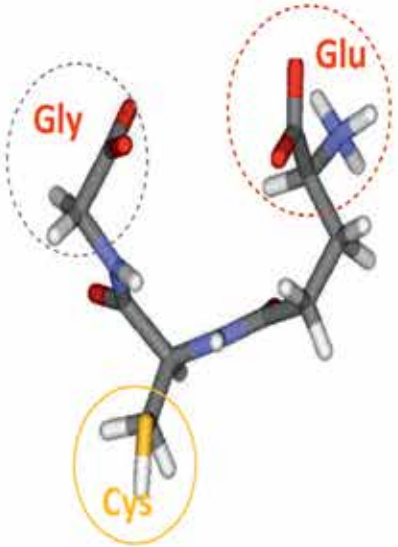

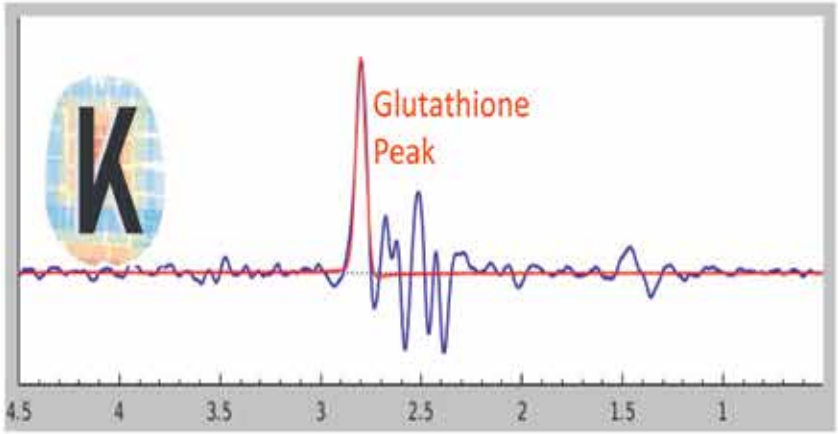

Measuring hippocampal glutathione using magnetic resonance spectroscopy
From the lab of Prof. Pravat Kumar Mandal

Ranjit Kumar Giri

Principal Investigator:
Ranjit Kumar Giri, Ph.D.,
Scientist VI (Professor)
Cellular & Molecular Neuroscience, Translational Neuroscience, Disease Pathology

Ph.D. from Institute of Life Science, Bhubaneswar, Odisha & post-doctoral positions from National Institute of Immunology, New Delhi (1997-1999)/University of Southern California, U.S. (1999-2003)/McLaughlin Research Institute, Great Falls, U.S. (2003-2007), Dr. Giri's research is based on understanding the mechanisms of perturbation in genetic expression network of Alzheimer's and prion disease using animal and CNS stem/progenitor cell-based models.

Research Associate:
Dimpi Gandhi, Ph.D.

Project Assistant:
Tuhina Sanwal, M.Sc.

Laboratory Attendant:
Lalit Bidla

Altered expression & proteolysis of receptor interacting protein kinase 1 in TgAPP$_{swe}$PSEN1δE9 mouse model of Alzheimer's disease

Receptor-interacting protein kinase 1 (RIPK1) is a Ser/Thr kinase and containing a death domain was initially discovered as an apoptosis-inducing death receptor Fas interacting protein. The carboxy-terminal death domain (DD) in RIPK1 binds to the intracellular DD of almost all death receptors (DRs) such as Fas or tumor necrosis factor receptor 1 (TNFR1/DR1), DR3, DR5, DR6, p75NTR and to the DD of adaptor proteins, such as- TRADD and FADD. Death receptors upon ligation with their cognate ligands, recruit RIPK1 either TRADD dependent and independent manner and such RIPK1 complexes mediate/dictates multiple cellular pathways related to inflammation, cell survival and cell death pathways like apoptosis and necroptosis (Figure 01).

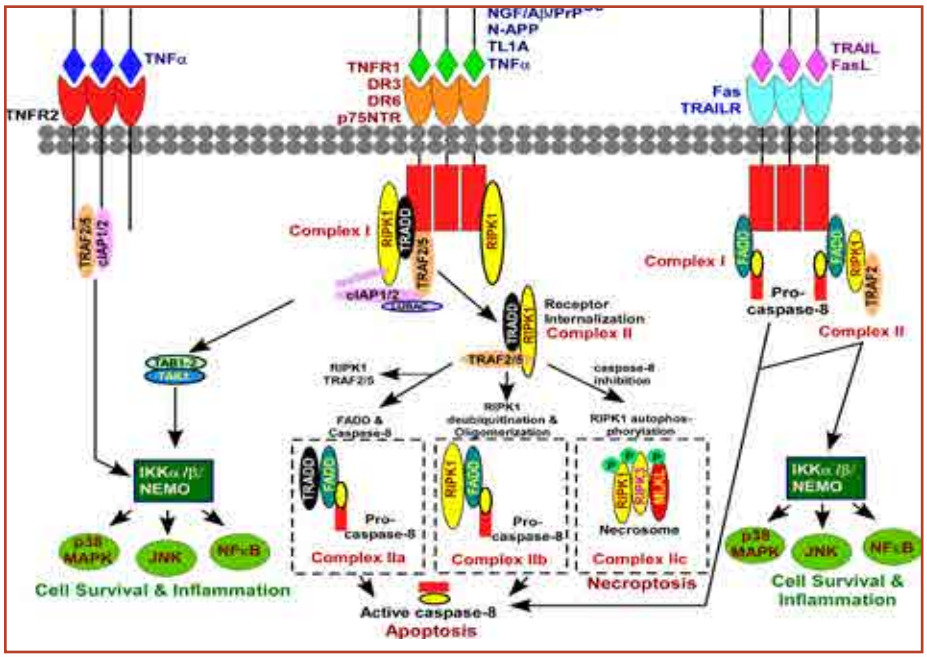

Figure 01: Schematic representation of RIPK1 functions as a converg-ing point of all kinds of death receptor activa-tion. Ligation of TNFR1 with TNFα results in the formation of complex I (survival), complex IIa & IIb (apoptosis) and IIc (necroptosis), based on varying RIPK1 activities. TNFR2 signaling leads to survival pathway via NF-κB activation. Role of RIPK1 in p75NTR, DR3 and DR6 activation is similar to TNFR1. RIPK1 also determines inflam-mation or cell survival and cell death in TRAILR and Fas activation. Proteolysis of RIPK1 by caspase-8 limits its cell survival capability.

Inflammation and cell death are intricately connected and often considered as parallel processes that can regulate each other. Dysregulated chronic inflammation is an important cellular process in many human diseases including rheumatoid arthritis, autoimmune and inflammatory diseases, cancers as well as neurodegenerative diseases like Alzheimer's disease.

Alzheimer's disease (AD) is a progressive and irreversible neurodegenerative disorder. It is the most common cause of dementia worldwide. AD can be classified either as sporadic Alzheimer's disease (SAD) or familial Alzheimer's disease (FAD). Genetic studies of early onset FAD have identified three causative genes: amyloid precursor protein (APP), Presenilin 1 (PSEN1) and presenilin 2 (PSEN2). Mutation/s in these genes affects the stability or increased formation of amyloid beta (Aβ) peptides, specifically the more fibrillogenic Aβ1–42 peptides that forms the backbone of the amyloid (Aβ) cascade hypothesis.

However, very little is known about the exact role of Aβ peptides towards neurotoxicity. In order to study the mechanisms associated with neurodegeneration in AD patients, transgenic animals expressing Swedish mutations in human APP and Exon-9 deleted human presenilin-1 genes were established. Brain tissues were harvested from Tg+ve and Tg-ve mice at 6, 12 and 18 months of age. Brain lysates were prepared in standard radioimmunoprecipitation assay (RIPA) buffer and stored at -80OC deep freezer for biochemical analysis. Amyloid beta peptide related features were studied by western blot analysis using 6E10 antibody (detects both Aβ peptides and full-length APP). Results show, the present animal model of AD exhibits robust Aβ-related pathologies (see legends for details) in an age-dependent manner (Figure 02) providing a suitable platform to study brain Aβ load-dependent alteration of cell death factors.

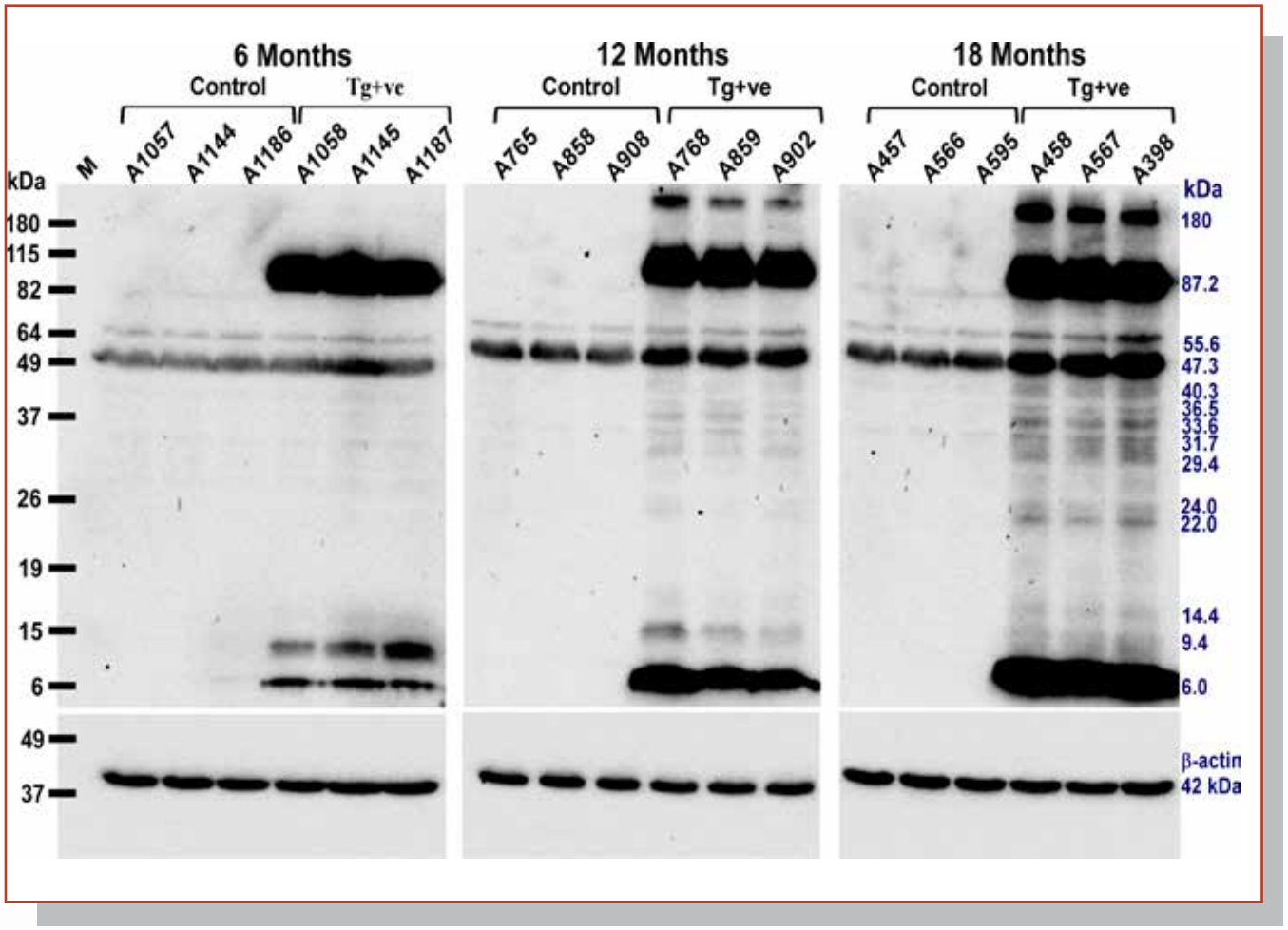

Figure 02: Increased production and accumulation of amyloid beta (Aβ) peptide in transgenic mice expressing human APPSwe and PSEN1δE9 mutations as a function of time. Aβ peptide seen as monomer (~6 kDa) and dimer (~9 kDa) are seen only in 6 months old Tg+ve mice brains than corresponding controls. Levels of these Aβ peptides increased with time (12 months; middle panel and 18 months; right panel). In addition, oligomeric (9-56 kDa) amyloid beta peptides are seen in12 months, which are further increased in 18 months old Tg+ve mice brains. Collectively, the current mice model of AD represents most of the amyloid beta related pathologies of human AD patients.

Elucidating the mechanisms behind amyloid beta-mediated cell death, RIPK1 emerged as a key and central adaptor protein to polygenic and pleotropic nature of death receptors signalling in present mouse model of AD. Although the physiological function of RIPK1 is well docu-mented in inflammatory and various cell death signalling, but its role in Alzheimer's disease is very limited. In addition, proteolytic cleavage of RIPK1 is an indicator of cell apoptosis. Therefore, age-dependent increased amyloid beta load was utilized to study RIPK1 activation or inactivation by western blot analysis. Equal amount (60 µg) of protein in brain cell lysates was size-fractionated in a 10% poly-acrylamide gel and transferred onto polyvinylidene difluoride (PVDF) membranes. Immunoblotting was performed using an anti-RIPK1 antibody, which detect both full length and cleaved RIPK1 protein.

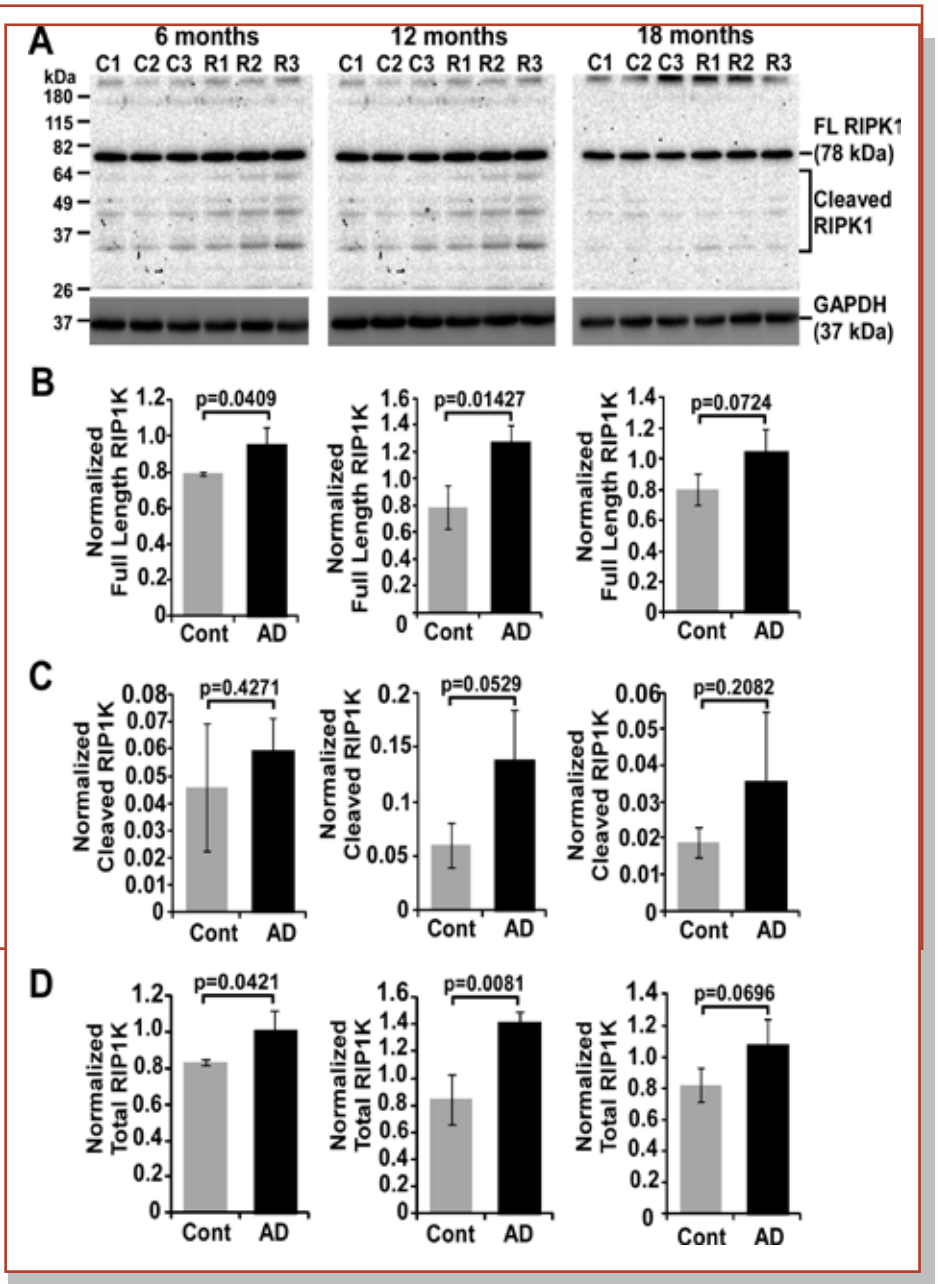

Figure 03: Expression and proteolysis of RIPK1 with respect to age-dependent increased Aβ load in mice expressing APPSwe and PSEN1δE9 mutation. A) Western blot images from 3 Tg+ve and 3 Tg-ve (control) mice brain lysates at 6 months (left panel), 12 months (middle panel and 18 months (right panel) of age. Densitometric analysis of full-length RIPK1 (B), cleaved RIPK1 (C) and tatal RIPK1 (D) intensities from 6 months (left panel), 12 months (middle panel) and 18 months (right panel) mice brain lysates. Each histogram represents mean ± standard deviation of three mice brain lysates from each age group. P< 0.05 is considered statistically significant.

Results indicate two important features of RIPK1 protein in present study. First, the level of RIPK1 is higher in Tg+ve mice brain than age-matched controls, across all age groups. Second, increased cleaved RIPK1 is clearly seen in all Tg+ve mice brain lysates than age-matched controls, across all age groups (Figure 03).

cleaved RIPK1 level is observed in 6 months and 12 months old Tg+ve mice brains than controls, but not prominently in 18 months old Tg+ve mice brains lysates. Densitometric analysis of full-length RIPK1 is significantly ($p \leq 0.05$) higher in 6 months (Figure 03B, left panel) and 12 months (Figure 03B, middle panel), but not in 18 months (Figure 03B, right panel) old Tg+ve mice brains than controls. Similarly, level of total RIPK1 (Full length + cleaved RIPK1) is significantly higher in 6 months (Figure 03D, left panel) and 12 months (Figure 03D, middle panel), but not in 18 months (Figure 03D, right panel) old Tg+ve mice brains than controls. In addition, densitometric analysis of cleaved RIPK1 is found to be significantly higher in 12 months (Figure 03C, middle panel), but not in either 6 months (Figure 03C, left panel) and 18 months (Figure 03C, right panel) old Tg+ve mice brains than controls. Increased RIPK1 level in present study can represent either inflammatory and cell-survival pathway activation in brain cells like astrocytes and microglia, which are involved in inflammation and self-proliferation. Increased cleaved RIPK1 in Tg+ve mice brains suggest possible activation of apoptotic neuronal and oligodendrocytic cell death in response to high level of toxic Aβ oligomers (~9-56 kDa). Aβ oligomers of 56 kDa are considered as star toxic isoforms, which are observed also in present mouse model of AD. Currently, there is no report on the cleavage of RIPK1 in either AD patients or any animal models of AD. Therefore, for the first time, it is reported that RIPK1 clevage is a downstream target of toxic Aβ peptide.

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Soumya Iyengar

Principal Investigator:
Soumya Iyengar
Systems Neuroscience, Cognitive Neuroscience

Pre-doctoral studies from AIIMS, New Delhi, specialized in Neuroanatomy and Ph.D. degree from the University of Southern California on development and organization of the anterior forebrain pathway, Dr. Iyengar's research focuses on understanding the changes in the brain involved with cognition in corvids. It is also involved in studying the effects of the endogenous opioid system on modulation vocalization and vocal learning. A third project focuses on studying structural changes in the developing human auditory cortex.

Research Associate:
Dr. Sonika Charak

Research Fellows:
Ms. Uzma Din
Ms. Pooja Parishar
Ms. Mukta Kumari
Ms. Anjali
Ms. Archana Panwar

Junior Research Fellow:
Ms. Risna KR
Ms. Aishwarya Iyengar

Technical Officer:
Arvind Singh Pundir

Techhnician:
Ram Mehar

Lab Assistant:
Krishan Sharma

Adult Neurogenesis in the Caudal Nidopallium of House Crows related to learning a Visual Discrimination Task

The family Corvidae includes birds such as crows, rooks, starlings and jays, which are excellent model systems to study cognitive functions since their cognitive abilities are on par with those of great apes. Electrophysiological studies on the nidopallium caudolaterale (NCL; an avian analogue of the prefrontal cortex) in carrion crows (Corvus corone) have demonstrated that it is involved in predicting behavioral rules, working memory, reversal and multicomponent behavioral tasks. We had earlier studied the dopaminergic system of an indigenous species of corvids (house crows, Corvus splendens), since it is important for cognition. Based on staining of tyrosine hydroxylase, the rate-limiting enzyme for catecholamine synthesis, we had demonstrated that the caudal nidopallium (NC) consists of at least five subdivisions including dorsal, medial, lateral, intermediate and ventral components (dNC, mNCL, lNCL, iNC and vNC), respectively. We were interested in understanding whether all these regions or whether only lateral and medial NCL were involved in learning. Furthermore, we were interested in understanding whether there were any changes in the addition of new neurons in NC, which could be correlated with learning.

For these experiments, house crows were trained on a shape discrimination task, which involved selecting between two shapes, one of which was rewarded with food. Whereas Trained birds achieved a success rate of ~80% on the task, undertrained birds performed at chance levels. We also included a group of crows (no-association) wherein the food reward was randomly associated with either of the shapes and a Baseline group of controls, which were only exposed to the set-up for a short period of time, but were not rewarded.

Using immunohistochemistry for the immediate early gene Arc, which acts as a marker for neural activity, we found that training on the visual discrimination task led to activation throughout the caudal nidopallium, not only in lNCL and mNCL. We also found that activation in the different subdivisions of NC was the highest in Trained birds, compared to that in other groups **(Fig. 1A and 1B)**. Furthermore, staining for doublecortin (DCX, a marker for immature neurons) revealed that there was a significant increase in the spherical subtype of these neurons in all parts of NC in Trained birds versus that in other groups **(Fig. 1C)**. Our results demonstrate that performance on the visual discrimination task leads to a significant increase in activation of areas throughout NC, which may play different roles in learning. Furthermore, learning appears to involve adult neurogenesis since the greatest number of new neurons are added to NC of Trained birds versus that in other groups.

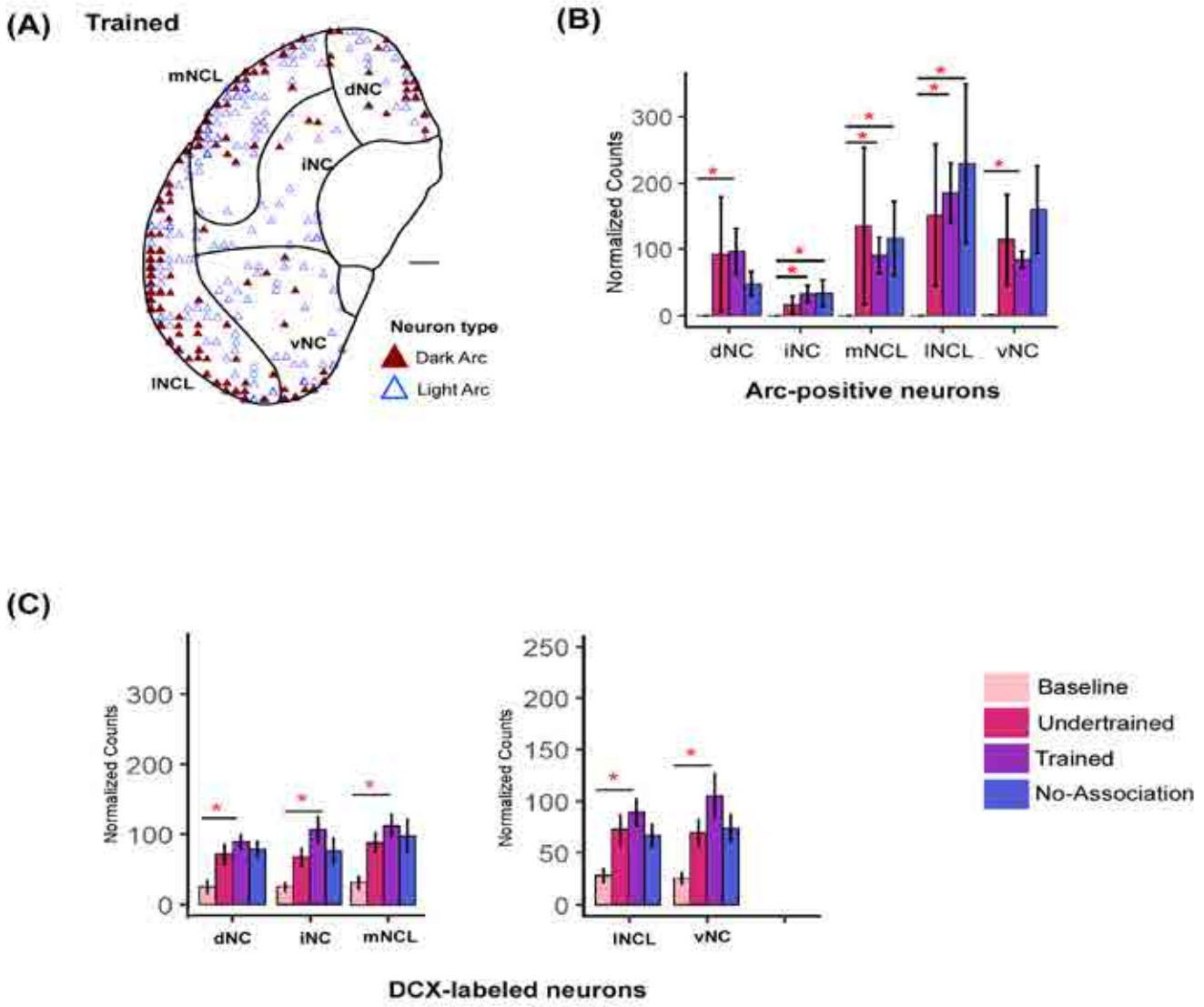

Figure Legend:

Figure 1: **(A)** An example of a coronal section from the caudal nidopallium of a house crow trained on visual discrimination stained for Arc. All five subdivisions of NC (dNC, iNC, mNCL, lNCL and vNC) contain Arc-positive neurons. **(B)** The number of Arc-positive neurons was the highest in Trained and no-association birds in lNCL. Similarly, training on the shape-discrimination task led to increased Arc expression in other subdivisions of NC. **(C)** The number of DCX-labeled neurons was significantly higher in Trained birds throughout the caudal nidopallium compared to that in other groups.

Collaborator:

Prof. S. Senthil Kumaran, Dept. of NMR, All India Institute of Medical Sciences, New Delhi.

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Sourav Banerjee

Principal Investigator:
Sourav Banerjee
Cellular & Molecular Neuroscience, Behavioral Neuroscience

Received his doctoral research on fundamental mechanisms of eukaryotic transcription from Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore; and postdoctoral research on protein synthesis-dependent control of synaptic plasticity from Yale University, Connecticut & University of California, Santa Barbara, U.S.

Area of research: The laboratory is investigating RNA-based mechanisms that operate locally at the synapse to regulate memory and globally within a specific population of neurons to modulate feeding behavior via adult neurogenesis. The major focus of the regulatory RNA-dependent mechanisms involves long non-coding RNAs and microRNAs. The laboratory uses mouse as a model system to decipher how these non-coding RNAs shape the function of brain in health and disease.

Research Fellows:
Ms. Sarbani Samaddar,
Mr. Balakumar Srinivasan,
Mr. Gourav Sharma,
Ms. Kamakshi Garg,
Ms. Dipanjana Banerjee,
Mr. Karthick Ravichandran,
Ms. Sania Sulata.

M.Sc. Dissertation:
Ms. Tulika Khargonkar

JRF:
Ms. Dhurgadevi K.R.

Technical Assistant:
D. Narendar

Non-coding RNAs in development and functions of neural circuit

RNA-based mechanisms of synapse formation and memory

Mechanism of functional autonomy in subcellular space is poised to resolve some of the pressing questions related to memory. How specific synapses are recruited to store memory? How are these synapses making persistent changes? What drives synapse-specific changes?

The localization of RNA, machineries required for protein synthesis as well as degradation and signaling molecules in neuronal dendrites create a microdomain to promote spatial control of synapse development and its functions. This localized control of gene expression drives structural and functional modifications of synapses that are necessary for memory storage as well as maintenance of network activity in the face of repetitive exposure to external stimuli. Motivated by these facts, the laboratory is investigating the mechanisms of synapse formation, Homeostatic and Hebbian forms of synaptic plasticity and memory storage by regulatory RNAs. Of particular interest, the laboratory has focused on long non-coding RNAs (lncRNAs) that function as regulatory RNAs. The research programme employed a variety of cell biological, biochemical and electrophysiology approaches and used hippocampal neurons in primary culture or in vivo as a model system to study the RNA-based mechanism of synapse formation and memory storage in health and disease.

Regulation of synapse formation:

The laboratory employed a transcriptomics analysis of synaptosomal RNA (a biochemical preparation to enrich synapses) from hippocampus and identified synapse-enriched long non-coding RNAs. Research programme initiated by the laboratory has verified the synaptic localization of a subset of synapse-enriched lncRNAs and characterized their role in synapse development in vitro and in vivo using primary hippocampal neurons in culture as well as in utero electroporation of CA1 neurons in hippocampus respectively. Our study identified a developmentally regulated lncRNA, Pvt1 that regulates dendritic complexity and spine structure.

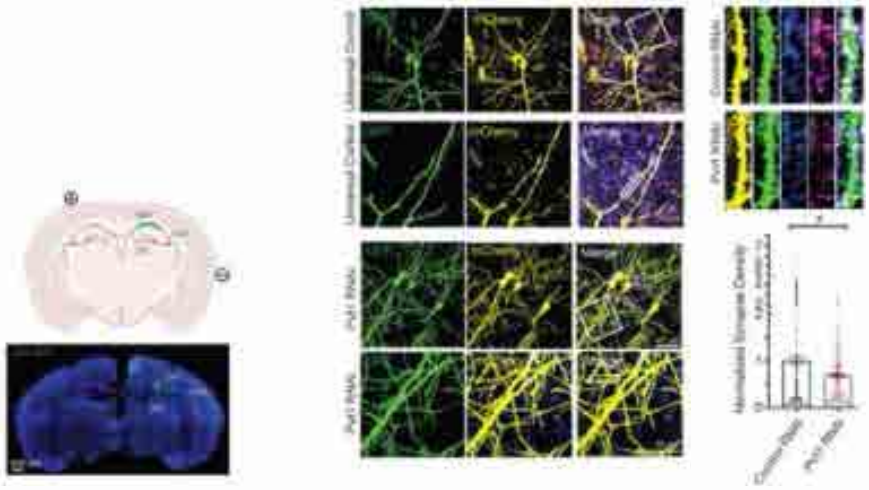

Figure 1: Pvt1 regulates excitatory synapse formation *in vivo*. *In utero* electroporated CA1 neurons were immunostained with PSD95 and Synapsin I and synapse density were measured following knockdown of Pvt1.

We observed that the loss of Pvt1 function leads to significant reduction of excitatory synapse density. Transcriptomics analysis following Pvt1 knockdown provided a molecular framework regulating development of excitatory synapses.

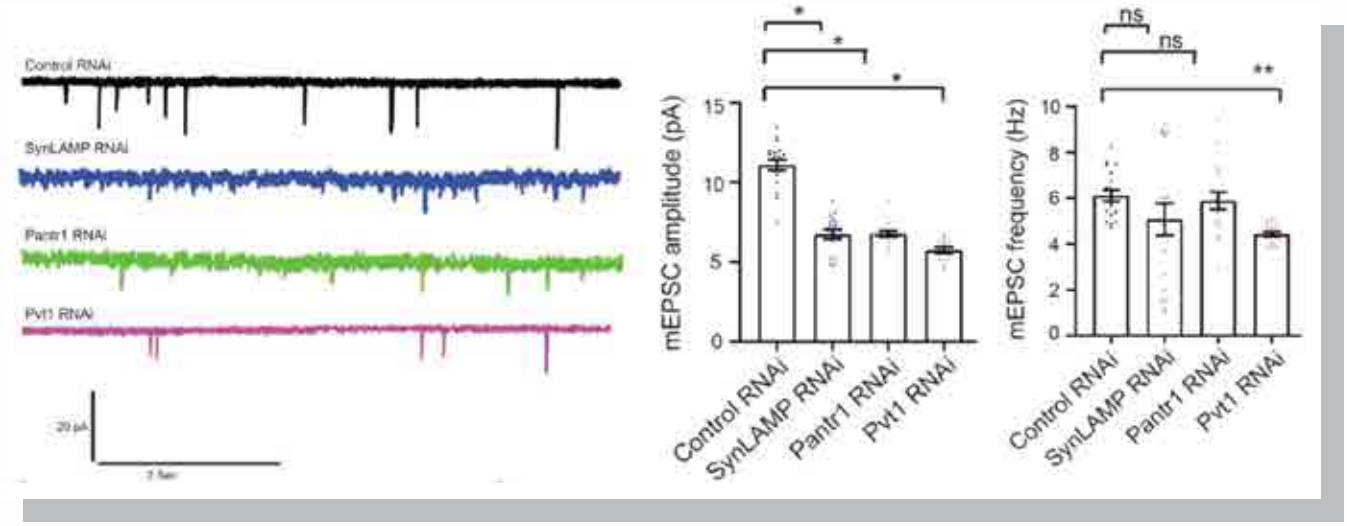

Figure 2: Pvt1 regulates excitatory synapse development. A) Traces from whole cell patch clamp recordings following knockdown of indicated synapse-enriched lncRNA. **B)** Quantification of mEPSC amplitude and frequency.

Furthermore, knockdown of Pvt1 reduces amplitude and frequency of miniature Excitatory Post-Synaptic Current (mEPSC) as detected by whole-cell patch clamp recordings. These observations demonstrate the necessity of Pvt1 in regulating both pre and post – synaptic function. Our study provides the first example of long non-coding RNA-Pvt1, involved in excitatory synapse formation.

Mechanisms of memory

De novo localization of RNA and its involvement in regulation of dendritic protein synthesis play a key role in hippocampus-dependent memory storage. The laboratory has investigated the role of synapse-enriched lncRNAs in dendritic protein synthesis and long-term memory. Our study demonstrated that the de novo protein synthesis by a novel synapse-enriched lncRNA, SynLAMP, is important for contextual fear memory encoding. The research programme has demonstrated that a specific set of lncRNAs is transported to synapse upon contextual fear conditioning via a possible interaction with RNA binding proteins.

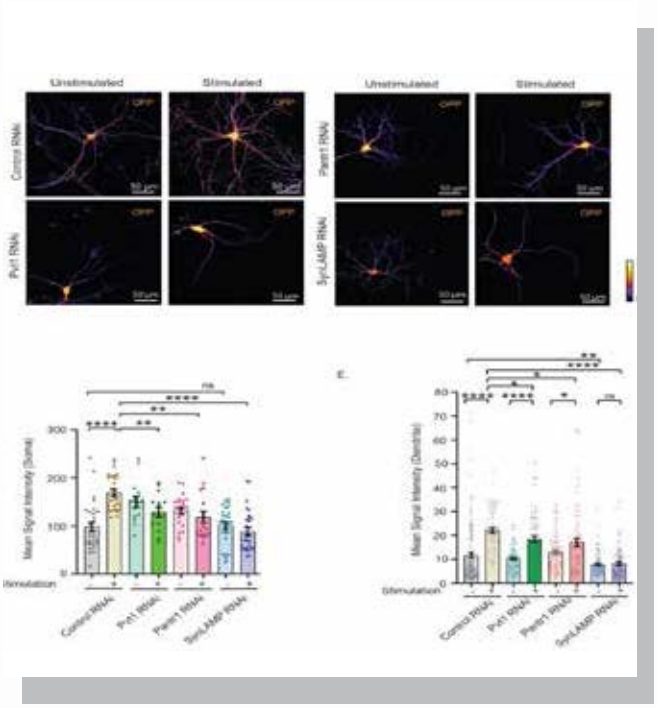

Figure 3: SynLAMP regulates activity-dependent translation in dendrites. Newly synthesized proteins were labeled with puromycin analog and detected by click-chemistry based FUNCAT assay following knockdown of indicated synapse-enriched lncRNAs.

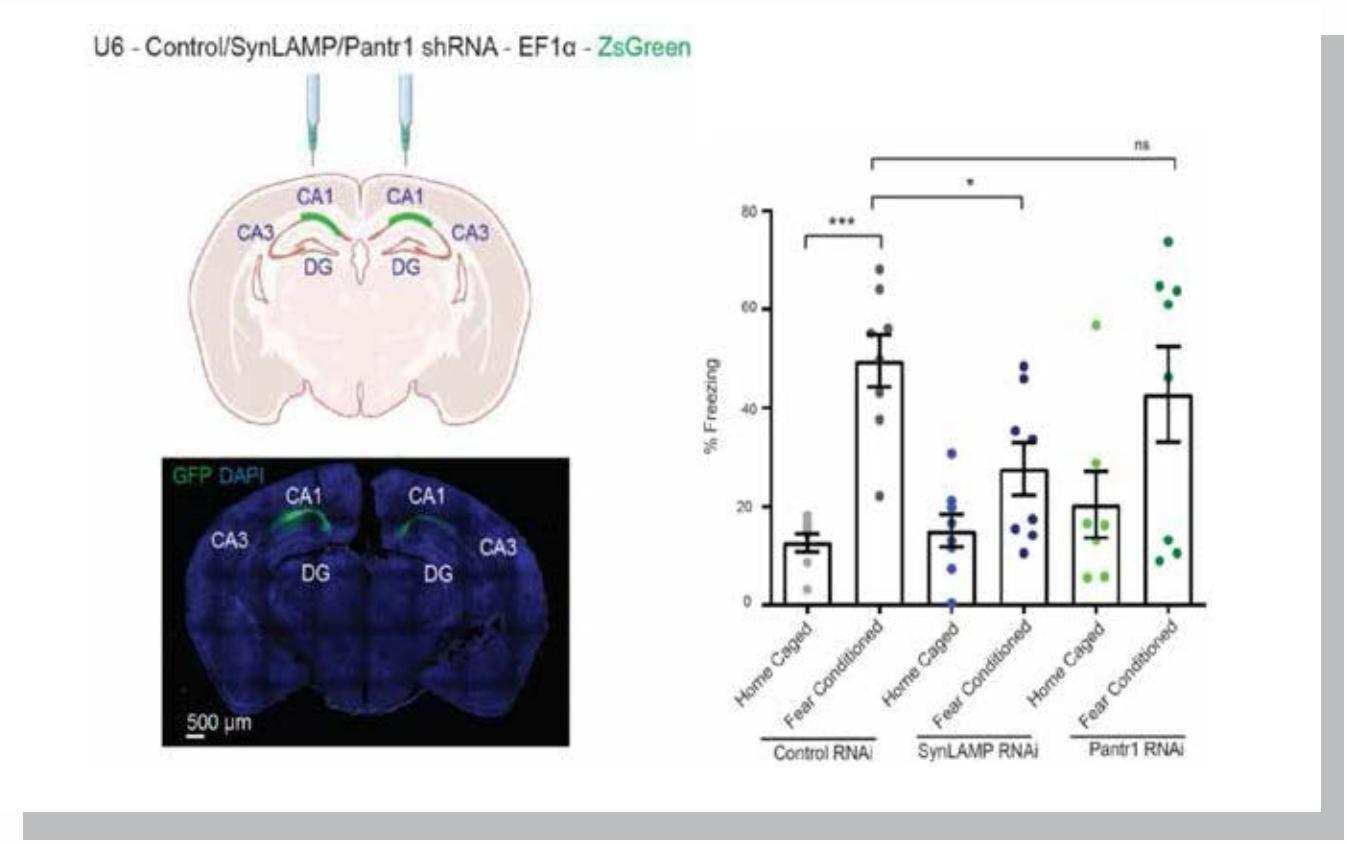

Figure 4: SynLAMP regulates memory consolidation. Knockdown of SynLAMP led to partial deficits in contextual fear memory consolidation whereas Pantr1 has no effect.

Our study has demonstrated that the SynLAMP function as a decoy to sequester translation repressor and subsequently regulate localized protein synthesis at the synapse. We observed that the knockdown of SynLAMP reduces dendritic protein synthesis. This activity-regulated translation is linked with consolidation of fear memory.

Diet-induced miRNAs regulates feeding circuit involving adult neurogensis

Dietary factors have shown to influence energy metabolism and body weight via modulation of feeding circuit in the brain. Deviations from physiological settings of energy metabolism often lead to obesity – a major health burden in India. The consumption of high fat containing diet for prolong period has shown to affect the functions of orexigenic and anorexigenic neurons in hypothalamus – the feeding centre of brain. Emerging studies have indicated that chronic High Fat Diet or HFD (60% calories coming from the diet) feeding of mouse enhances adult neurogenesis in the Arcuate Nucleus (ARC) of the hypothalamus and subsequently increases body weight. However, the mechanistic insight of diet-induced control of adult neurogenesis is poorly understood. It is imperative that a better understanding of this process would allow us to design effective strategy to tune the functions feeding circuitry.

More recently, microRNAs (miRNAs) have shown to regulate adult neurogenesis in hippocampus – the memory center of the brain. Prompted by this observation, our study aims to investigate the role of miRNAs in modulation of adult neurogenesis in hypothalamus. Furthermore, this study used a system biology approach to investigate the contribution of miRNA-target interaction and assess its implication in functional integration of newborn neurons in the feeding circuit.

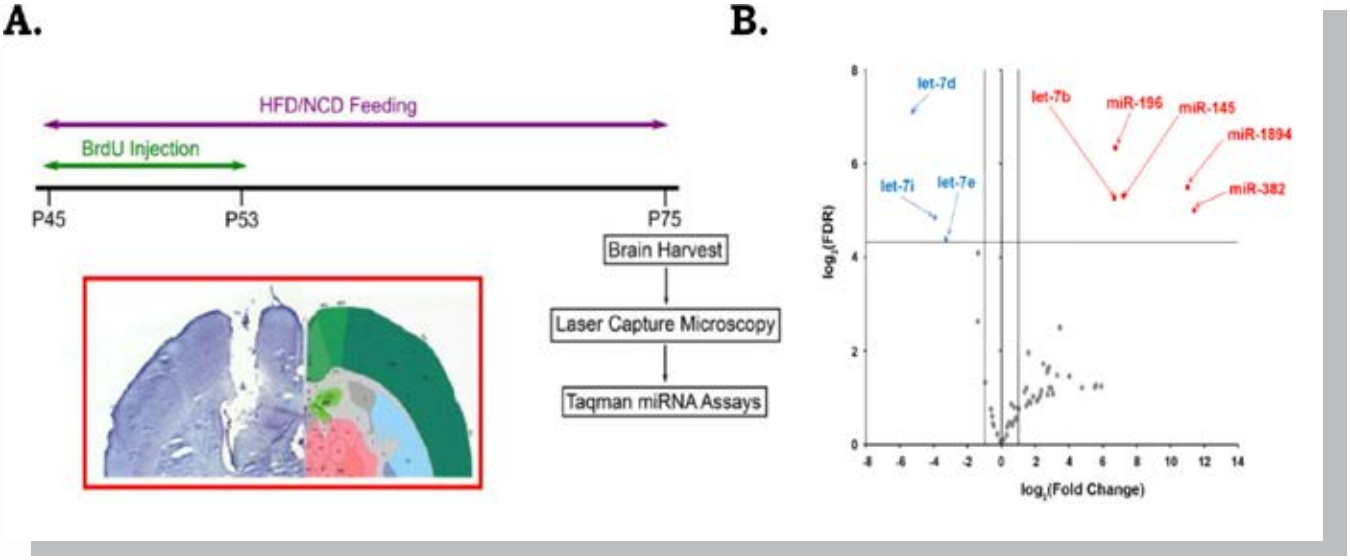

Figure 5: Diet-regulated miRNAs in adult neurogenic tanycyte in hypothalamus. A) HFD feeding paradigm and site of BrdU injection. **B)** Up-regulated miRNAs in tanycyte following HFD (Red) and Normal Diet or NCD (Blue).

Figure 5: Diet-regulated miRNAs in adult neurogenic tanycyte in hypothalamus. A) HFD feeding paradigm and site of BrdU injection. B) Up-regulated miRNAs in tanycyte following HFD (Red) and Normal Diet or NCD (Blue).

A mouse model was established using C57BL/6J mice to investigate the diet-induced adult neurogenesis in hypothalamus. The mice were fed HFD starting at Post-natal Day 45 (P45) and continued till P75. To label endogenous population of β2 tanycytes, a neurogenic population at median eminence along the lining of third ventricle, BrdU was injected through intra cerebro ventricular injections (i.c.v) from P45 to P53. Neural progenitor cells from β2 tanycytes were laser captured and differentially expressed miRNAs upon HFD feeding were identified by an unbiased screen using miRNA array. The set of miRNAs that showed upregulation (>1.5 fold up-regulated) upon HFD feeding were selected to investigate their importance in modulation of feeding circuit function. Predicted targets of enriched miRNAs were collected from TargetScan, Pictar and Diana Tools databases. Interactions between the targets were determined using STRING database. The interaction network was analyzed using Brain Connectivity Toolbox in MATLAB. The interaction network was separated into smaller communities based on Louvain's community detection method. The modularity of the network was calculated to distinguish whether the network was based on random interactions. The network modularity was determined to form a highly modularized network and not random connections. An agreement matrix was formed from the community analysis of the network to form larger consensus partitions of the whole network. From this analysis, we calculated the participation coefficients (PC) and z-scores for each miRNA target (nodes) to determine the important hubs involved in the network using the two parameters. The hubs relevant to neurogenesis and metabolism were then chosen for further biochemical validations.

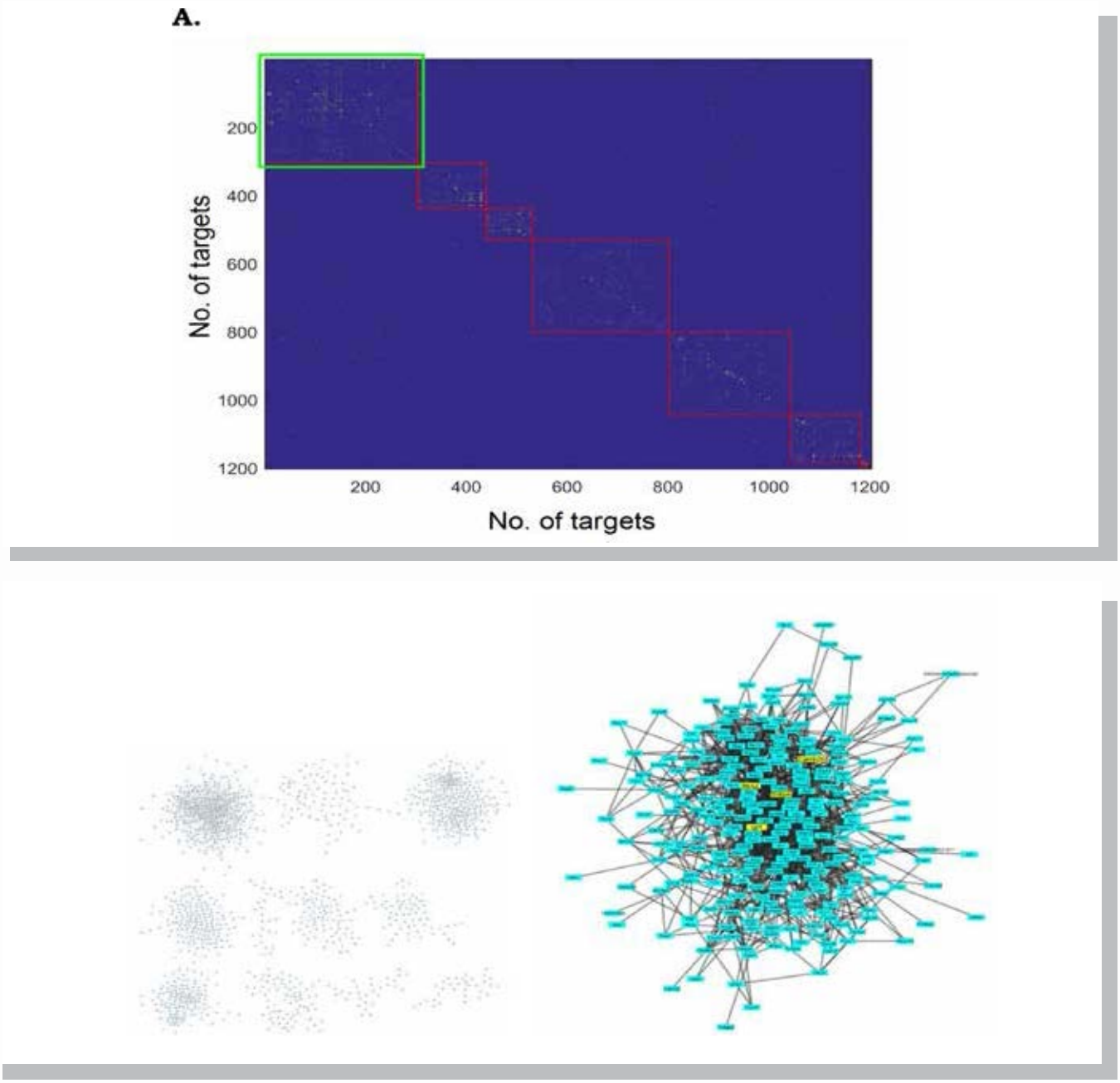

Figure 6: Network analysis of diet-regulated miRNA targets. A) Clusters of interacting miRNA targets within whole network. **B**) Individual clusters of miRNA targets. The "hub" proteins encoded by miRNA-regulated indicated in "yellow". miRNA-mediated regulation of these "hub" transcripts analyzed by reporter assay.

The interactions between diet-induced miRNAs and target transcript encoding hub proteins were analyzed by reporter assay. Our study identified IGF1 (Insulin Growth Factor 1), NTRK2 (BDNF receptor), ERBB4 (neuroligin receptor) and CamK2b (synaptic proteins associated with neural activity) as major hub proteins that are combinatorically regulated by all five diet-induced miRNAs.

To analyze implication of miRNA-target interaction –mediated control of feeding circuit function, neuronal type that are differentiated from newborn neurons

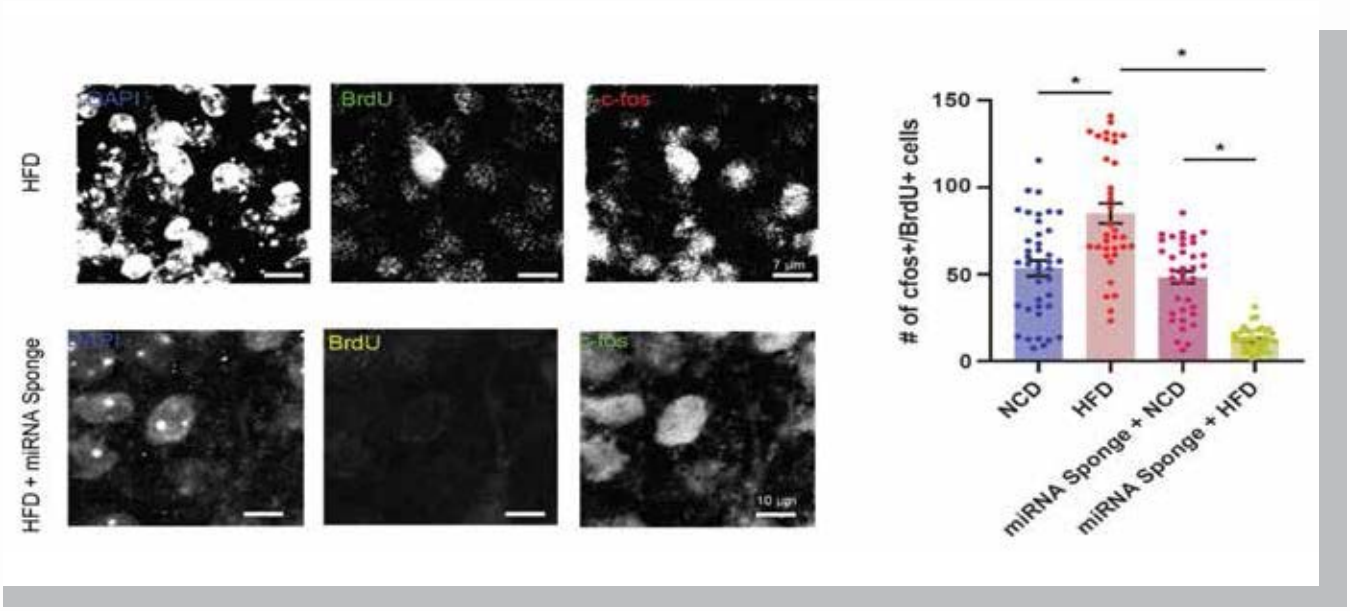

Figure 7: Inhibition of miRNA function sequesters integration of newborn neurons into feeding circuit. Injection of miRNA sponge in median Eminence of Arcuate Nucleus (ARC-ME), the site for tanycytic neurogenesis, inhibits functional integration of newborn neurons as detected by BrdU and C-fos immunostaining following sponge –mediated inhibition of miRNA function.

We argued that the functional integration of AgRP expressing newborn neurons would be key determinant of diet-regulated function of feeding circuit. We have tested functional integration of newborn neurons into the feeding circuitry by analyzing c-Fos expression in BrdU positive cells. We observed that HFD feeding led to a significant enhancement in functional integration of newborn neurons as detected by an increase in BrdU and C-Fos double positive cells. However, this enhancement was abrogated by inhibition of diet-induced miRNAs. Taken together, our study provides a miRNA-based molecular framework that could potentially be used to tune the functions feeding circuitry necessary for maintaining an energy balance.

Collaborators:

Dr Timothy Bredy, Queensland Brain Institute, Australia

Prof. Ted Abel, Iowa Neuroscience Institute, USA

Prof. Sheffali Gulati, AIIMS-New Delhi, India

Dr Dipanjan Roy, IIT-Jodhopur, India

Dr Sharba Bandyopadhyay, IIT-Kharagpur, India

Swagata Dey

Principal Investigator:
Swagata Dey

India Alliance Early Career Fellow at the National Brain Research Centre, Manesar, studying the cytoskeletal basis of dendrite remodeling in the neurons of the roundworm, Caenorhabditis elegans.

Technical Assistant:
Ms. Supraja Balakrishnan

Understanding the role of microtubule regulators in defining the neuronal polarity

A functional nervous system requires an intact anatomical structure of neuronal compartments and associated connections. These compartments often undergo structural and functional modifications during development, regeneration, and plasticity-related events. Failure to do so, may result in degeneration of certain compartments, loss of functional connectivity with target tissues, and eventually, a manifestation of neurodegenerative symptoms. As dendrites are the input processes, they define the quality and quantity of information that is processed by a neural circuit. Dendritic arbors are structurally diverse and their morphology correlates to the neuron type and function. Aberrant dendrite morphology is a hallmark of some chronic and acute neuropathologies like Autism, Schizophrenia, Alzheimer's disease, epilepsy, traumatic brain injuries, and drug abuse.

Unlike other compartments of the neurons, dendrites remodel extensively in response to various developmental, sensory, or pathological cues. For example, during pupa formation, Drosophila dendritic arborization (da) neurons prune their dendrite arbor completely and reconstruct in a ¬new geometry. Similarly, in vertebrates, sensory experience refines the connections of the mitral cells with a particular glomerulus. Neurite remodeling has been extensively studied using axon injury models and is facilitated by changes in the cytoskeletal architecture, rerouting of the polarized transport, and changes in the transcriptome. For example, axon injury causes a rise in the intracellular calcium which causes catastrophe of the microtubules and an increase in Cyclic Adenosine monophosphate (cAMP), Protein Kinase A (PKA), and Mitogen-activated protein kinase kinase kinase (MAPKKK) such as Dual Leucine Zipper Kinase (DLK-1). DLK-1 downregulates the microtubule depolymerization by KLP-7 (Kinesin-13) and promotes the formation of the growth cone facilitated by the actin turnover mechanisms. Dendrites and axons have distinct molecular constitutions and conventional axon regeneration pathways are not involved in dendrite regeneration. However, cytoskeletal effectors like AKT, ROR, and Wnt effectors have been implicated in the process.

The dendritic cytoskeleton is mainly composed of microtubules and actin with scaffolding proteins like spectrins and septins. The core machinery for microtubule maintenance consists of end-binding proteins like EBP and Patronin, depolymerizing motor Kinesin-13, assembly factors like CRMP, and motors like Kinesin-1 that transports the majority of cargoes including tubulins and MT protofilaments. Similarly, actin is maintained by polymerization factors like Profilin, depolymerization factors like Cofilin, and branching factors like Arp-2/3 and WASP/WAVE, which have been implicated in dendritic arbor formation. Dendritic arborization also depends on the microtubule and actin nucleators in the form of Golgi outposts, kinetochore proteins, endoplasmic reticulum, and actin blobs, which enrich at the presumptive dendritic branch points. Due to dendritic complexity and lack of in vivo models, it is not well understood how neuronal cytoskeleton is organized and regulated for proper dendritic arborization during development or regeneration.

Due to the diversity of the cytoskeletal regulators, we have focused on Kinesin-13 to understand its role in dendrite development and regeneration. As previously mentioned, KLP-7 of the Kinesin-13 family of motors gets downregulated by DLK-1 for the promotion of axon regeneration. KLP-7 has also been implicated in the regulation of neuronal polarity and anatomy under the effect of Wnt signaling in the touch

neurons of *C. elegans*. Furthermore, in Drosophila neurons, its ortholog klp10a negatively regulates the dendrite pruning. The nature of the microtubule cytoskeleton is unclear during dendrite development or regeneration. Here, I have discussed the role of KLP-7 in determining the axon-dendrite compartmentalization in the PVD neurons.

KLP-7/Kinesin-13 is required for the axon dendrite compartmentalization in the PVD neurons

KLP-7 is a motor of the Kinesin-13 family that glides over the microtubules and causes catastrophe on the protofilament ends. Conditional knockout of KIF2 (mammalian ortholog of Kinesin-13) in the hippocampi resulted in the formation of abnormal neurites in the dentate granule cells, which were not differentiated into the axons and dendrites in terms of their molecular constitution. Along with the additional cell proliferation and migration defects, these mutant mice showed epileptic hyperactivity. Similar anatomical defects were also observed in the touch neurons of *C. elegans*, where the loss of the klp-7 gene resulted in the formation of ectopic neurites with axonal markers. Both in vertebrate and invertebrate models, Kinesin-13 regulates the microtubule organization in the neurites and attributes to axonal and dendritic identities however, the underlying mechanism is not explored.

To address this question, we are using the PVD neurons of *C. elegans* with a well-defined axon and a highly stereotyped dendritic arbor. The orthogonal branches have a distinct cytoskeletal architecture with the primary branches generally microtubule rich whereas the higher order branches are rich in actin. This makes it a suitable model to explore the connection between the cytoskeleton and dendrite identity. Using this neuron model, previous studies have established the roles of various microtubule polarity regulators some of which also changes the polarized distribution of cargoes into the dendrites and the axon.

We investigated aspects of neuronal polarity in the loss of function mutant of klp-7, the worm ortholog of Kinesin-13. We checked the distribution of the axonal marker, RAB-3 as a reporter for neuronal polarity (Figure 1A). Unlike the wildtype where the RAB-3 was restricted to the axon in the ventral nerve cord, we observed a mislocalization of the axonal cargo, RAB-3 into the dendrites of the klp-7 null mutant (Figure 1B-C). As compared to the wild type, a significant number of branches showed the presence of RAB-3 (Figure 1D). Also, the primary dendrites rich in microtubules showed a greater prevalence of RAB-3 punctae in this mutant (Figure 1E). A similar phenotype was observed for another synaptic molecule SAD-1 which also gets mislocalized to the dendrites in the absence of klp-7 (Figure 1F-G). This was a clear indication that even though axons and dendrites are structurally distinct, loss of klp-7 disrupts the axon dendrite compartmentalization.

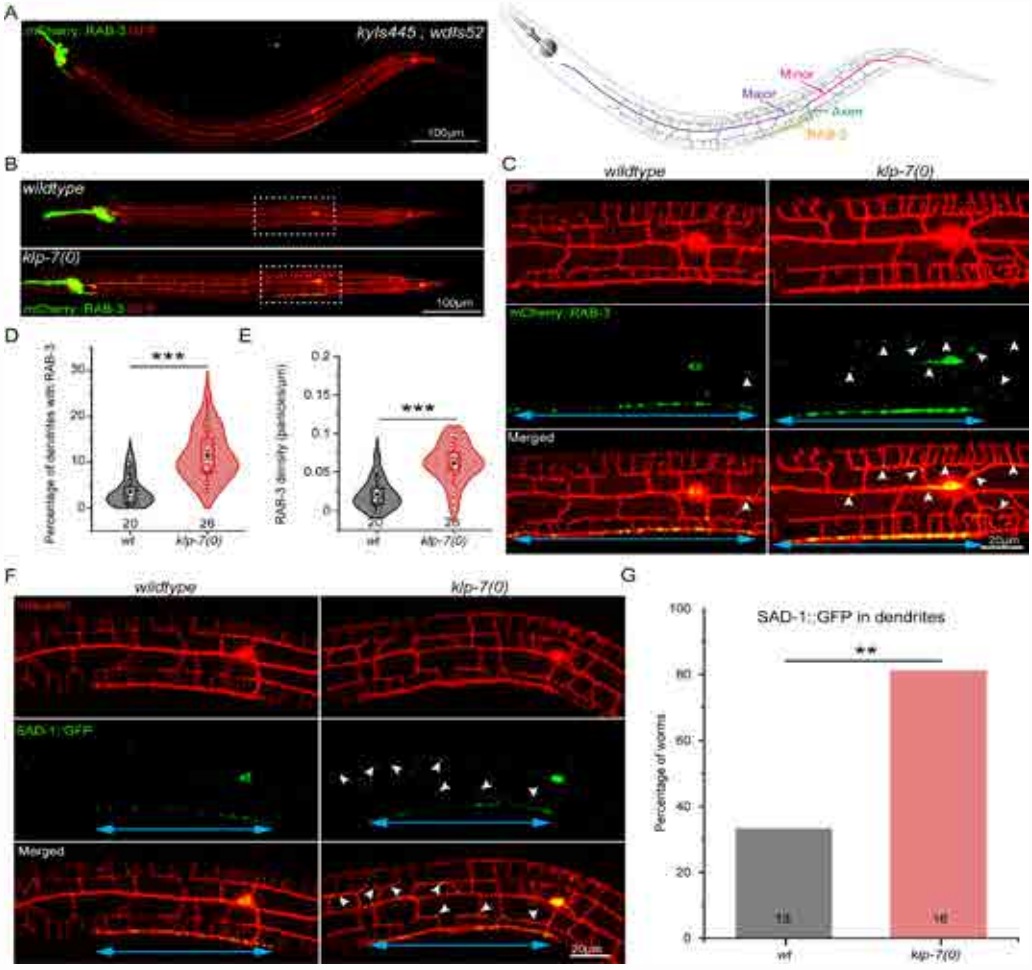

Figure 1: KLP-7 regulates the axon-dendrite compartmentalization in the PVD neurons.

A. Representative image and schematic (right) of the PVD neuron expressing soluble GFP (wdIs52) and mCherry: RAB-3 (kyIs445) to assess neuronal polarity.

B-C. Whole body (B) images of PVD neurons with dotted area magnified (C) in the wildtype and klp-7(0) showing the distribution of mCherry: RAB-3. Blue arrow represents the distribution in the axon (ventral nerve cord) and white arrowheads represent the distribution in the dendrites. Respective n values are mentioned within the graph.

D-E. The percentage of dendrites with RAB-3 (D) and the density of RAB-3 punctae in the primary dendrites (E) are compared between the wildtype and klp-7(0) neurons. Comparison of means was done using Tukey's test. $p<0.001$***. Respective n values are mentioned within the graph.

F-G. Images (F) and percentage of worms (G) showing the distribution of SAD-1: GFP (kyIs445) with soluble mScarlet (shrEx472) in the PVD dendrites of wildtype and klp-7(0) mutants. Blue arrow represents the distribution in the axon (ventral nerve cord) and white arrowheads represent the distribution in the dendrites. Statistical comparison was done using Fisher's test $p<0.01$**.

Loss of axon dendrite compartmentalization is a phenotype specific to klp-7(0)

As KLP-7 is a microtubule catastrophe factor, we asked if all microtubule catastrophe factors regulate the axon-dendrite compartmentalization. We observed another mutant that has a loss of function of EFA-6. EFA6 is a cortical protein that is an exchange factor for ARF6 GTPase required in membrane trafficking and actin regulation. The *C. elegans* ortholog, EFA-6 has a microtubule depolymerizing domain that causes the catastrophe of the microtubules near the cell cortex (Figure 2A). Loss of EFA-6 causes the

cells to have long microtubules and has been phenotypically correlated to spindle defects, embryonic lethality, and dlk-1-independent axon regeneration.

Unlike the loss of function mutant of klp-7, null mutant of efa-6 did not change the distribution of RAB-3 to the dendrites (Figure 2B-C). Measurement of the number of dendrites with RAB-3 and distribution of RAB-3 in the primary dendrite of the PVD neuron of efa-6(0) were equivalent to those of wild type (Figure 2D-E). Axon-dendrite boundary seems to be preserved in this mutant like the wild type. Furthermore, we did not observe a synergism between klp-7 and efa-6 in the double mutant as compared to the klp-7 mutant alone (Figure 2D-E). This indicated that the effect of klp-7 on neuronal polarity is highly specific even though both klp-7 and efa-6 are microtubule catastrophe regulators.

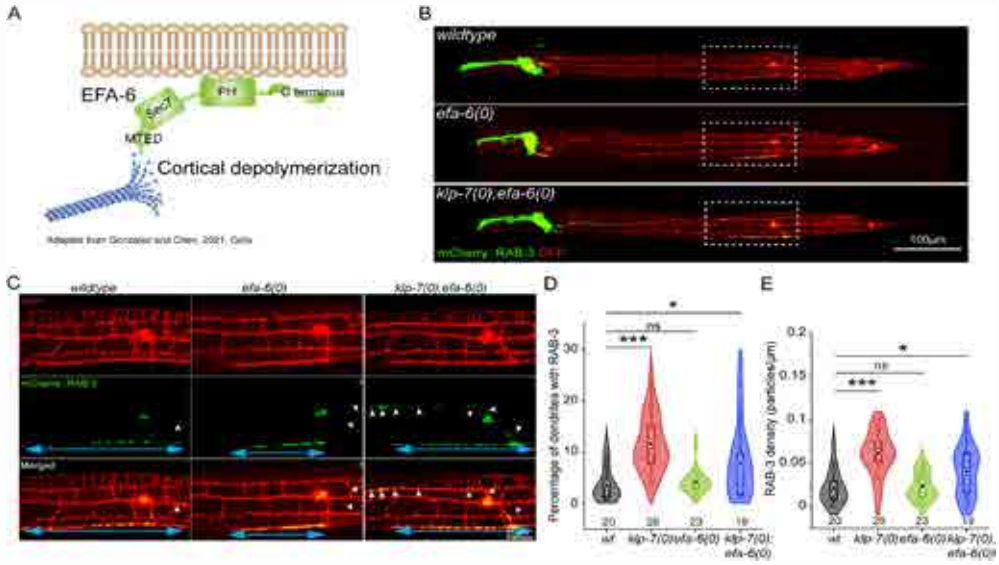

Figure 2: Specific requirement of KLP-7 in the regulation of axon-dendrite compartmentalization.

A. Schematic of *C. elegans* EFA-6 based on the domain description by Gonzalez and Chen, 2021, Cells and Wormbase. MTED (MicroTubule Elimination Domain) is an 18 amino acid motif present in the invertebrate EFA6 that causes depolymerization of microtubules at the cell cortex. Sec7 is required for actin regulation and PH (Pleckstrin Homology) domain is required for membrane tethering of the protein at the cell cortex.

B-C. Whole body (B) images of PVD neurons expressing soluble GFP (wdIs52) and mCherry: RAB-3 (kyIs445) with dotted area magnified (C) in the wildtype, efa-6(0), and double mutant klp-7(0); efa-6(0) showing the distribution of mCherry: RAB-3. Blue arrow represents the distribution in the axon (ventral nerve cord) and white arrowheads represent the distribution in the dendrites.

D-E. Percentage of dendrites with RAB-3 (D) and density of RAB-3 punctae in the primary dendrites (E) are compared between the wildtype, klp-7(0), efa-6(0), and double mutant of klp-7(0); efa-6(0) neurons. Comparison of means was done using Tukey's test. $p<0.001$***, <0.05*, >0.05 (ns). Respective n values are mentioned within the graph.

Microtubule organization by KLP-7 is a determiner of the axon-dendrite compartmentalization

Pioneer studies in neuronal polarity have used pharmacological perturbation of the microtubules through Paclitaxel to induce multiple neurites with axonal identity. To understand if general microtubule stabilization could be the basis of the neuronal polarity in the PVD neurons. We used a 5µM concentration of Paclitaxel, which is estimated based on the ectopic neurite outgrowth phenotype in ALM neurons in *C. elegans* when exposed to Taxol. Treatment of L4 worms since their hatching did not change the presence of RAB-3 in the PVD neurons with respect to the control (DMSO

treated) (Figure 3A). The percentage of the dendrites with RAB-3 accumulation was similar to the treatment control (Figure 3B). This further strengthened the observation that microtubule stabilization by loss of microtubule catastrophe regulators or pharmacological perturbation may not disrupt the axon-dendrite compartmentalization. It further suggests that KLP-7-dependent microtubule organization may play a specific role in determining the dendritic identity.

To further understand if KLP-7 mediated microtubule organization defines the dendritic identity, we used pharmacological disruption of microtubules by Colchicine. We used a concentration of 1mM colchicine which has been shown to affect the microtubule dynamics and function of the gentle touch neurons. On exposure to 1mM colchicine, we observed no difference in the wild type distribution of RAB-3, however, in the klp-7 loss of function mutant, the prevalence of RAB-3 in the dendrites decreased significantly with the exposure of the colchicine (Figure 3C-D). This was a partial change as a significant number of klp-7(0) dendrites still accumulated RAB-3 in the presence of colchicine as compared to its treated wildtype control (Figure 3D). This indicates that microtubule dynamics maintained by KLP-7 prevent the entry of axonal cargoes like RAB-3 into the dendrites. This led us to investigate the microtubule organization of PVD neurons and the role of KLP-7 in maintaining it.

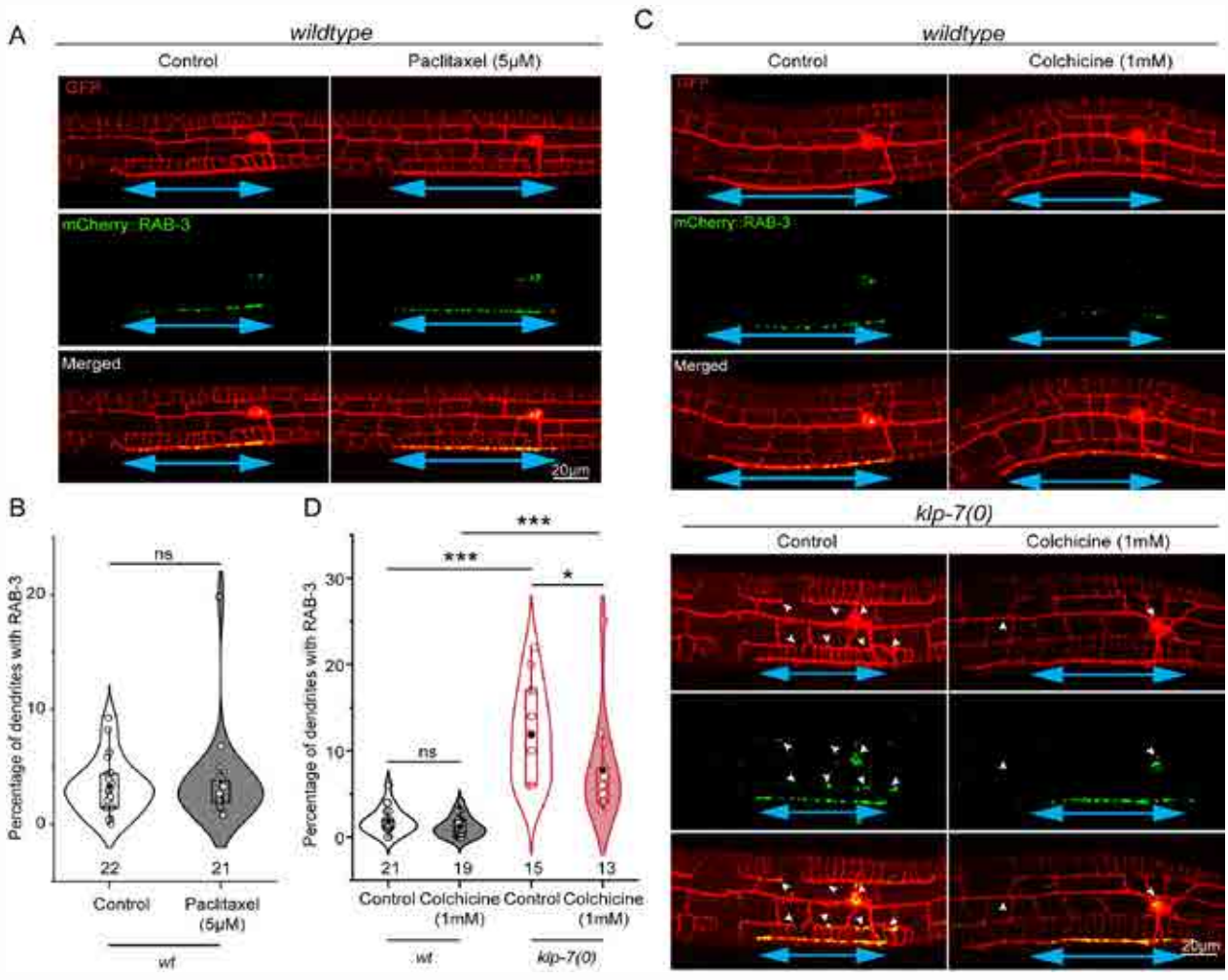

Figure 3: Microtubule organization by KLP-7 determines dendritic identity.

A-B. Representative images (A) and quantification (B) of distribution of mCherry: RAB-3 upon pharmacological perturbation of microtubules using Paclitaxel (5μM) as compared to control

treatment (DMSO) in the wildtype neurons. Blue arrow represents the distribution in the axon (ventral nerve cord). Comparison of means was done using Tukey's test. p>0.05 (ns). Respective n values are mentioned within the graph.

C-D. Representative images (C) and quantification (D) of distribution of mCherry: RAB-3 upon pharmacological perturbation of microtubules using Colchicine (1mM) in the wild type and klp-7(0) neurons. Blue arrow represents the distribution in the axon (ventral nerve cord) and white arrowheads represent the distribution in the dendrites. Comparison of means was done using Tukey's test. p<0.001***, <0.01**, <0.05*. Respective n values are mentioned within the graph.

Kinesin-13 regulates the relative orientation and distribution of dynamic microtubules in the major dendrite

Previous studies have explored the dynamic microtubules in the PVD dendrites and deciphered AnkyrinG (UNC-44), CRMP2 (UNC-33), UNC-119, Kinesin-1 (UNC-116), Patronin (PTRN-1), and Ninein (NOCA-1) as the major regulators of microtubule dynamics. The role of KLP-7 in maintaining the dendritic microtubule organization is yet to be characterized. To understand the microtubule organization, we observed the dynamics of the plus tips of the microtubules using the EBP-2: GFP marker. EBP-2: GFP binds to the plus ends of microtubules and shows comet-like movement in a time lapse acquisition.

In the wild type neurons, the anterior dendrites show minus end-out microtubules with the comets that are moving toward the cell body (Figure 4A). However, in the klp-7 null mutant, we see a significant number of comets that are moving in the opposite direction as also visible in the kymographs (Figure 4A). Quantification of the EBP-2: GFP comets showed that instead of minus end out polarity in the anterior dendrite like the wild type, the mutant has a mixed orientation of microtubules (Figure 4B). One possibility is that klp-7 is specifically depolymerizing the plus ends of the microtubules to maintain the minus-end-out polarity of the microtubules in the anterior dendrite. We will be exploring this possibility by overexpressing klp-7 in the background of ptrn-1(0), which has increased precedence of the plus end out microtubules in the anterior dendrite. Unlike wildtype dendrites, robust polymerization events were diminished which was evident in the rates of microtubule polymerization which was reduced in the mutant (Figure 4C). This could have resulted from the increased stability of microtubules and less availability of tubulin dimer subunits in the absence of KLP-7-dependent depolymerization. This assay revealed two aspects of dendritic microtubule organization that are regulated by Kinesin-13 i.e. polarity and polymerization. It is however, unclear if KLP-7-mediated microtubule depolymerization is participating locally to maintain microtubule polarity in the anterior dendrite or globally to change the molecular composition in the axons and dendrites.

Previous results have elucidated that increased stabilization of microtubules in the klp-7(0) results in the loss of the mi nus ends. I checked the presence of the minus end protein PTRN-1: tagRFP in the PVD dendrites to understand if the minus ends are perturbed due to the loss of the klp-7 gene. The density of the PTRN-1: tagRFP was comparable between the wildtype and klp-7(0) neurons (Figure 4J-K). This indicates that KLP-7 influences the entire microtubule organization on a global scale.

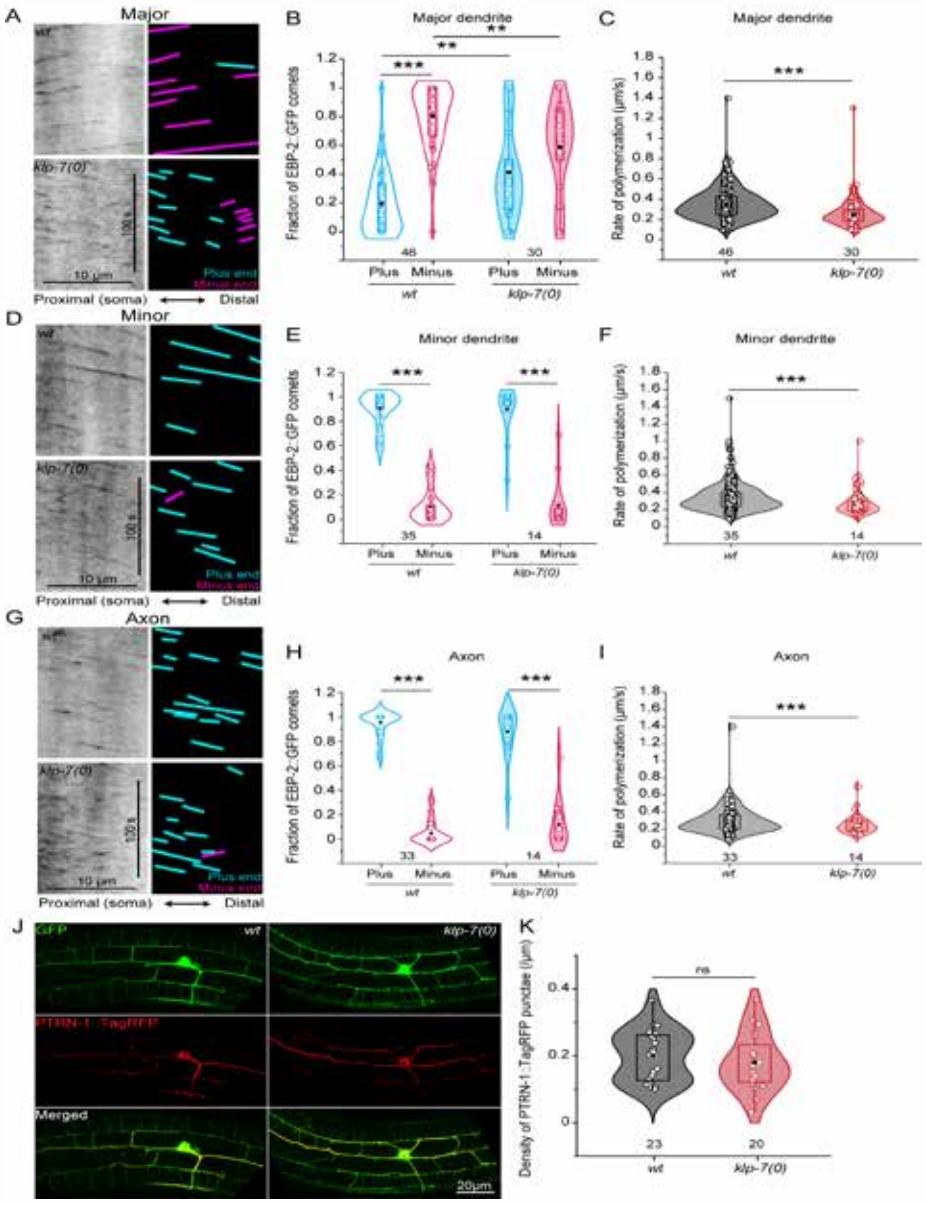

Figure 4: KLP-7 regulates the microtubule polarity and dynamics in the PVD dendrites.

A, D, and G. Kymographs with their respective schematics showing the trajectories of EBP-2: GFP comet in the PVD major dendrite (A), minor dendrite (D), and the axonal (G) compartments of wildtype and klp-7(0). Schematics show the orientation of the comets in the plus-end-out (cyan) and minus-end-out (magenta) directions.

B, E, and H. Relative orientation of the microtubules is represented as a fraction of EBP-2: GFP comets in the plus end out and minus end out directions in the PVD major dendrite (B), minor dendrite (E), and the axonal (H) compartments of wildtype and klp-7(0). Comparison of means was done using Tukey's test. $p<0.001$***, <0.01**. Respective n values are mentioned within the graph.

C, F, and I. Rates of polymerization were quantified as the covered distance divided by the duration of the EBP-2: GFP comets in the PVD major dendrite (C), minor dendrite (F), and the axonal (I) compartments of wildtype and klp-7(0). Comparison of means was done using Tukey's test. $p<0.001$***. Respective n values are mentioned within the graph.

J-K. Representative images showing distribution of PTRN-1: tagRFP and its density in the major dendrite in the wildtype and klp-7(0) PVD neurons also expressing constitutive GFP marker. Comparison of means was done using Tukey's test. $p>0.05$ (ns). Respective n values are mentioned within the graph.

Interestingly, we observed distribution of the EBP-2: GFP comets was altered in the klp-7 loss of function mutant (Figure 5A). In the wild type, EBP-2: GFP comets are present in the primary dendrites and the axon whereas in the klp-7(0) mutant these comets also went into secondary branches and sometimes to tertiary branches (Figure 5A). As speculated earlier, an increased number of the dynamic ends of the microtubules may also increase the propensity of RAB3 vesicles. And we see that the RAB-3 vesicles also occupy the secondary, tertiary, and quaternary branches of the klp-7 mutant (Figure 5B).

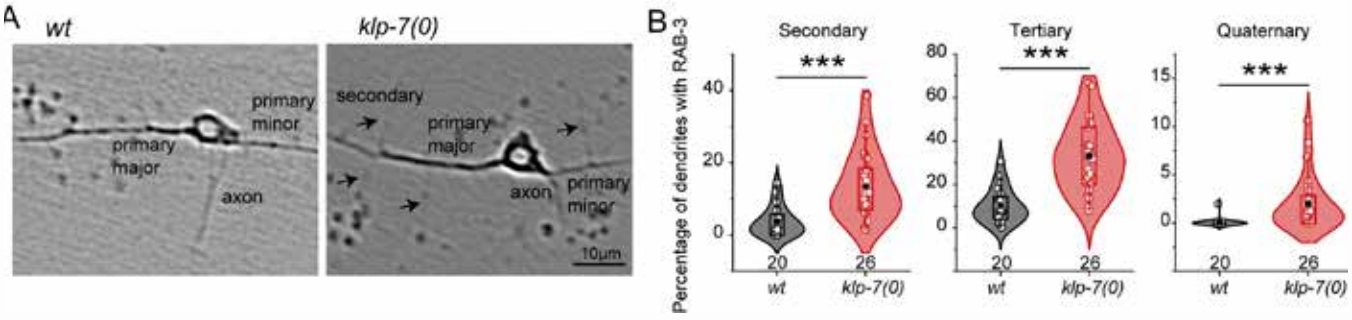

Figure 5: KLP-7 limits the distribution of microtubules and anterograde traffic in the dendrites.

A. Representative images of the PVD neurons expressing EBP-2: GFP in the wild type and klp-7(0) mutant worms.

B. Quantification of the percentage of secondary, tertiary, and quaternary branches in the wild type and klp-7(0) PVD neurons with RAB-3 accumulation. Comparison of means was done using Tukey's test. $p<0.001$***. Respective n values are mentioned within the graph.

Differential regulation of microtubule organization by Kinesin-13 in PVD compartments

In the anterior dendrite, we observed that KLP-7 is regulating the polarity and the polymerization. To understand the spatiotemporal extent of the KLP-7 mediated microtubule organization we also checked the microtubule dynamics in the other neurites of the PVD neuron i.e. in the minor dendrite and the axon (Figure 4D-I). We observed a decrease in the rates of polymerization in both minor dendrite and the axon however, we did not observe any change in the microtubule polarity in these neurites, which have a plus-end-out orientation of the microtubules (Figure 4D-I). This indicated differential functions of KLP-7 associated with the different compartments of the PVD neuron.

To further understand the role of klp-7 in maintaining the microtubule organization, we assessed the activity profile of KLP-7 in the various compartments of the PVD neuron. We investigated the presence and mobility of GFP-tagged KLP-7 in the four compartments of the PVD neuron (Figure 6A). Major and minor are the microtubule-rich dendritic compartments, proximal axon, and axon initial segment (Figure 6A). Localization of GFP: KLP-7 was equivalent in all these compartments (Figure 6B), however, the FRAP assay revealed that the mobility of GFP-KLP-7 is significantly lesser in the axon initial segment with respect to the other compartments (Figure 6C-F).

Previously, in the mammalian neurons and gentle touch neurons of *C. elegans*, Kinesin-13 is differentially regulated in the axons and dendrites, which allows the neurons to acquire a distinct microtubule organization specific to these compartments. This is in line with the previous results where Kinesin-13 is downregulated in the axonal compartment to ensure more stability to the microtubules. This was confirmed by the rates of polymerization, which were lesser in the axon as compared to the dendrites (Figure 6G). Furthermore, the loss of klp-7 function decreased the polymerization rates

to a similar level suggesting the differential activity of KLP-7 may be correlated to axon-dendrite compartmentalization (Figure 6G). Similar observations were made when molecules maintaining axon-dendrite compartmentalization like AnkyrinG and CRMP2 were perturbed. Therefore, I checked the possibility of Kinesin-13 affecting the constitution of the axon initial segment.

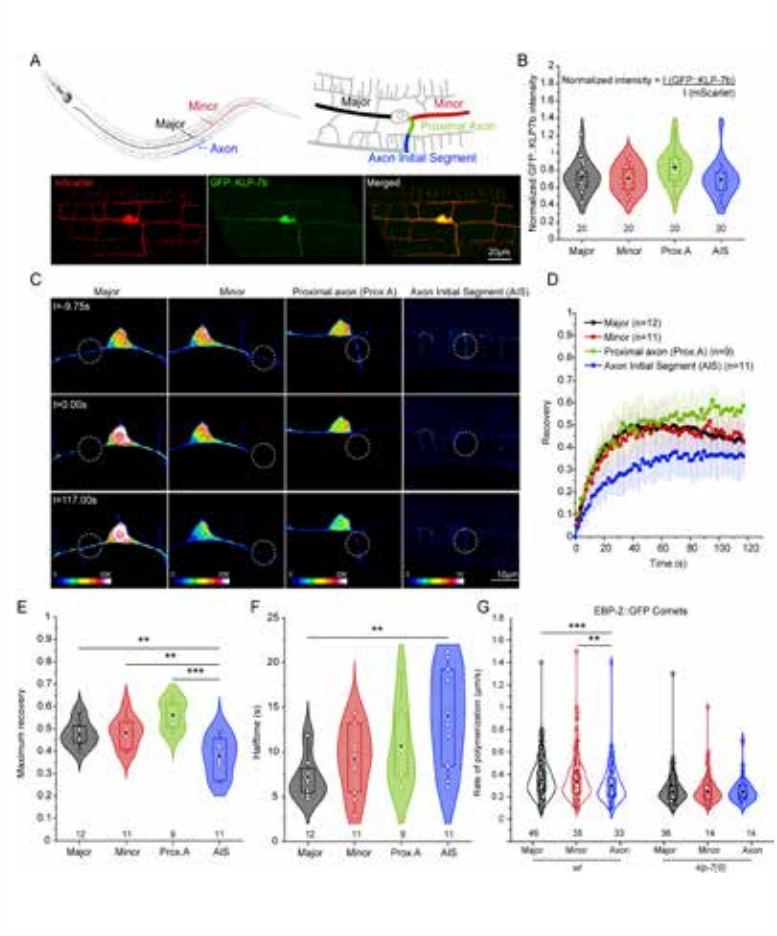

Figure 6: Differential activity of KLP-7 in the PVD axonal and dendritic compartments.

A. Schematic and representative image showing the major, minor, proximal axon, and axon initial segment compartments to assess the distribution of GFP: KLP-7b isoform in the PVD neuron.

B. Intensities of GFP: KLP-7b in the various compartments of the PVD neuron normalized to the constitutive marker mScarlet. Respective n values are mentioned within the graph.

C-F. Representative images (C) of Fluorescence Recovery After Photobleaching assay of GFP: KLP-7b in various compartments quantified as recovery profiles (D), maximum recovery ratio (E), and halftime of the recovery (F). Comparison of means was done using Tukey's test. $p<0.001$***, <0.01**. Respective n values are mentioned within the graph.

G. Comparison of the rates of polymerization in the major, minor, and axonal compartments of the PVD neurons in the wild type and klp-7(0). Respective n values are mentioned within the graph.

Axon Initial Segment (AIS) protein UNC-44 accumulates in the dendrites of klp-7(0)

The boundary between the axons and the dendrites is maintained by the AIS which regulates the polarized trafficking in the axons. In vertebrate neurons, several key proteins like TRIM46, Ankyrin G, CRMP2, and EB3 maintain the microtubule cytoskeleton in the AIS at the origin of the axon. Studies in *C. elegans* neurons have found additional proteins like UNC-119 which helps in the anchoring of UNC-33 (CRMP2) to UNC-44 (AnkyrinG) to facilitate the bundling of microtubules in a polarized array. In the PVD neurons, a homologous structure with similar molecular composition in the laterodistal region of the axon has been annotated as the AIS.

To understand the constitution of AIS in PVD neurons and the role of KLP-7 in its maintenance, I observed the presence of endogenously expressed Ankyrin G, UNC-44: GFP, which is ubiquitous in all neurites (Figure 7A-C). The bonafide axon initial segment in the klp-7 mutant also shows a similar degree of enrichment as that of the wild type (Figure 7D). Interestingly, in the mutant neurons, multiple neurites are emerging from the cell body with a significant accumulation of UNC-44 (Figure 7A, E).

As Axon initial segment also acts as a sorting checkpost, due to ectopic accumulation it may redirect the axonal traffic into the dendrites and thus increase the prominence of plus end out microtubules. The fidelity of the Axon initial segment in regulating microtubule and neuronal polarity also depends on other factors like UNC-33 and UNC-119, will be investigated in near future.

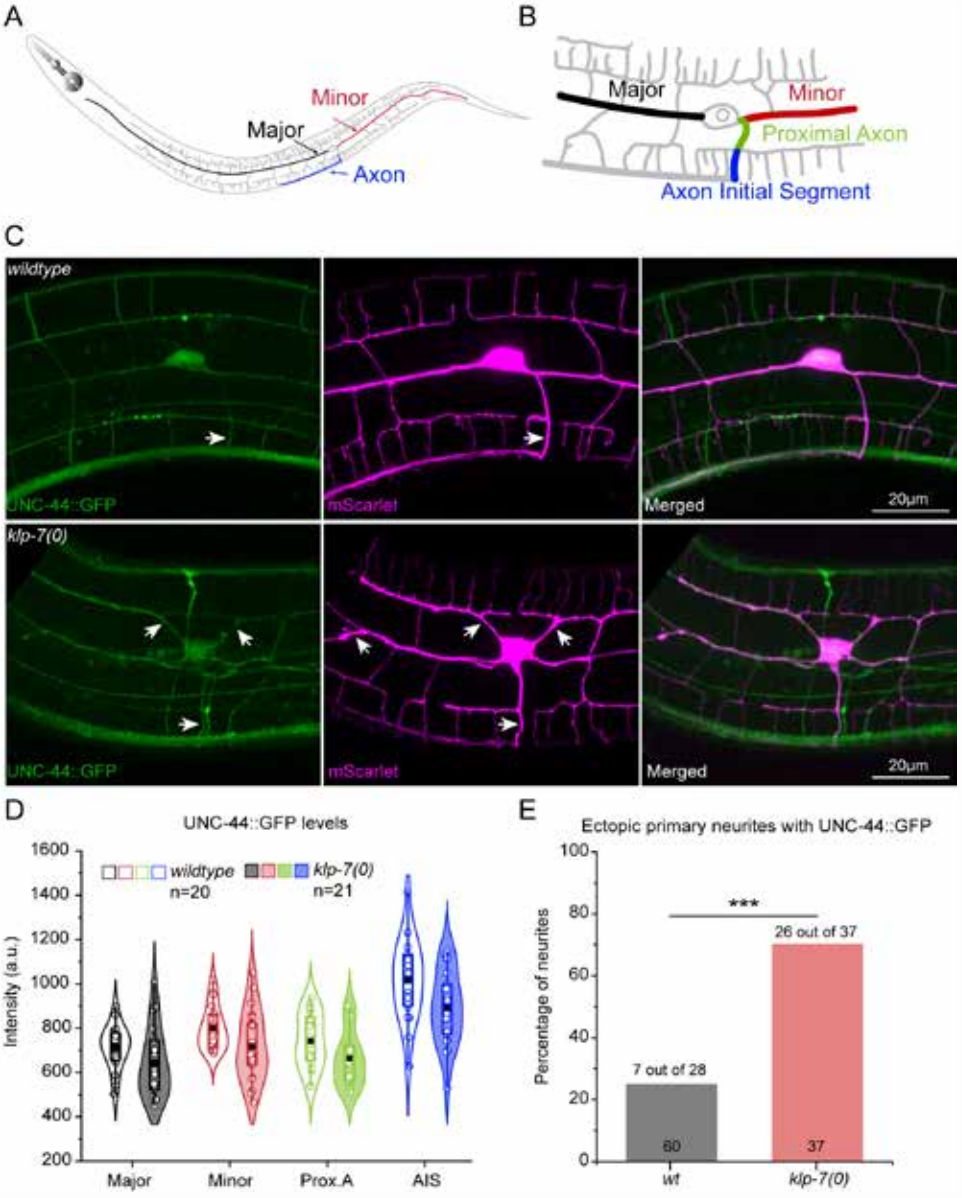

Figure 7: Enrichment of UNC-44 in the ectopic neurites of klp-7(0).

A-B. Schematic and representative image showing the major, minor, proximal axon, and axon initial segment compartments to assess the distribution of UNC-44: GFP in the PVD neuron.

C-D. Representative images and intensities of UNC-44: GFP in the neurites of PVD neurons of wildtype and klp-7(0). Respective n values are mentioned within the graph.

E. Ectopic branches emanating from the cell bodies of wildtype and klp-7(0) neurons were assessed for their enrichment and quantified as the percentage of neurites with UNC-44: GFP of total neurites assessed. Number of assessed PVD neurons are mentioned adjacent to the X-axis. Proportion of the ectopic neurites showing enrichment of UNC-44: GFP is mentioned on top of the bar plot. Statistical comparison was done using Fisher's test $p<0.01$**.

Conclusions

In this study, we have found that Kinesin-13 plays a role in the polarized trafficking of cargo and polarity and distribution of microtubules in the dendrites. Although it is known that microtubule organization contributes significantly to polarized trafficking, the role of Kinesin-13 is specific in this case. It appears to be correlated to the formation of axon-dendrite checkpoints mediated by Kinesin-13. These checkpoints ensure the spatiotemporal distribution of microtubules and cargo transport. Our previous results showed that a lack of Kinesin-13 causes structural anomalies in the dendrites with ectopic branches, and altered branch density and dynamics corresponding to a failure in dendritic pruning. Furthermore, the dendrite regeneration is limited in the klp-7(0) null mutant. Based on our current understanding, aberrant microtubule organization may hamper the polarized trafficking in the dendrites and subdue the regenerative response. We are currently investigating the spatiotemporal role of Kinesin-13 in the formation of polarity checkpoints and their correlation to arborization.

Publications:

Dey S., Maiya R, Ray K, Menon G I. (2023). ***The interplay of active and passive mechanisms in slow axonal transport.*** Biophysical Journal, Volume 122, Issue 2, Pages 333-345, DOI: 10.1016/j.bpj.2022.12.011.

Presentations:

1. Kinesin-13 regulates the microtubule organization and dendritic identity in PVD neurons of *Caenorhabditis elegans*. Microtubules, Motors, Transport, and Trafficking (M2T2) meeting 2023, January 2023, Bhopal.

2. Kinesin-13 dependent axonal-dendrite compartmentalization in PVD neurons. 3rd Indian *C. elegans* meeting, September 2022, Thiruvananthapuram.

3. Kinesin-13 mediated axonal-dendrite compartmentalization and dendrite arborization in PVD neurons of *Caenorhabditis elegans*. Molecular Mechanisms of Neuronal Connectivity (Virtual), September 2022.

Collaborator:

Prof. Jessica Feldman, Department of Biology, Stanford University, USA

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R&D Initiatives
& Flagship Programs

Dementia Science Programme

(A DBT Funded National Level Research Programme, coordinated by National Brain Research Centre)

Dementia is a devastating memory impairment condition. Alzheimer's disease (AD) accounts for majority of these cases. AD is a neurodegenerative condition. In the advanced stages of the disease, severe memory loss and impairment in other brain functions is observed. In addition to AD, there are other dementia conditions such as vascular dementia, dementia with Lewy body, and frontotemporal lobe dementia. According to the projections, the number of dementia cases are likely to increase tremendously in the coming decades. Out of these, majority of the cases are expected to be in low and middle-income countries such as India. This may tremendously increase the burden on the healthcare system as well as the society.

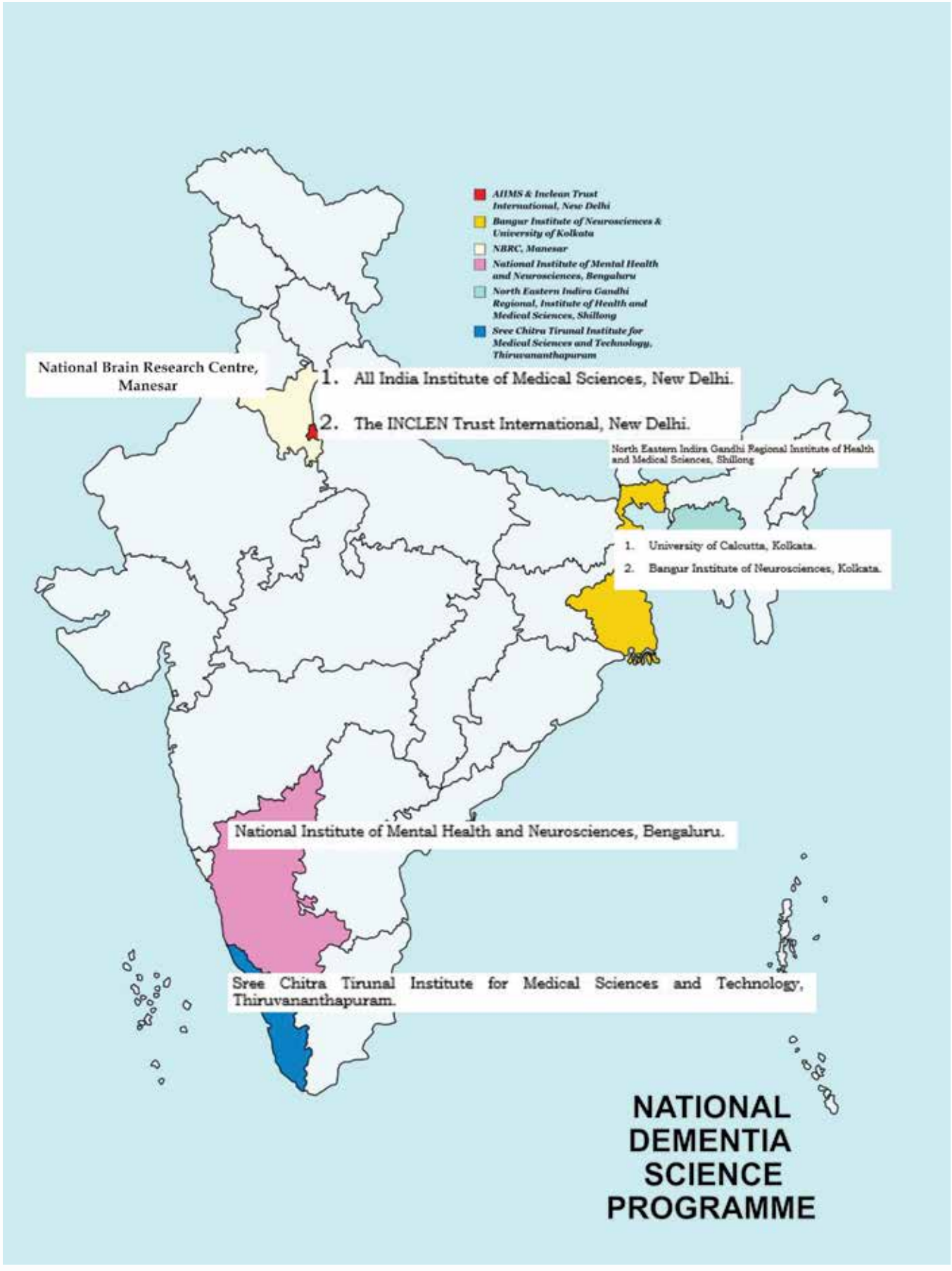
An urgent need was felt to understand different facets of dementia including AD. Towards this, National Brain Research Centre is coordinating a DBT-funded comprehensive and multi-centric Dementia Science

Programme aimed at collecting data regarding incidence, prevalence, biomarkers, and risk and protective factors. This Programme involves basic scientists as well as clinicians from rural as well as hospital sites across the country. All the participating sites use robust and uniform criteria for diagnosis of dementia and its classification. These criteria are internationally accepted, and have been adapted and validated for the Indian context. It is expected that the results from the study may help in formulation of National levels policies for this major cognitive disorder in the elderly population.

Participating Institutions (arranged alphabetically) in Dementia Science Programme are:

1. All India Institute of Medical Sciences, New Delhi.
2. Bangur Institute of Neurosciences, Kolkata.
3. University of Calcutta, Kolkata.
4. The INCLEN Trust International, New Delhi.
5. National Brain Research Centre, Manesar.
6. National Institute of Mental Health and Neurosciences, Bengaluru.
7. North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences, Shillong.
8. Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.

Director, NBRC is coordinating the Programme, with Dr. Pravat K Mandal, NBRC, and Dr. N. K Arora, INCLEN Trust International, as coordinators.


AIIMS & Inclean Trust International, New Delhi
Bangur Institute of Neurosciences & University of Kolkata
NBRC, Manesar
National Institute of Mental Health and Neurosciences, Bengaluru
North Eastern Indira Gandhi Regional, Institute of Health and Medical Sciences, Shillong
Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram
National Brain Research Centre, Manesar
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2. The INCLEN Trust International, New Delhi.
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National Institute of Mental Health and Neurosciences, Bengaluru.
Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.
NATIONAL DEMENTIA SCIENCE PROGRAMME

Initiatives at NBRC LAB

Metabolicgenesinnon-canonicalexpressions to reconfigure Tumor Micro Environment

Considering the complex relationships between epigenetics and metabolism, innovative cancer therapies either targeting tumor metabolism to reverse epigenetic dysregulation or epigenetic-modifying drugs to modulate cancer metabolism has been suggested. As metabolic enzymes perform several non-canonical functions, and since aberrant metabolic and dysregulated inflammation is inter-twined with chromatin landscape in tumors; we propose to investigate how metabolic genes subserve non-canonical functions to facilitate reprogramming of Tumor Micro Environment (TME) involved in glioma progression.

The project is sponsored under SERB POWER Fellowship to Prof. Ellora Sen, NBRC.

Screening of Novel Neuro Protective Molecules

A project has been initiated from the lab of Dr. Bhavani Shankar Sahu in collaboration with Dr. M Dhruba Singh's lab on Screening and development of novel neuro protective molecules based on naturally-inspired compounds against neurodegenerative diseases.

Scientists from IIT-BHU are also a part of the project.


eppendorf

IDH1-R132H effects epigenetic landscape in gliomas; Patients respond better to chemotherapeutics.

Somatic mutations in gliomas form a typical kind of tumor affecting the brain and spinal cord at large. Therefore, it is difficult to cure. **Dr. Ellora Sen's laboratory at the Division of Cellular & Molecular Neurosciences in DBT-National Brain Research Centre (DBT-NBRC) in collaboration with the All-India Institute of Medical Sciences (AIIMS), New Delhi,** observed a peculiar interconnection between epigenome and anti-proliferative signatures found in these mutants.

With the use of an in-vitro medium & IDH1-WT including mutant glioma tissues from patients, they found the diminished expression pattern of the epigenetic modulators, histone methyltransferase PRMT1 and its associated histone activation mark H4R3me2a in IDH1-R132H gliomas.

The researchers at the lab identified a specific (PTX3 & PRMT1-dependent) epigenetic pathway that increases the internal metabolic recycling process (autophagic flux) in the mutant cells, which is vital for their survival. Autophagy is an important biological phenomenon where a cell breaks down, and destroys damaged and abnormal proteins and other substances within a cytoplasm. Blocking this PTX3 & PRMT1-dependent pathway in the glioma cells appeared to trigger a selective form of iron extraction within the cell (ferritinophagy) that damaged the cancer cells, forcing them to die.

The study highlights the vital role played by these two enzymes - PRMT1 and PTX3 - in keeping the glioma cell alive. This research highlighted the possibility of selectively targeting glioma cells and forcing them toward ferritinophagy-mediated cell death as a treatment.

The work has been published recently in Autophagy journal (Jan 2023) titled 'PRMT1 driven PTX3 regulates ferritinophagy in glioma'.

Other links: https://www.tandfonline.com/doi/full/10.1080/15548627.2023.2165757

Minocycline for Intervention in Japanese Encephalitis Virus Infection/Acute Encephalitis Syndrome

National Brain Research Centre, Manesar

Japanese encephalitis virus (JEV) is the most common cause of Acute Encephalitis Syndrome (AES) in India, yet uncontrolled in many parts of the country, claiming hundreds of lives every year. In India, Japanese encephalitis (JE) was first reported in 1955 when clinical cases were reported from Vellore and Pondicherry. Since then, this disease has spread in many parts of the country. About 25–30% of JE cases are fatal and 50% result in permanent neuropsychiatric sequelae.

For humans, currently there are three types of JE vaccines: inactivated JE vaccine and live attenuated JE vaccine – both developed in vitro and inactivated JE vaccine produced in mouse brain. Mouse-brain inactivated vaccine is the most widely produced and internationally distributed and has the maximum efficacy of 91%. However, it is the live attenuated vaccine against JE SA14-14-2 strain, commonly used in India. Though the vaccination schedule is comprehensive in specific belts of the country, there are several areas, which do not receive vaccination though they fall under endemic zones. Currently, there is no therapeutic countermeasure available specific to treat JE. All current therapy is supportive in nature and target alleviation of the symptoms.

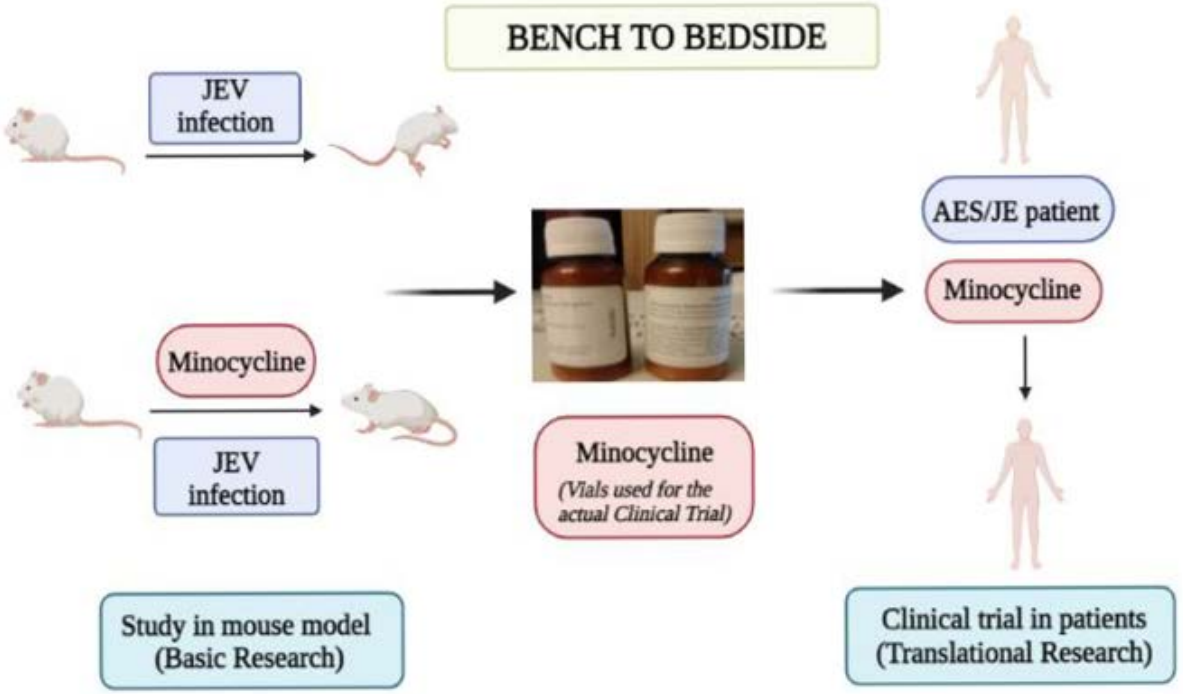
Research done at Dr Anirban Basu's lab at National Brain Research Centre (NBRC) showed that a second generation tetracycline called minocycline is effective in controlling JE in pre-clinical laboratory investigations. Based upon that, NBRC and King George's Medical University (KGMU), Lucknow, conducted a double blind randomised controlled trial on the use of Minocycline in Acute Encephalitis Syndrome (AES). The trial was conducted by Prof. Rashmi Kumar, Head, Department of Paediatrics, KGMU, Lucknow. The trial showed that there was a significant advantage of administrating minocycline for patients, who survived their first day in hospital. There was an advantage in all the other parameters where Minocycline was used w.r.t. the placebo arm, though these were not statistically significant. Meanwhile, another trial has been conducted by Dr Anita Mehta of Baba Raghav Das Medical College, Gorakhpur, on the use of Minocycline in specific cases of Japanese Encephalitis (JE). Here again, **a significant functional use with Minocycline in terms of hospital stay was observed, but no statistical advantage was seen in other parameters.**

There were circulars from the UP Government recommending that Doxycycline (another antibiotic of tetracycline family) could be used in cases of encephalitis and even fever.

There is a possibility to initiate a larger, probably a Phase IV clinical trial on Minocycline in AES. Possibility of including Minocycline as an alternative to Doxycycline may also be considered wherever such indications are there in guidelines for encephalitis, especially AES.

Drug repositioning/repurposing: Promising strategy to develop therapy against viral infections

Role of Oral Minocycline in Acute Encephalitis Syndrome in India - A Randomized Controlled Trial



Mishra et al, *J Neurochem*. 2008 Jun; 105(5): 1582-95

Kumar et al, *BMC Infect Dis*. 2016 Feb 4; 16:67

NBRC Flagship program: Comparative mapping of common mental disorders (CMD) over lifespan

Coordinator (Ex-officio, Director/ Former Director-in-charge, NBRC): Prof Pravat Mandal

PIs (Brain Imaging): Prof Arpan Banerjee

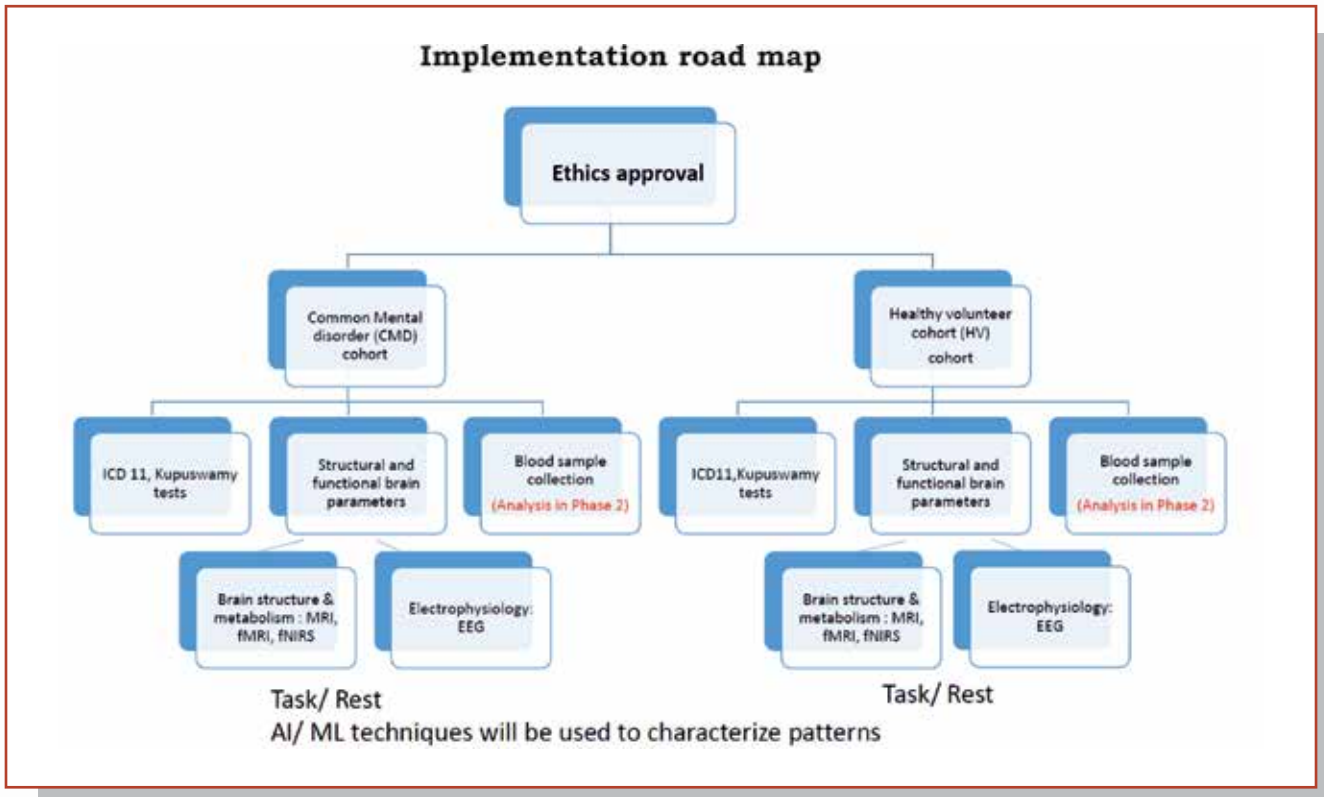
PIs (Bio-banking & Genetic analysis): Prof Shiv Kumar Sharma & Prof Anindya Ghosh Roy

NBRC has secured funds from the Department of Biotechnology in support of its flagship program for brain mapping of common mental disorders (CMD) of India. In Phase 1, the project involves collection of brain imaging and biological sample by building cohorts and identifying imaging phenotypes from anxiety, depression, bipolar and post-traumatic stress disorder (PTSD) – together defined as CMD. In Phase 2, the project will involve linking of brain imaging and molecular phenotypes by Artificial intelligence / machine learning tools. Goals of the flagship program (Phase 1) are following:

- ✓ To build a new big-data repository comprising of brain imaging (structural and functional) data of normal **and patients with common mental disorders (CMD) comprising of anxiety, depression, OCD and PTSD,** where AI-based techniques can be implemented over the long-term.
- ✓ Quantification of changes in brain's structural and functional networks during resting state and with naturalistic stimuli in a cross-sectional adult life span data from general population (in the age range between **18-80 years**).
- ✓ Identification of parameters to differentiate between different etiologies of cognitive impairment in **CMD subtypes comprising of anxiety, depression, OCD and PTSD.**
- ✓ Predictive regression-based model to extract relationship among mental health measures in different phases of CMD in the age range between 18-80 years and overlapping brain connectivity patterns.
- ✓ Collection of blood samples to build a bio-bank for genetic analysis in Phase II.

The flagship project is of immense clinical and research importance to the nation and will be impactful in-patient treatment and drug discovery. The project has provided normative data in populations that has not been accessed by previous studies and be an important resource hub for a variety of researchers from eminent technological institutions across the country. The expected outcome from this project are following if would be allowed to be completed.

1) **Creation and dissemination of a public database** that will include normative data from 200 healthy volunteers and 200 mental health affected patients.
2) **Several imaging derived phenotypes (IDP)** that include information about specific brain structures and their connections by the end of Phase 1.
3) **Creation of a bio-bank in Phase 1** that will store blood samples from healthy and patient participants. In **phase 2, genomic DNA** will be prepared from the blood samples and subsequently whole-genome sequencing and analysis will be done.



Current status: Project discontinued as per DBT recommendations

Key achievement from the project implementation:

A) The scanning protocol outlines for EEG & MRI for common mental disorders finalized.

B) Computational modelling relating structure-function to be used to study healthy ageing and age associated changes in common mental disorder published (Pathak et al., 2022b).

C) EEG data of 62 normal healthy volunteers collected.

D) DTI/ resting state fMRI of 38 normal volunteers collected. Recruitment planning of patients in full swing

E) New EEG resource facility set up by Dr Arpan Banerjee is being used by 2 other labs (Dr Dipanjan Roy IIT Jodhpur & Dr Nivethida T IIT Bombay). Institute can earn revenue in future from this state-of-the-art facility.

F) Publications from Dr Arpan Banerjee where the generous support of Flagship Program has been acknowledged. The list of these publications is mentioned in B8.

Publications:

1. **Banerjee A.**, Chakraborty P, Saha S, Deco G, Roy D*. (2023). ***Structural-and-dynamical similarity predicts compensatory brain areas driving the post-lesion functional recovery mechanism.*** Cerebral Cortex Communications (accepted)

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3. **Banerjee A.**, Singhal S, Ghosh P, Kumar N. (2023). ***Parametric separation of phase-locked and non-phase-locked activity.*** Journal of Neurophysiology, 129: 199–210 (Innovative Methodology)

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Report prepared by Dr Arpan Banerjee, Scientist VI, NBRC.

ARTICLES

Newslaundry Impact: Health Ministry okays observational study on pimple drug for acute encephalitis patients

Minocycline, the drug which was found to be effective in clinical trials conducted in 2012-13, will go through observational study and not more trials.

HEALTH

Indian Scientists Find out How Infants

Researchers at the National Brain Research Centre performed expe
virus may affect properties of human foetal neural stem cells durin

ETPri

BRC team studying C

r Bureau · Last Updated: May 31, 2022, 12:32 AM IST

Synopsis
The centre has sourced some brain sections
brain bank of Nimhans in Bengaluru for the

In Haryana, the making of an Indian brain template

The archetype will be constructed from the scans of 150 Indians

JACOB KOSHY

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New map: Dr. Pravat Mandal, centre, during a MRI scan at the National Brain Research Centre.

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Herbal compound stops coronavirus-triggered inflammation, viral replication

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A potential n approach to

Links between biological metabolism may open ne therapy.


Zika Virus Causes Microcephaly in
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some post-Covid complications,
experts at the Gurgaon-based
Brain Research Centre (NBRC) are
studying how the coronavirus
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Indian study learns how brain handles sudden distractions, could help create mental health tools
Study conducted by scientists from National Brain Research Centre (NBRC), Manesar, it was published in the journal NeuroImage last month.
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PATENT TITLE :

A METHOD FOR METABOLITE SIGNAL QUANTITATION FOR MAGNETIC RESONANCE SPECTROSCOPY DATA

Funded by Ministry of Electronics and Information Technology (MEITY)

Principal Inventor:

Prof. Pravat K Mandal

Co-Inventor:

M. Grewal; S. More;

Dr. S. Saharan and Dr. D. Shukla

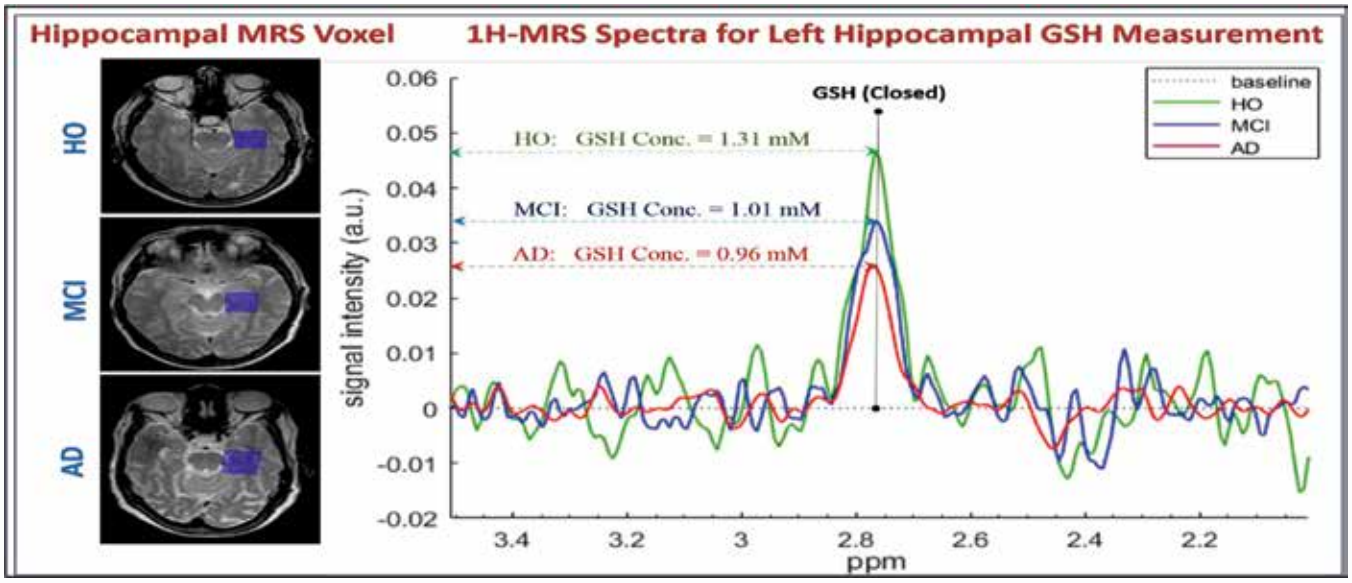

Figure showing much early prediction of Alzheimer's disease by measuring hippocampal GSH -level using this methodology

HO: Healthy Old,

MCI: Mild cognitive impairment

AD: Alzheimer's disease

PUBLICATIONS

NBRC Publications for FY 2022-23

Total = 67

1. **Basu A.,** Venkatesh I P S, Bhaskar M. ***Japanese encephalitis viral infection modulates proinflammatory cyto/chemokine profile in primary astrocyte and cell line of astrocytic origin.*** Metab Brain Dis. 2022 Jun;37(5):1487-1502. doi: 10.1007/s11011-022-00991-w. IF 3.584
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11. **Banerjee A.,** Pathak A, Roy D. ***Whole-Brain Network Models: From Physics to Bedside.*** Front Comput Neurosci. 2022 May 26;16:866517. doi: 10.3389/fncom.2022.866517. IF 2.380
12. **Basu A.,** Chakraborty S. ***miR-451a Regulates Neuronal Apoptosis by Modulating 14-3-3ζ-JNK Axis upon Flaviviral Infection.*** mSphere. 2022 Aug 31;7(4):e0020822. doi: 10.1128/msphere.00208-22. IF NA
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Data from 1st Apr. 2022 - 31st Mar. 2023. Source: Pubmed.

*The List of Publications includes journals from NBRC Facilities & Faculties.

Presentations

National:

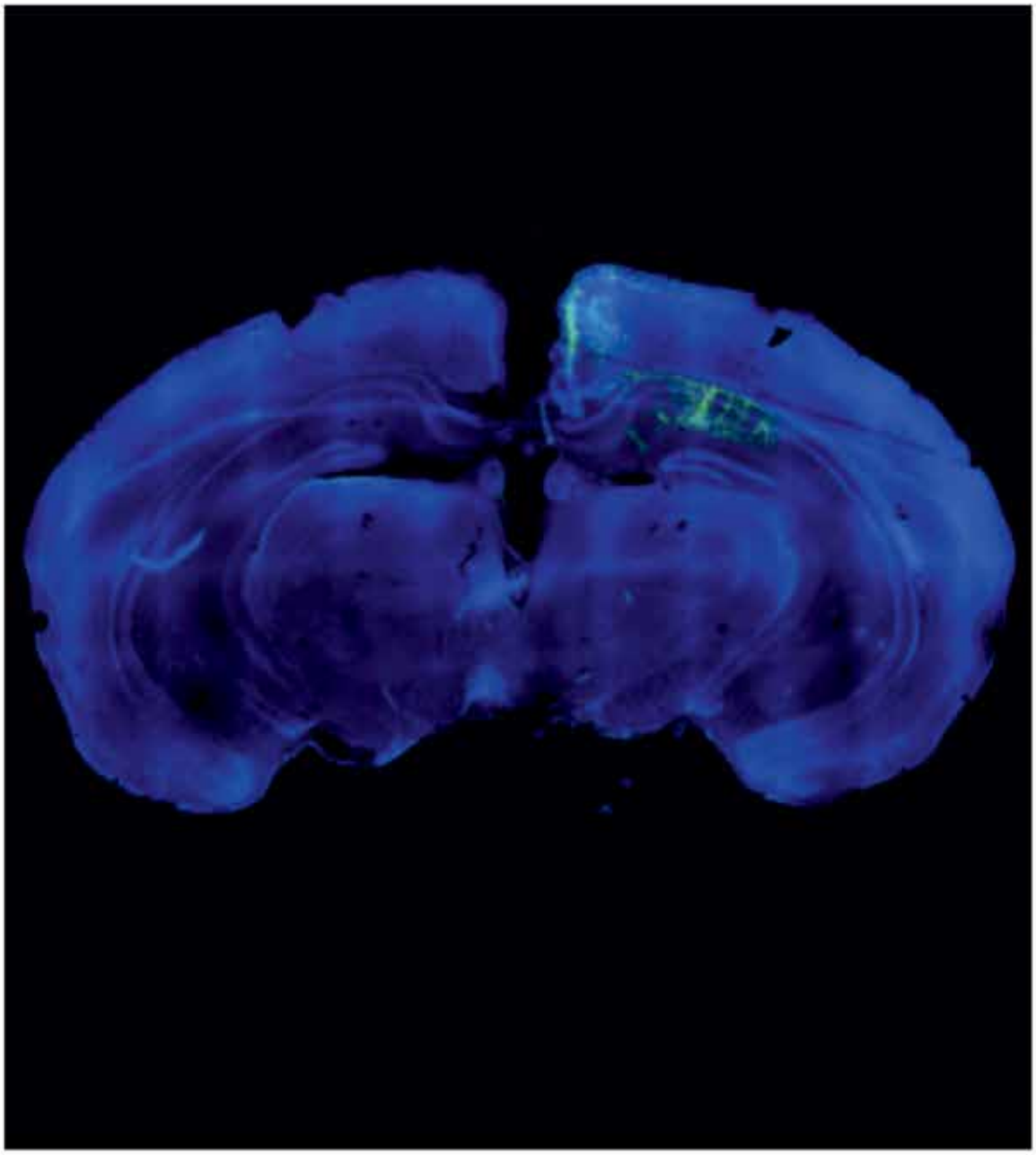
- **Anindya Ghosh Roy:** 2nd March, 2023, Invited seminar, Department of Neuroscience at the Amity University-Noida. Title: "Study of neurite regeneration using *C. elegans*".
- **Anindya Ghosh Roy:** 27th January, 2023, Invited seminar, M2T2 at IISER Bhopal. Title: "Microtubule organization in *C. elegans* touch neuron".
- **Anindya Ghosh Roy:** 9th December, 2022, IAN-2022 symposium-"Neurodevelopment and its disorders". Title: "Role of Muscleblind-like (MBLN) protein MBL-1 in axon growth and synapse formation".
- **Anirban Basu:** Invited speaker; Neurotropic virus induced *"atypical innate immune response"* in the central nervous system; CSIR-IICB, Kolkata, 16th-18th March, 2023.
- **Anirban Basu:** Invited speaker; Neurological disorders and challenges of developing nation; National Institute of Technology Nagaland, Chumukedima, Dimapur, 6th December, 2022.
- **Anirban Basu:** Invited speaker; Biotechnology: Scope, opportunities, and changing dynamics; National Institute of Technology Nagaland, Chumukedima, Dimapur, 5th December, 2022.
- **Anirban Basu:** Invited speaker; Molecular basis of virus-induced acute flaccid paralysis; Correlation with motor neuron dysfunction. Regional Centre for Biotechnology, Faridabad. IUBMB Focused Meeting on Biochemistry & Molecular Biology of RNA Viruses, 15th-18th November, 2022.
- **Anirban Basu:** Invited speaker; Drug repositioning/repurposing: Promising strategy to develop therapy against viral infections. SGT College of Pharmacy, SGT University, Gurugram, 27th September, 2022.
- **Anirban Basu:** Invited speaker; Global Climate crisis and conflict: Impact on the Emerging and re-emerging infectious diseases. SGT College of Pharmacy, SGT University, Gurugram, 27th September, 2022.
- **Anirban Basu:** Invited speaker; Global Climate crisis and conflict: Impact on the Emerging and re-emerging infectious diseases. (Karyashala Workshop, organized by IISER-Kolkata); 15-19th June, 2022, Sinclairs Ooty.
- **Anirban Basu:** Invited speaker; Viral Diseases of the nervous system: Host Immunity and Therapeutic Interventions. From Neurons to Behavior, workshop organized by IAN Delhi chapter; SLS, JNU, 21 April, 2022.
- **Arpan Banerjee:** September 2022, Invited speaker at Amity University, Gurgaon. Title: Brain, Mind & Behavior: The science of who we are and how happy we want to be.
- **Arpan Banerjee:** December 2022, Invited Speaker, APSN Meeting, *Multi-scale dynamic field model: A computational microscope to explore the role of neurotransmitter kinetics onto macroscopic brain dynamics.*
- **Arpan Banerjee:** January 2023, Invited Speaker, RKMVERI University Belur Math. Title: Computational Microscope to Study Whole Brain Network Dynamics in Health and Diseases.
- **Arpan Banerjee:** February 2023, Invited speaker, CMC Vellore, India. Title: Beyond neuroimaging measures: Computational Microscope to Study Whole Brain Network Dynamics in Health and Disease.
- **Arpan Banerjee:** March 2023, Invited speaker, CDAC, New Delhi. Title: Leveraging variability of inter-individual brain connectomes to gain insights on health and disease.

- **M. Dhruba Singh & Nisha:** Downregulation of PTEN suppresses pathogenesis of human neuronal Poly(Q) in Drosophila by regulating mitochondrial dysfunction. The 27th Scientific Conference of the SNIP (Society on NeuroImmune Pharmacology) 2023, New Delhi, 15th-18th March, 2023.
- **Ellora Sen:** Non-canonical function of metabolic genes: Implications in glioma biology. Karyashala Workshop, organized by IISER-Kolkata, June, 2022, Sinclairs Ooty.
- **Ellora Sen:** Fine Tuning Cancer therapy: Targeting Epigenetic-Metabolism-Inflammation landscape. National Institute of Pharmaceutical education and research (NIPER), Ahmedabad, September, 2022
- **Ellora Sen:** Targeting the metabolic-inflammatory-circadian network in glioma: Implication in chemotherapeutics International Society of Nutraceutical & Chronic Diseases-India, 5th INCD, Dept. of Zoology, Delhi University, October, 2022.
- **Ellora Sen:** Natural Active Pharmaceutical ingredients: Therapeutic Potential. National Institute of Technology, Dimapur, Nagaland, December, 2022.
- **Ellora Sen:** Isocitrate Dehydrogenase Mutation: More than just a Cog in the wheel of glioma. Society for Biological Chemists, Kolkata, December, 2022.
- **Ellora Sen:** Interplay of inflammation-metabolism-epigenetics in glioma: Deconstructing the network. Annual Retreat, NBRC, December, 2022.
- **Ellora Sen:** Interaction between Metabolic and Epigenetic Landscapes: Implications in Glioma Progression. Prof. P.C Ghosh Memorial Lecture, Dept. of Biochemistry, Delhi University-South Campus, January, 2023.
- **Ellora Sen:** Modern Science Meets Traditional Medicine: Mantra for Global Health. National Science Day, Central University of Haryana, February, 2023.
- **Ellora Sen:** Dysregulated Metabolism in glioma progression: Intricate link with redox homeostasis, Kusuma School of Biological Sciences, IIT-Delhi, March, 2023.
- **Ellora Sen:** Moonlighting by IDH1 in gliomas: Potential Therapeutic targets revealed. 27th Annual Meeting of the Society on NeuroImmune Pharmacology (SNIP), New Delhi, March 2023.
- **Ellora Sen:** Convergence of metabolic, immune modulatory and epigenetic events in glioma: Therapeutic Interventions. 8th International Conference on Molecular Signaling and 4th CeSin Symposium. March 2023.
- **Pankaj Seth:** Invited Lecture, *Cell culture methods for understanding brain disorders* at the Certificate course of Lab animal sciences, National Brain Research Centre, Manesar, India, 15 February, 2023.
- **Pankaj Seth:** Invited Lecture, *Understanding neurological disorders through human neural stem cell models,* ISF College of Pharmacy, Moga, Punjab, India, 10 November, 2022.
- **Pankaj Seth:** Invited Lecture, *Human fetal brain derived neural stem cell model and its potential for understanding healthy and diseased brain,* at the Centre for Biomedical Research, Lucknow India, 30 September, 2022.
- **Pankaj Seth:** Special Lecture, *Human Neural Stem cells: Window into virus induced neurodegeneration* Webinar for Undergraduates at Department of Zoology, SS Khanna Girls Degree College, (Under DBT Star College Scheme, Govt of India), an affiliate of University of Allahabad, Allahabad, India, 24 September, 2022.
- **Pankaj Seth:** Invited Session Speaker, *Molecular Mechanisms of SARS-CoV2 mediated neuronal damage,* in Symposium 2 - Nervous System & Challenging Infections during International Brain Research Organization (IBRO) Sponsored 8th Federation of Asian Oceanian Neuroscience Societies International meeting on 19 August, 2022.

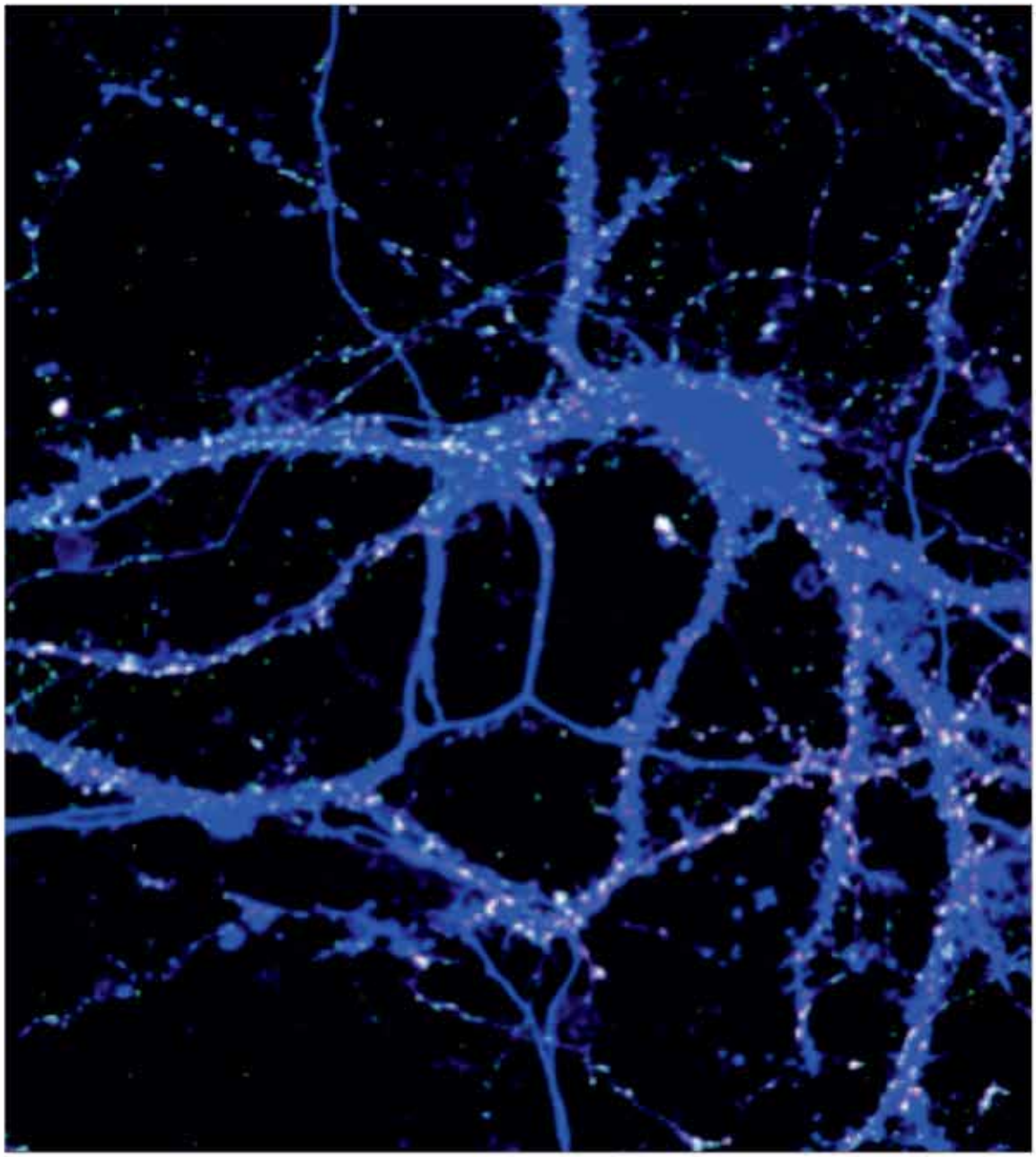
- **Pankaj Seth:** Invited Speaker, *SARS-CoV2 human brain functions – a morbidity in Long COVID-19 cases* at the IBRO Sponsored meeting and workshop on Recent Progress in Brain Research and Drug Delivery organized by ISF College of Pharmacy, Moga, Punjab, India, 14 May, 2022.
- **Pravat Kumar Mandal:** Recent development of Imaging-based Research for Alzheimer's disease, IIT Delhi.
- **Soumya Iyengar:** Birds in Neuroscience Research. Certificate Course on Laboratory Animal Science, NBRC, Manesar, 6th Feb-17th Feb, 2023.
- **Soumya Iyengar:** Development of Neural Circuits in the Human Auditory Cortex. ISHACON 2023; 54th Annual National Convention of The Indian Speech-Language and Hearing Association of India,17th Feb, 2023.
- **Sourav Banerjee:** Synapse-enriched long non-coding RNAs in neuronal development and memory. EMBO meeting on "Molecular and physiological basis of behavioural/ cognitive defects in neurodevelopmental disorders" JNCASR, Bangalore, October 2022.
- **Sourav Banerjee.** Long non-coding RNAs in synapse development and memory. EMBO meeting on RNA binding proteins and RNA condensation. NCCS, Pune (Virtual).

International:

- **Ellora Sen:** Inflammatory-metabolic landscape in regulating survival responses: Lessons learnt from IDH1-Mutant gliomas. Invited talk Society for Free Radical Research SFRR, November 2022, Seoul, South Korea.
- **R. Borah, A. Banerjee:** *1/f component of EEG signals as predictive markers of emotional arousal states* Society for Neuroscience Meeting 2022, San Diego, USA.
- **P. Ghosh, K. Saluja, A. Banerjee:** *How do distracting sounds distract us while listening to speech and non-speech audio?* Society for Neuroscience Meeting 2022, San Diego, USA.
- **S. Singhal, P. Ghosh, N. Kumar, A. Banerjee:** *Concurrent separation of phase-locked and non-phase-locked activity* Society for Neuroscience Meeting 2022, San Diego, USA.
- **Pankaj Seth:** Invited Lecture, *Primary cell culture model of human brain cells for understanding neurodegenerative diseases* at- Precision medicine in Parkinson's disease: Past lessons and conquering new frontiers. Organized by Luxembourg Institute of Health, Transversal Translational Medicine, Luxembourg, 26-27 January, 2023.
- **Sourav Banerjee:** The local lncRNome: Dendritic lncRNAs in functional synapse development and memory involving localized translation. EMBO meeting on "RNA localization and local translation", Sant Feliu De Guixols, Spain, July 2022.
- **Sourav Banerjee:** Synapse-enriched long non-coding RNAs: Implications in translational control and memory storage. Invited talk at Neuroscience Research Institute, University of California, Santa Barbara, September 2022.
- **Sourav Banerjee:** The local lncRNome: Synapse-enriched lncRNAs in synaptic plasticity and memory. Invited talk ETH Zurich and LMU, Munich, July 2022.
- **Sourav Banerjee:** Synapse-enriched long non-coding RNAs: Implications in translational control and memory storage. Invited talk at Iowa Neuroscience Institute, University of Iowa, September 2022.



Role of long non-coding RNA (IncRNA) at the dendritic knob in regulating synaptic hyperactivity.
From Prof. Sourav Banerjee's lab.



Extramural Research Projects

Extramural Research Projects undertaken at NBRC

S. No	Principal Investigators/ Co-Investigators	Funding Agency	Title of the Research Projects	Total Amount sactioned (Rs. In Lakhs)	Amount received during F.Y. 2022-23 (Rs. In lakhs)	Year of sanction	From	To	Extended Upto	Sanction No.
1	Prof. Pravat K. Mandal	DBT	Unravelling the causes of stroke and cognitive decline in general population: A cross-cultural perspective	73.66	0.00	2016	14.02.2014	13.02.2023	13.08.2023	BT/IN/Netherland/03/ KP/2012 & re-allocation on 05.08.2015, 21.04.2016
2	Prof. Pravat K. Mandal	MeitY	Artificial Intelligence for Early Predictive Diagnosis of Alzheimer's Disease using Multi-Modal Imaging Data	59.96	11.00	2019	17.09.2019	30.06.2023	30.06.2023	No. 4(5)/2019-ITEA dated 17.11.2019
3	Prof. Anirban Basu	SERB	J.C Bose Fellowship	95.00	7.00	2021	09.10.2021	08.10.2026	Running	JCB/2020/000037 dt. 09.10.2026
4	Prof. Sourav Banerjee	DBT	CRISPR-Cas 13 -mediated engineering of endogenous long non-coding RNAs for fluorescent tagging to study RNA dynamics	72.00	17.80	2020	29.02.2020	28.02.2023	27.02.2024	BT/PR31811/ GET/119/285/2019 dt 29.02.2020
5	Prof. Pankaj Seth	DBT	Role of Ephrins/Eph receptors in HIV medicated Neuropathogonesis	73.16	6.45	2019	27.06.2019	26.03.2023	Closed	BT/PR27512/ MED/122/146/2018
6	Prof. Pankaj Seth	DBT	Effect of hypoxia on different neural cell types in vitro - a modal to design therapeutic strategies against cerebral palsy in preterm infants	66.96	22.23	2018	15.10.2018	14.10.2023	Running	BT/PR21413/ MED/122/40/2016
7	Prof. Pankaj Seth	DBT	Understanding the molecular mechanisms of SARS-CoV-2 mediated neuronal death in COVID-19	48.75	9.60	2022	01.11.2022	01.11.2025	Running	BT/PR44439/ MED/29/1582/2021 dt. 02.11.2022
8	Prof. Pankaj Seth	SERB	Role of FAM43A,the duslexia and ADHD gene, in brain development and signaling in the brain	16.74	0.00	2022	01.02.2022	31.03.2025	Running	PS/SERB/0222/116 dated 01.02.2022
9	Director, NBRC	DBT	Dementia Science Programme: Incidence / Prevalence / Risk / Intervention analysis of dementia and basic research thereof	2816.77	0.00	2017	18.12.2017	17.06.2025	Running	BT/HRD/ DEMENTIA/2017 dated 18.12.2017
10	Director, NBRC	DBT	Comparative Mapping of common mental disorders (CMD) over lifespan	477.05	0.00	2019	29.09.2019	28.09.2022	Closed	BT/MED/-III/ NBRC/Flagship/ program/2019 dt. 29.09.2019
11	Prof. Anindya Ghosh Roy	SERB	Study of neuronal regeneration after injury using Caenorhabditis elegans	50.72	10.00	2020	20.05.2020	19.05.2023	Closed	CRG/209/ 002194 dt 20.05.2020

S. No	Principal Investigators/ Co-Investigators	Funding Agency	Title of the Research Projects	Total Amount sactioned (Rs. In Lakhs)	Amount received during F.Y. 2022-23 (Rs. In lakhs)	Year of sanction	From	To	Extended Upto	Sanction No.
12	Prof. Soumya Iyengar	SERB	Exploring Auditory Perception in House Crow using functional Magnetic Resonance Imaging and Neuroanatomical Techniques	21.87	8.00	2020	20.05.2020	19.05.2023	Running	CRG/2019/002672 dt. 22.11.2019
13	Prof. Soumya Iyengar	DST	Autism Spectrum Disorders, Genes and the Gut Microbiome:Utilizing Song Birds (Zebra Finches) as a Model System	41.45	0.00	2021	24.02.2021	23.02.2024	Running	DST/CSRI/2017/69 dt. 24.02.2021
14	Prof. Soumya Iyengar	ICMR	The sensitive period of the Human Auditory Cortes a Neuroanatomical Study	18.72	0.00	2019	25.09.2019	24.07.2023	Running	51/04/2019-ANA/BMS dt. 25.09.2019
15	Prof. Ellora Sen	SERB	Non canonical function of metabolic genes in sculpting glioma tumor microenvironment	38.10	0.00	2022	28.03.2022	27.03.2025	Running	PDF/2021/000199 dt. 28.03.2022
16	Prof. Arpan Banerjee	Gate Foundation	Collaborative research and experimentation RMID Only	$113122.98	$28280.75	2022	01.03.2023	28.02.2025	Running	3905/ Kings College London
17	Dr. Bhavani Shankar Sahu	ICBEB (Italy)	Defining the central role of obesity -associated metabolic stress on regulated exocytosis	Euro 45,000	Euro 15,000	2020	01.12.2020	30.11.2023	Running	CRP/IND20-05_EC dt. 01.12.2020
18	Dr. Bhavani Shankar Sahu	IBRO, Paris, France)	IBRO Fellowship (Travel Grant and Return Home Program (RHP))	Euro 20,000	0.00	2019	October, 2019	Upto 2022	Closed	Dr. Rebecca Hadid, Director of Professional Development Programs letter dated 26.11.2018
19	Dr. Bhavani Shankar Sahu	SERB	Investigations on the role of Syntaxin 6 in dense-core vesicle biogensis	31.42	19.27	2022	11.10.2022	13.10.2024	Running	SRG/2022/000745 dt. 11.10.2022
20	Dr. Bhavani Shankar Sahu	DBT	Understanding the regulated secretory pathway and its role regulating physio-metabolic fuctions	103.60	19.22	2018	14.11.2018	13.11.2023	Running	BT/RLF/Re-entry/38/2016 dt. 14.11.2018
21	Dr. Nivethida Thirugnanasambandam	DBT	Modulating effective connectivity in the 'agency network' of human (IYBA-2020)	60.43	0.00	2021	16.08.2021	15.08.2024	Transferred to IIT Bombay	BT / 13 /IYBA/2020/12 dt. 16.08.2021
22	Dr. Nivethida Thirugnanasambandam	DBT	Innvestigating the role of nicotinic neuromodulation in levodopa-induced dyskinesias - a multimodal study	378.71	3.21	2017	01.07.2017	30.06.2022	Transferred to IIT Bombay	IA/CHPI/16/1/502624 st. 21.06.2017
23	Dr. Swagata Dey	DBT	The Welcome Trust / DBT India Alliance titled "Regulation of cytoskeletal dynamics and transport during dendrite " regeneration	167.73	15.37	2019	01.01.2020	31.12.2025	Running	IA/E/18/1/504331 dt 27.12.2019
24	Dr Suman Saha, NPDF	SERB	Dynamical route to criticality in self-organizing neuronal activity	19.20	0.00	2022	14.02.2022	13.02.2024	Running	CRG/2021/0585 dated 14.02.2022

Distinctions, Honors & Awards


Poster/Logo Making Competition
3rd Rank
Essay Writing Competition
3rd Rank

Academic Achievements:

Awards

1. **Prof. Pankaj Seth:** Prof MGK Menon Lecture Award for pioneering contributions in the field of neurosciences and neurovirology by The National Academy of Sciences, India on February 28, 2023, at NIPGR, New Delhi, India.
2. **Prof. Anirban Basu:** Inducted into the council of the Indian National Science Academy (2023-2025).
3. **Prof. Anindya Ghosh Roy:** Wellcome Trust-DBT Senior Fellowship award (2023).

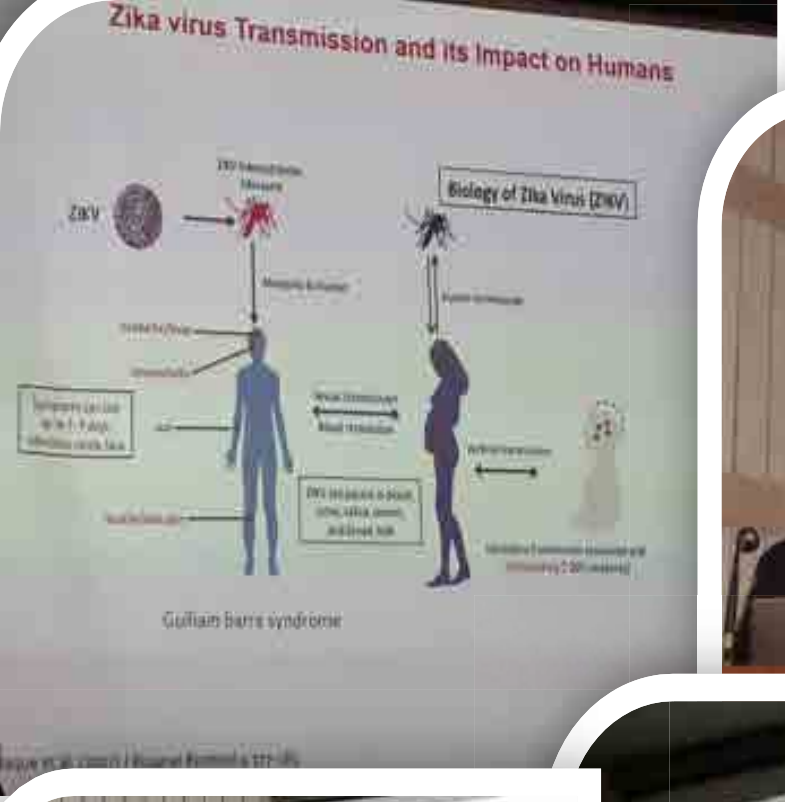
Travel Fellowship

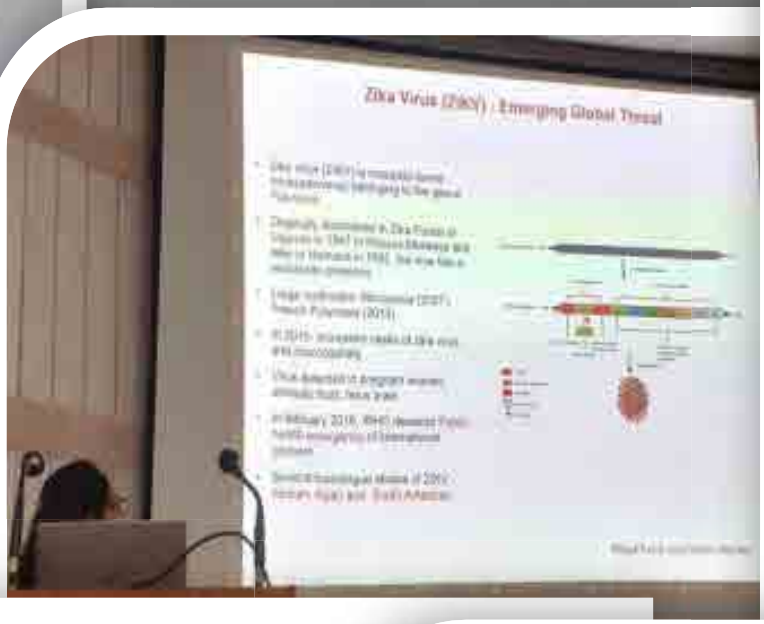
1. **Priyanka Ghosh:** IBRO international travel award for visiting SfN, 2022 (Prof. Pankaj Seth's lab)
2. **Gargi Majumdar:** India - EMBO Lecture Course;

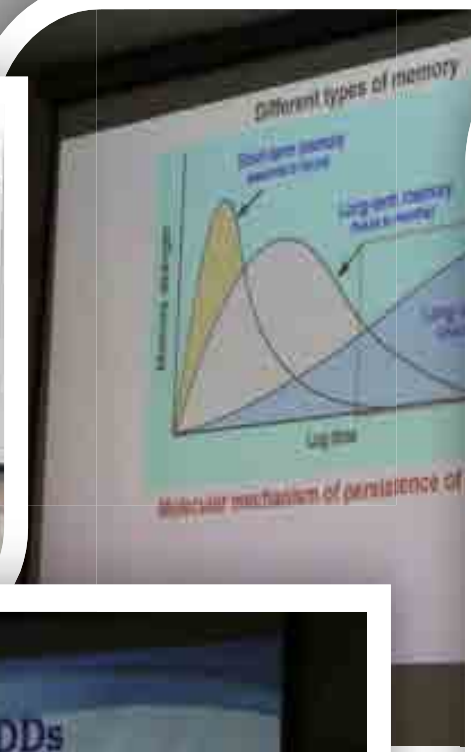
   Noninvasive Brain Stimulation: Advances in research and clinical practice (12th-17th Dec, 2022, IIT Gandhinagar).

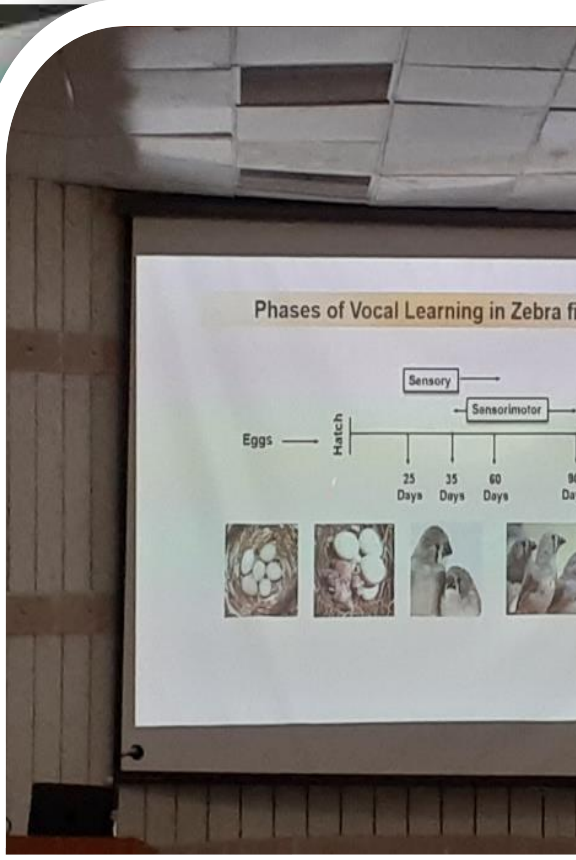
Poster Awards

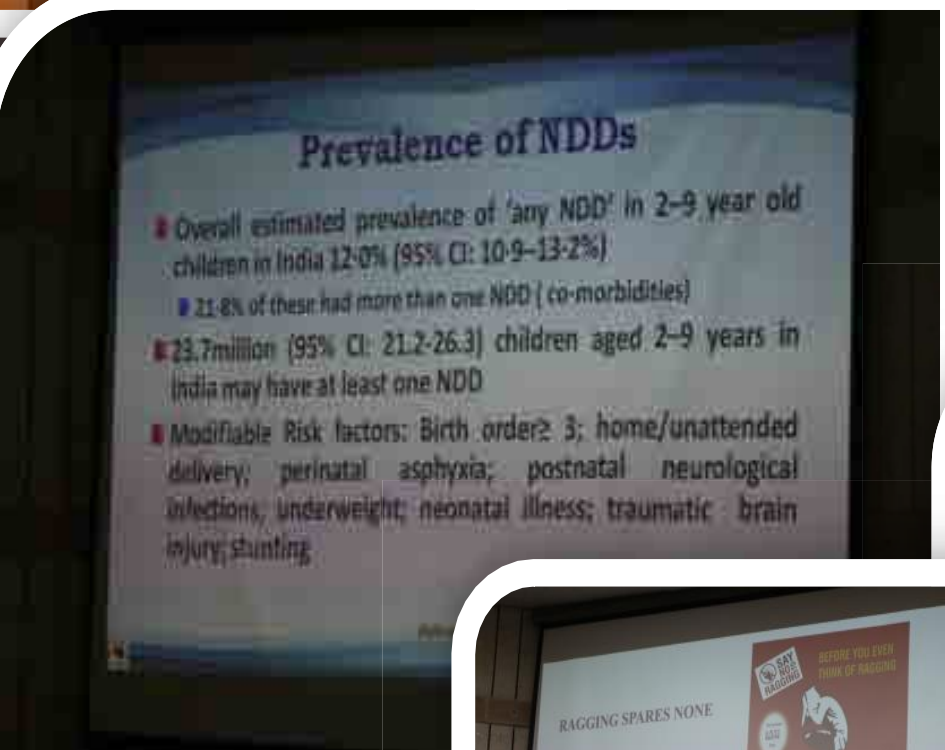
1. **Gargi Majumdar:** Best Poster Award in Industry Day under Intelligence- and Neuro-marketing theme, IIT Jodhpur, February 3-4, 2023.
2. **Kirti Lathoria*** Ph.D. scholar, awarded the Arthur Falek Young Investigator Award for the most outstanding Poster Presentation by the Society on Neuroimmune Pharmacology (SNIP) at the 27th Annual Meeting in New Delhi, held on March 15th -19th, 2023 . Presented the work published in Autophagy*


Zika virus Transmission and its Impact on Humans
ZIKV
Biology of Zika Virus (ZIKV)
Guillain barre syndrome


Zika Virus (ZIKV) : Emerging Global Threat


Different types of memory


Phases of Vocal Learning in Zebra fi
Sensory
Sensorimotor
Eggs
Hatch
25 Days
35 Days
60 Days


Prevalence of NDDs
Overall estimated prevalence of 'any NDD' in 2–9 year old children in India 12·0% (95% CI: 10·9–13·2%)
21·8% of these had more than one NDD (co-morbidities)
23.7million (95% CI: 21.2-26.3) children aged 2–9 years in India may have at least one NDD
Modifiable Risk factors: Birth order≥ 3; home/unattended delivery; perinatal asphyxia; postnatal neurological infections, underweight; neonatal illness; traumatic brain injury; stunting


Finally, early detection test for Alzheimer's is on the way!!!!
Hurray!!!!!

RAGGING SPARES NONE
VICTIMS
PERPETRATORS
ABETTORS
SAY NO TO RAGGING
BEFORE YOU EVEN THINK OF RAGGING
THINK OF

Academic Programmes

ACADEMIC PROGRAMMES

National Brain Research Centre (NBRC) was awarded Deemed University status (de-novo category) in 2002 under Section 3 of UGC Act, 1956, vide notification No.F.9-52/2001-U.3 dated 20th May, 2002 issued by the Ministry of Education (formerly the Ministry of Human Resources Development/1985-2020), Government of India. NBRC is the first autonomous institution to attain the status of Deemed University among the other institutes of the Department of Biotechnology. The 'Deemed to be university' status of NBRC has been reviewed by the committee duly constituted by the UGC and also by an independent committee constituted by the MoE (formerly HRD), on completion of five years as Deemed University. The committee recommended extension of Deemed University status and placed NBRC under "A" category.

ACADEMIC PROGRAMMES

Ph.D. in Neuroscience

NBRC has a Ph.D. Programme in Neuroscience to develop trained manpower having a broad overview of different aspects of Neuroscience.

NBRC provides a fellowship of ₹31,000/- per month for Junior Research Fellows and ₹35,000/- per month for Senior Research Fellows.

M.Sc. in Neuroscience

NBRC is one of the first institutes in the country to develop an integrated multidisciplinary teaching programme in Neurosciences. During the academic year 2015-16, NBRC reintroduced the M.Sc. (Neuroscience) programme to develop trained manpower having a broad overview of different aspects of Neuroscience.

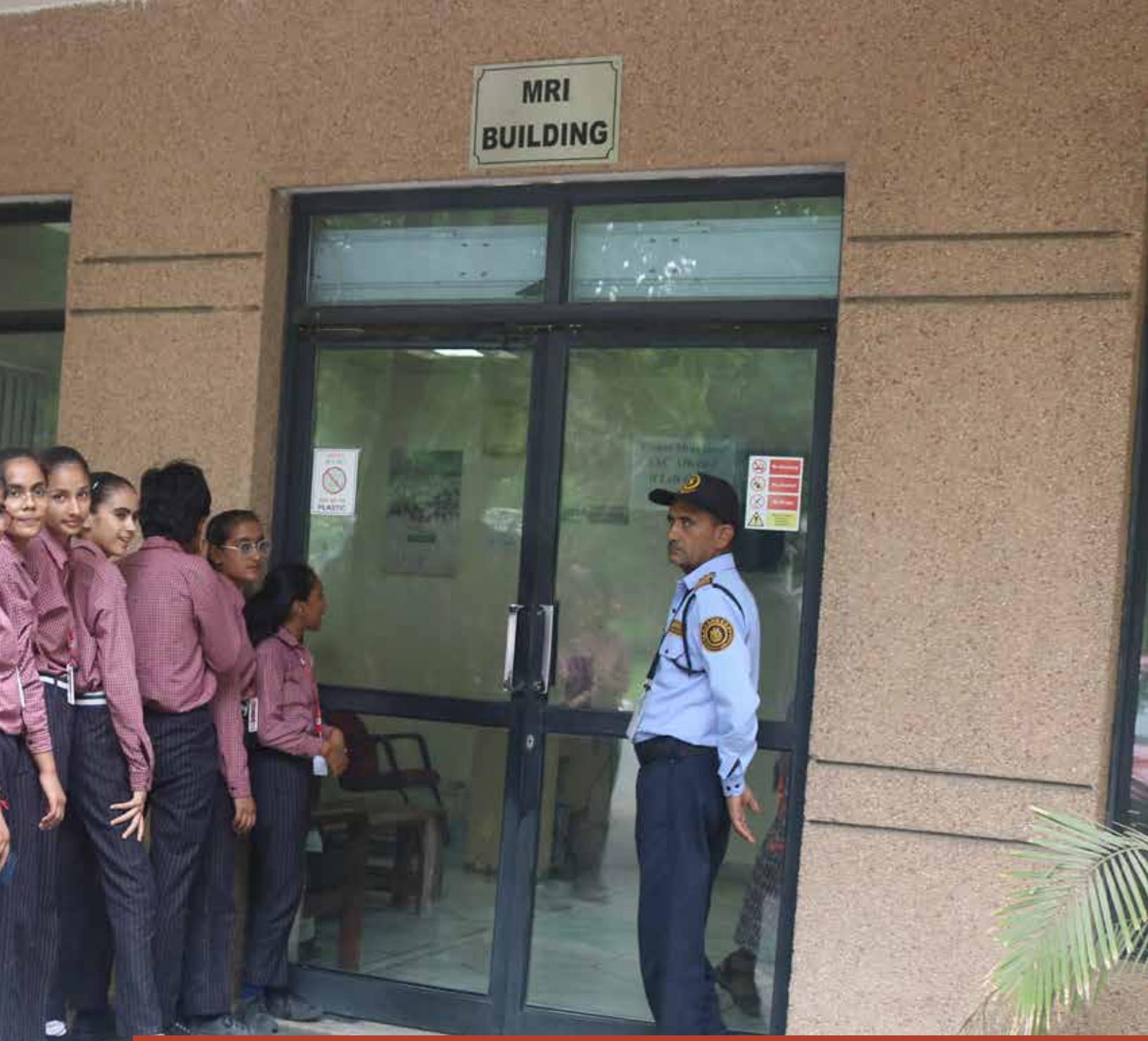
M.Sc. (Neuroscience) students are provided with a fellowship of ₹12,000/- per month.

NBRC inducts students for its M.Sc. (Neuroscience) and Ph.D. programmes from diverse backgrounds having Bachelors or Master's degree in any branch related to Neurosciences, Psychology or M.B.B.S., B.E., or B.Tech. NBRC recognizes that understanding brain functions requires a fusion of knowledge from multiple disciplines.

Summer Training and Short-term Programmes

NBRC conducts Summer Training Programme for the Students, recommended through three National Science Academies viz: (1) Indian Academy of Sciences, Bangalore (2) Indian National Science Academy, New Delhi (3) National Academy of Sciences, Allahabad. The summer training is for a period of eight weeks and the trainees are provided with shared accommodation at NBRC hostels. Summer trainees are encouraged to attend seminars and journal clubs organized at the institute. The summer training projects provides an exposure to Neuroscience and motivates trainees to consider it as a future career option.


MEG
BUILDING



Facilities & Resources

COMPUTING FACILITY (CF)

Coordinator

Prof. Arpan Banerjee

Technical Staff

Kedar Singh Bajetha
Seepika
Tarnnum Mansoori
Sachin Kumar

The Computing Facility of the National Brain Research Centre manages the overall Information and Communications infrastructure of the Institute, besides extending its support in R&D activities. The followings are summarized as under:

A) **Campus Converged Network** *(NBRC-IntraNet):* The NBRC campus network consists of a campus-wide Local Area Network (LAN) running on a 10Gbps fiber optic backbone with redundant paths over manageable switching fabric, integrated further with wireless access points managed through a central controller for mobility needs. The redundancy and robustness are built into the network architecture. The network is supplemented with a secure firewall/UTM cluster for network safety, intrusion detection system, gateway level antivirus, VPN facility, managing IT policy and detailed auditing/logging, etc. The campus network is IPv6 compliant and are functional in the dual stack. The wireless network of the institute has further been integrated with Eduroam services by incorporating it with the National NREN (ERNET-India). The Eduroam service provides visiting scientists and researchers, a seamless secure wireless access in all participating institutions across the world.

The campus converged network of the institute is integrated with National Knowledge Network (NKN), on a 1 Gbps optical fibre link provided by BSNL that is further supplemented with a 50Mbps backup radio link for redundancy. The NKN linkage is instrumental in running several scientific projects for multi-site high-volume data applications like the NBRC-AIIMS data pipeline for MEG Resource Facility[1] (earlier, Centre of Excellence for Epilepsy project) funded by DBT.

The campus converged network not only carries data traffic, but also the Voice traffic from the IP-PBX system as well as the Video traffic from the IP-CCTV system.

B) **IP-PBX facility:** The telecommunication systems of the institute are running on IP-PBX and the campus network is used to carry the voice traffic along with data traffic, whereas the endpoints user's IP-Phones are connected to LAN. The facility is running on automatic failover mode on virtualized servers from the institute's data center. The external incoming and outgoing voice traffic is routed on E1-PRI of BSNL. The users are also provided with various facilities like multi-point conferencing, voicemail, directory, call forwarding, etc. over the provided endpoints.

C) **Institute's Core and Application Servers:** The computing facility manages and maintains the server infrastructure of the institute, housed and maintained in the data center facility. In essence, the institute currently has five fully utilized 42U server racks in the data center facility. The various services running on these servers can be classified as follows:

[1] Magnetoencephalography (MEG) Resource Facility at NBRC is a collaborative project between National Brain Research Centre (NBRC) and All India Institute of Medical Sciences (AIIMS) under the aegis of Department of Biotechnology (Government of India). The facility has been incorporated into the esteemed DBT-SAHAJ infrastructure, with the primary objective of creating a "National Service Facility" offering access to resources

- Web servers for the institute and various web servers related to ongoing computational projects and applications of various scientific groups. The primary web server for the official website is running from VMs installed on the NIC cloud.
- NBRC has moved its mail server (nbrc.ac.in) to NIC server with advanced security features and enabled with 2FA. The email facility will be available to the users without any downtime. The mailing system is monitored by the NIC team round-the-clock and fixed the issues at the earliest if arises. The system also provides distribution facility to the end users for sending mails to the groups in one go. NBRC provide email accounts to its core employees, students, post-doctoral fellows, project assistants and project staff as well. All accounts are secured and mapped with user's mobile number as per the latest security policy. DNS servers for the official and hosted domains run from NBRC datacenter and a DNS facility of Ernet India (nbrc.ac.in) domain is also used.
- Central Storage servers (400TB) have been installed that work along with backup servers handling storage requirements of the users and laboratories for online central storage and data processing. Major steps have been taken for upgrading the central storage infrastructure.
- Radius and authentication servers for access, accounting, and authorization of computing resources
- License management servers for managing institutional site/network/concurrent licenses.
- Application servers running on windows and Linux platforms for common computing requirements of the users and also other specialized computing servers for specific data processing requirements of various laboratories.

D) **Other Facilities & Services**

- **NIC Cloud and Email Services :** The CF also manages the Virtual Machines on the NIC Cloud for better availability of web resources (especially the official website http://www.nbrc.ac.in and public DNS). Similarly, users having GOV.IN email ids on NIC platform for better availability.
- **Central Documentation Facility:** The central documentation facility provides round-the-clock availability to users for various computational needs like a facility for printing, scanning, poster-printing, etc. apart from providing data-processing computational nodes.
- **ICT Support & Service:** The computing facility also provides support and manages maintenance activities for the entire computing infrastructure of the institute including user endpoints- computers, peripherals, software etc. Computing Facility has increased its wireless facility in the student's hostel to improve internet connectivity. We have added 4 new Meraki outdoor access points with 10-year license.
- **CCTV Monitoring and Management:** More cameras are added to the surveillance system to enhance coverage of the campus. The installed IP Cameras are connected to the core network, enhancing the security and monitoring of the campus. Most entry/exit points of the buildings are covered with the Central CCTV system.
- **Software Development:** Undertaking the software development activities in line with the institute's requirements, several scientific and e-Governance applications have been developed in-

house. As per the requirement of the research community at NBRC, the computing facility has developed a hassle-free Central Instrumentation Facility Booking System (CIFBS) for booking the scientific equipment, used by the faculties, students and project staff across laboratories. The users may book any equipment as per their research plan prior 15 days (in advance). Each user has a maximum time limit to book one piece of equipment to ensure that the equipment is also available for other users. Using their ids, users may cancel a reservation if they need to. Additionally, the system will automatically cancel the booking if the user fails to mark their attendance after a predetermined time limit (with a countdown displayed on the screen). The system is also capable of generating various kinds of reports like booking reports user-wise, equipment-wise, cancelled reports user-wise, and equipment-wise.

- **Infrastructure Improvement:** The computing facility also undertakes planning and implementation of new computational infrastructure facilities and services, software/ hardware/network upgradations of Institute computers/peripherals, etc., and also planning to upgrade our mailing system with enhanced security.

- **Video-conferencing:** Computing facility has installed new setups for online audio-video conferring across different congregational arrangements like- Auditorium, Director's Board room, Seminar halls etc. The rooms are well equipped with smart interactive panel, camera and sound systems. The department efficiently conducts online meetings / interviews / lectures / workshops and online routine events through licensed online meeting tools.

Data Centre Division at NBRC

Animal Facilities

NBRC is an autonomous institute of Department of Biotechnology, Govt. of India, with a mandate of carrying out frontline research to understand brain function in health and disease. As part of the infrastructure, NBRC has a state-of-the-art animal facility to meet the requirements of the scientists for advanced neuroscience research.

The Institute recognizes that use of laboratory animals in research is an important necessity accompanied with great ethical responsibility as per the guidelines mentioned under Control and Supervision of Experiments on Animals (CCSEA). To ensure appropriate care and use, detailed programs of excellent veterinary and husbandry care, and programs for peer-reviewed evaluation of all activities prior using any animal during research, are in place.

NBRC is committed to the highest standards of research and recognizes that laboratory animals must receive the best possible care, not only to obtain valid research data, but also to ensure the health and safety of animals, researchers, and animal caretakers. Qualified and trained veterinarians oversee all the animal health concerns, and provide all necessary veterinary care to ensure that healthy animals are available for research.

The Animal Facility is registered CCSEA, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, New Delhi. (Registration number: 464/GO/ReRcBiBt-S/Re-L/01/CPCSEA; initially registered on 24/08/2001. All activities of the Animal Facility are carried out as per standard operating procedures (SOPs). The Animal Facility maintains the records of day-to-day activities as well as breeding, maintenance and experimentation as per the statutory requirement of CCSEA.

Animal Facility Centre, NBRC

The main activities of Animal Facility are to procure and breed a wide variety of species of laboratory animals and supply quality animals to in-house researchers, which are used as animal models for understanding the human brain in health and disease. A high degree of hygienic conditions is maintained in the animal house by regular cleaning and sterilization of the cages, water bottles, bedding and feed. The animal rooms are also regularly disinfected. Heavy-duty steam autoclaves have been installed for these purposes. A hot vapour jet machine is used for cleaning the large monkey cages. The staff is required to take shower, and change overall before entering the animal rooms, and again in the evening after finishing the work. All users are required to use appropriate PPEs before handling animals.

Steam Sterilizer

The main activities of Animal Facility are to procure and breed a wide variety of species of laboratory animals and supply quality animals to in-house researchers, which are used as animal models for understanding the human brain in health and disease. A high degree of hygienic conditions is maintained in the animal house by regular cleaning and sterilization of the cages, water bottles, bedding and feed. The animal rooms are also regularly disinfected. Heavy-duty steam autoclaves have been installed for these purposes. A hot vapour jet machine is used for cleaning the large monkey cages. The staff is required to take shower, and change overall before entering the animal rooms, and again in the evening after finishing the work. All users are required to use appropriate PPEs before handling animals.

Animal Facility Floor map

All the animal species are housed in species appropriate cages, designed as per the CCSEA guidelines. The outdoor play area for non-human primates has six large interconnected enclosures that provide a flexible layout for optimising enrichment and social interactions. The transgenic and mutant mice are housed under germ-free conditions in filter top cages and individually ventilated cages (IVC). Such animals are handled in laminar hoods, and then moved to fresh cages in a cage-changing station under hepa-filtered air.

Wards at Animal House

Individually ventilated Caging

The animals are maintained under controlled environmental conditions as specified in CCSEA guidelines, with temperature maintained between 22±2°C, relative humidity between 45-55%, 12:12 hr light-dark cycle, and 12-15 air changes per hour. The air-handling system uses 100% fresh air for each change.

All animals are procured as per CCSEA guidelines. A health surveillance program for screening incoming animals is carried out to assess animal quality. Animals procured from other places are kept in quarantine to minimize risk for introduction of infection in established colony.

Necropsy Room

The animal facility has a state-of-art surgical suite equipped with intensity controlled surgical lights, advanced surgical microscopes, gas anesthesia machines, equipment for monitoring the physiological state of the animals, including heart rate monitor, pulse oximeter and rectal thermometer. For cleaning and sterilization of the surgical instruments, there is an ultrasonic instrument cleaner, glass bead sterilizer and ethylene oxide gas sterilizer.

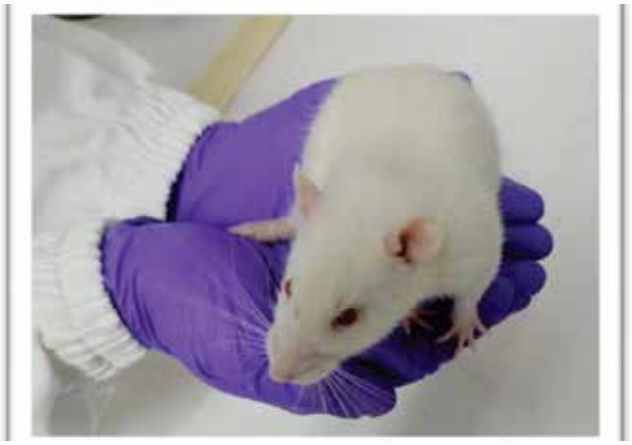
The animal facility has a necropsy room, perfusion room with a perfusion hood, deep freezer for carcass storage, and incinerator for disposal of the animal carcass.

Animal house facilities

The animal facility has been equipped with a card reader security system. The access is restricted to the animal house staff, maintenance staff and the investigators, who are listed in the IAEC approved protocols. All the personnel, who handle animals are required to have a current tetanus vaccination, and those who handle non-human primates (NHP) are regularly screened for tuberculosis. Everyone handling NHP's is trained in the procedures for the first-aid in case of an injury from an animal bite or scratch.

Close circuit monitoring cameras have been installed at various locations in the facility to help in effective monitoring of the animal facility.

The Veterinary staff of Animal Facility also conducts short-term training for M.Sc. and Ph.D. students, Project Assistants and other scientific staff in the field of laboratory animal science covering ethical and statutory guidelines that regulate scientific experiment on animals, general biology and reproduction of the laboratory animals, animal identification techniques, blood collection, injections, anesthesia and monitoring, handling and restraint, husbandry and care, sex differentiation, humane euthanasia, etc.



Laboratory Rat

The animal facility is currently maintaining the following species and strains of laboratory animals.

Mice Strains

- SWISS
- BALB/c
- C57BL/6J
- CD1

Transgenic Mice

- B6C3-Tg (APP695) 85DboTg(PSEN1) 85Dbo (Alzheimer's disease model)
- UBC-GFP (Green fluorescent protein)
- B6CBA-Tg (Hdexon1) 62Gpb/3J (Huntington's disease model)
- B6;129P2Pvalb< tm1(cre)Arbr>/J
- B6. CgGt (ROSA) 26Sor<tm9(CAGtdTomato)
- B6.CgTg(Scnn1acre)3Aibs/J
- STOCK Gad2<tm2(cre)Zjh>/J
- B6. CgTg (Camk2a-cre) T29-1Stl/j
- B6.129-Rp122<tm1.1Psam>/j
- STOCK Tg (Thy1-EGFP) MJrs/J
- B6. Cg-Tg (Thy1-YFP)16Jrs/J
- B6. Cg-Tg (Thy1-YFP) HJrs/J
- B6;129S6-Tg (Camk2a-cre/ ERT2)1Aibs/J
- STOCK Ssttm2.1(cre)Zjh/J
- B6. Cg-Gt (ROSA)26Sortm6(CAG-ZsGreen1) Hze/J
- B6:129X1-Gt (ROSA)26Sor<tm (EYFP) Cos>/j
- C57Bl6-Tg (Nes-cre/ERT2) Keise/j
- B6;129S6-Gt (ROSA)26Sortm96(CAG-GCaMP6s) Hze/J
- C57BL/6J-Tg (Thy1 GCaMP6s) GP4.3Dkim/J

Rat Strains

- Long Evans
- Sprague Dawley

Non-human primates

- Rhesus Monkeys (Macaca mulatta)
- Bonet Monkeys (Macaca radiata)

Birds

- Zebra finches (Taeniopygia guttata)
- House crows (Corvus splendens)

All the mice strains are maintained by inbreeding and the rat strains by outbreeding. Zebra finch colonies are maintained by outbreeding arrangements. The transgenic mice are maintained under a specialized breeding program after the investigators provide the molecular genotyping of these strains based on the presence or absence of the genes of interest.

Library

The library at NBRC, plays a vital role in the collection, development and dissemination of scientific and technical information to meet the present and future needs of the Centre and also provides facilities and support to the scientists, researchers, students, staff and NBRC's networked centers. The Library is housed in a spacious two-storey building, with reading room, reference room, video conferencing, online journal access facility, book section, internet access and reprographic facilities etc. The main aim of the NBRC Library staff is to provide excellent services to users in NBRC and all centers associated with the Institute. The NBRC library has a large collection of Journals, books and other relevant research materials on Neuroscience, Biochemistry, Genetics, Molecular Biology, Immunology & Microbiology, Pharmacology and Toxicology, Psychology, Physics, Mathematics, Computer Science and general subjects. **The NBRC Library currently subscribes to 979 (approx.) online journals through the DBT e-Library Consortium (DeLCON), 3 specialized journals, and 122 freely accessible online journals.** It also maintains digital archives and news clips about the Centre and subscribes to Newspapers and News Letters. The collection of the NBRC Library is growing gradually along with new developments in research and knowledge in the field of Neuroscience and related areas. To provide optimum service to all users, the NBRC library is currently digitizing its list of collections using the LSEASE software, to which all users will have full access. A barcode technology has also been installed for accurate and speedy circulation and the management of all library documents. The new software will also help in efficient library operations viz. administration, acquisition, circulation, serial control, cataloguing and information retrieval. The Library has set up 22 Computers with Internet facility in the NBRC Common room for use of researchers and students and providing electronic access to the subscribed journals through the campus portal. The NBRC Library also provides Inter Library Loan Services to NBRC's 48 networked centres all over India. Researchers at different centres send their requirements for research materials or journal articles through email to library@nbrc.ac.in or to the Librarian Dr. D. D. Lal, ddlal@nbrc.ac.in. The materials are then shared to the members free of cost. The library entertains an average of approximately 450 requests for articles and the numbers are gradually picking up every year. The NBRC Library regularly evaluates its information services to ensure that the Institution's requirements are met. Efficient resource sharing and active cooperation across libraries are managed through inter library loan practice to exploit maximum use of resources. Provision of sharing copies of rare documents is also available.

CORE ACTIVITIES INVOLVED:

1. Book Acquisition
2. Periodicals Acquisition
3. Selective Dissemination Information (SDI)
4. Current Awareness Services (CAS)
5. Inter Library Loan
6. Resource Sharing
7. Circulation services
8. Reference Services, Bibliographic services
9. Indexing and Special Services
10. Collects maintains, store and retrieves information and data keeping in the view of evolving needs of its researchers
11. Help to Network Centres.

Books added at NBRC Library:

1. *Drosophila : Methods and Protocols /by Christian Dahmann; Edition: 3rd ed.; ISBN: 978-1-0-716-2540-8; Year: 2022.*
2. *Drosophila Neurobiology : A Laboratory Manual/by Bing Zhang, Marc R. Freeman, Scott Waddell; ISBN: 978-0-8-796-9905-5; Year: 2010.*

Online Journals added:

1. *Journal of Neurophysiology/by: American Physiological Society Publisher, Vol: 35; ISSN: 1522-1598; Year: 2023*
2. *Journal of Cognitive Neuroscience/by: MIT Press Publisher, Vol: 129-130; ISSN: 1530-8898; Year: 2023.*

DBT's Electronic Library Consortium (DeLCON)

DeLCON CONSORTIUM:

A NATIONAL LIBRARY CONSORTIUM FOR LIFE SCIENCES & BIOTECHNOLOGY HOSTED & ADMINISTERED BY NBRC & SPONSORED BY DEPARTMENT OF BIOTECHNOLOGY (DBT)

The DBT Electronic Library Consortium (DeLCON) is a major initiative of the Department of Biotechnology (DBT) to provide unlimited access to most of the relevant periodicals to the researchers at participating institutions. It was initiated in the year 2008 and finally launched in the month of January 2009 with 10 DBT core member institutions (including DBT H.Q. & ICGEB) enabled with a centralized subscription to a large number of high impact online journals. It is a national initiative for providing access to scholarly electronic resources including full-text and bibliographic databases in all the life sciences disciplines to the DBT institutions.

It facilitates the access to high quality e-resources to the faculties, scientists, research scholars, students and Project Assistants of the DBT research Institutions in the country to improve teaching, learning and research. DeLCON consortium was extended in three phases; and in the second phase 17 DBT Institutions were added, in the year 2010. Subsequently, seven more institutional members were added in the 3rd phase of extension in the year 2011. In the year 2012, DBT merged all the phases and it became a single 'DeLCON Consortium' with 33 members.

In the year in 2019, the DBT added one new Institute i.e. Institute for Stem Cell Science and Regenerative Medicine (InStem) under DeLCON Consortium. Currently, DeLCON has a total of 35 members. The 'DeLCON Consortium' provides current (presently approx. 979 online resources) as well as archival access to more than 1176 core peer-reviewed journals.

The DeLCON comprises the following 35 member institutions:

List of DBT & NORTH EAST REGIONAL (NER) INSTITUTIONS

DBT Institutions

1. Department of Biotechnology (DBT), New Delhi
2. National Brain Research Centre (NBRC), Manesar
3. National Institute of Plant Genome Research (NIPGR), New Delhi
4. National Institute of Immunology (NII), New Delhi
5. National Centre for Cell Science (NCCS), Pune
6. Institute of Life Sciences (ILS), Bhubaneshwar
7. Institute of Bioresources and Sustainable Development (ISBD), Imphal
8. Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad
9. Rajiv Gandhi Centre for Biotechnology (RGCB), Thiruvananthapuram
10. International Centre for Genetics Engineering and Biotechnology (ICGEB), New Delhi
11. National Agri-Food Biotechnology Institute (NABI), Mohali, Punjab
12. National Institute of Biomedical Genomics (NIBMG), Kalyani, Kolkata DBT's
13. National Institute of Animal Biotechnology (NIAB), Hyderabad
14. Regional Centre for Biotechnology (RBC), Faridabad, as a part of NCR Biotech Science Cluster (BSC)

15. Transnational Health Science & Technology Institute (THSTI), Faridabad, as a part of NCR Biotech Science Cluster (BSC)
16. Biotechnology Industry Research Assistance Council (BIRAC), New Delhi
17. Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore.

North Eastern Region (NER) Institutions

18. Dibrugarh University, Assam
19. Assam University, Silchar
20. North Eastern Regional Institute of Science & Technology, Arunachal Pradesh
21. North East Institute of Science & Technology, Assam
22. Mizoram University, Mizoram
23. D. M. College of Science (DMC), Manipur*
24. Sikkim University, Gangtok
25. College of Veterinary Science, Assam Agricultural University, Guwahati
26. Guwahati University, Assam
27. Manipur University, Imphal
28. College of Veterinary Science & Animal Husbandry Central Agricultural University, Mizoram
29. Rajiv Gandhi University, Arunachal Pradesh
30. Nagaland University, Nagaland
31. North-Eastern Hill University (NEHU), Shillong
32. St. Anthony's College (SAC), Meghalaya*
33. Indian Institute of Technology Guwahati, Assam
34. Tezpur University, Tezpur, Sonitpur, Assam
35. Sikkim State Council of Science and Technology, Gangtok, Sikkim

(*= DMC is a part of Mizoram University & SAC is a part of NEHU)

In terms of number of users, the DBT's Electronic Library Consortium (DeLCON) is the largest consortium in India constituted in the area of Biotechnology and Life Sciences with a vision and plan to reach out to all DBT Institutions departments, research institutions, universities, and their colleges affiliated to DBT.

The complete list of full-text resources (e-Journals) subscribed under the DeLCON Consortium is given below.

LIST OF JOURNALS UNDER DeLCON CONSORTIUM

Name of Publishers → Journals → Hyperlink of the publishers → No. of Journals

- American Association for Cancer Research (AACR) → http://www.aacr.org → 9 Journals
- American Society for Microbiology (ASM) → http:// www.asm.org/ → 16 Journals
- Cold Spring Harbor Laboratory Press (CSHL) → http://www.cshl.edu → 4 Journals
- Taylor & Francis (T&F) → http://www.informaworld.com → 38 Journals
- Nature Publications → http:// www.nature.com → 34 Journals
- Oxford University Press (OUP) → http:// www.oxfordjournals. org → 21 Journals
- Springer India → http://www.springerlink.com → 343 Journals
- Microbiology Society (MBS) → http:// mic.sgmjournals.org → 2 Journals

- Wiley-Blackwell → http:// www3.interscience.wiley.com/cgi-bin/home → 82 Journals
- Elsevier Science (ScienceDirect) → http:// www.sciencedirect.com → 428 Journals
- American Association of Immunologist (AAI) → http://www.aai.org/ → 1 Journal
- Proceedings of National Academy of Sciences (PNAS) → http://www.pnas.org → 1 Journal

Archives only

- Lippincott William & Wilkins/Wolter Kluwer/OVID→ http://ovidsp.ovid.com → 11 (Only Archives from 2009-2011)
- Marry ANN Liebert (MAL) → http://www.liebertonline.com → 92 (Only Archives from 2009-2018)
- American Chemical Society (ACS) → http://pubs.acs.org→ 47 Journals (Only Archives from 2009-2016)
- Annual Reviews (AR) → http://www.annualreviews.org → 23 Journals (Only Archives from 2009-2011)
- The New England Journal of Medicine (NEJM) → http:// www.nejm.org → 1 (Only Archives from 2009-2018)
- American Association for Advancement of Science (AAAS)→ http://www.sciencemag.org → 3 Journals (2009-2019)
- American Society for Biochemistry and Molecular Biology (ASBMB)→ http:// www.jbc.org → 2 Journals (2009-2020)
- American Society for Hematology (ASH) → http://bloodjournals.hematologylibrary.org → 1 Journal (2009-2019)

BENEFITS OF DeLCON CONSORTIUM (GENERAL)

The consortia-based subscription to e-resources is a viable solution for increasing the access to electronic resources across DBT institutions at a lower rate of subscription.

Major benefits of DeLCON Consortium are:

- DeLCON acts as a single window service for a large number of DBT Institutions with their diverse research and academic interest.
- DeLCON with its collective strength of participating institutions, attracts highly discounted rates of subscription with most favourable terms of agreement for a wider range of e-resources. Most of the e-publishers have responded positively to the call of the Consortium. The rates offered to the consortium are lower by 66% to 99% depending upon the category of DBT institutions.
- DeLCON has triggered remarkable increase in sharing of electronic resources amongst participating DeLCON members
- The research productivity of DBT institutions has improved with increased access to international full text resources (Journals and database).
- Users have immediate access to material previously not subscribed to, at no incremental cost for accessing back files.
- It improves the existing library services and reduced the subscription cost.
- DeLCON is open so that other DBT institution can also join the DeLCON Consortium.
- DeLCON offers better terms of agreement for use, archival access and preservation of subscribed electronic resources, which would not have been possible for any single institutions.
- Members of the DeLCON Consortium have the benefit of cap on the annual

increase in the rates of subscription. While the usual increase in price of e- resources varies from 15% to 20%, the DeLCON members enjoy a cap on increase in price ranging from 5% to 7%.

- Since the subscribed resources is accessible online in electronic format, the DBT institutions have less pressure on space requirement for storing and managing print-based library resources.

MAJOR ADVANTAGES OF DeLCON FOR CONSORTIUM MEMBERS

Some of the important advantages of the DeLCON consortium provides to members as given below:

- Consortia-based subscription to electronic resources provides access to wider number of electronic resources at substantially lower cost.
- Optimum utilization of funds.
- Facilities to build up digital libraries
- Helpful in providing better library services like CAS and SDI
- Cost sharing for technical and training support
- Electronic Journals demand neither library space nor shelving costs
- The DeLCON consortium has been offered better terms of licenses for use, archival access and preservation of subscribed electronic resources, which would not have been possible for any single institution; and
- Available 24 hours a day, 7 days a week

SELECTION PROCEDURES OF RESOURCES UNDER DeLCON CONSORTIUM

In order to understand the compilation base in DBT member Institutions, meetings of DBT Directors, & DeLCON Nodal Officers were held and their views and feedback are obtained. The print & online collection base available in DBT research institutions libraries and their needs are surveyed with the aim to recognize and determine e-resources to be subscribed under the DeLCON Consortium. Based on the feedback received from DBT Members, e-resources of various publishers are recognized and evaluated before negotiating licensing arrangements. Keeping in view the multiplicity of research programmes offered by DBT Institutions, every attempt was made to subscribe to e-resources that are multidisciplinary in nature with wide scope and coverage.

All e-resources were evaluated on the criteria as given below:

i) Qualitative and quantitative contents;

ii) Coverage;

iii) Their availability on different platforms and their comparative advantages / disadvantages;

iv) Rates applicable for these resources to individual institutions as well as to other consortia.

SUBJECT AREAS OF DeLCON CONSORTIUM

The DeLCON Consortium covers all the disciplines and subjects coming under Life Sciences i.e. Biotechnology, Bioinformatics, Biochemistry, Biology, Chemical Biology, Sciences, Immunology, Neuroscience, Plant Genome, Plant Biology, Microbiology, Physiology, Psychology, Physiotherapy, Psychotherapy, Genome, Gene, Genetics, Mathematics, Physics, Chemistry, Radiology, Medicines, Computational Biology, Cell Biology, Cell Sciences, Molecular Biology, Molecular and Cellular Biology, Computational Neuroscience, System Neuroscience etc.

OPERATIONAL FUNCTIONALITY OF DeLCON CONSORTIUM

The DeLCON is fully funded by DBT and has network connectivity among DBT Institutions. Individual Institutions have unique static

NBRC Library

IP address and access is given by the publishers. However, the whole programme is administered, monitored and maintained by DeLCON Nodal Centre at NBRC and DeLCON National Steering Committee.

NODAL CENTRE & HEAD QUARTER OF DeLCON CONSORTIUM & ITS ACTIVITIES

The consortium Headquarter functions under a National Steering Committee with the responsibilities of ensuring inter-institutional coordination; monitoring licenses for electronic resources, ordering and payment for subscribed services, establishing work groups on different subjects to improve the functioning of consortium as well as to identify new resources and evaluates the existing resources, and propagating the consortium to attract new members in it. The Department of Biotechnology has also setup a National Review Committee that have the overall responsibility of making policies, monitoring the progress, coordinating with Member Institutions for promoting the activities of DeLCON Consortium. The important functions of the consortium headquarter are : to act as nodal agency for increasing the cooperation amongst participating institutions; to coordinate all activities concerned with subscription of e-resources on behalf of consortium; to liaison with electronic publishers to provide training and technical help to participating member institutions to coordinate with DBT and participating institutions for subscription to resources; to organize the meeting of the National Steering Committee and to decide upon the policy issues to maintain a website for the Consortium for the benefit of its members and to encourage sharing of resources in an online mode; to propagate the advantage of consortium with other institutions and enroll new members in the consortium; and to organize annual meetings of the consortium members.

National Neuroimaging Facility

National Neuroimaging facility, sponsored by the Department of Biotechnology, Govt. of India, came into existence in the year 2006. The main purpose of this National Facility is to facilitate/support cutting-edge brain imaging research undertaken by intramural and extramural laboratories. The facility is orchestrated with the following equipments:

1. 3 Tesla Magnetic Resonance Imaging (MRI): Philips Achieva 3.0 T scanner
2. Electroencephalography (EEG): Two systems in place

A) 64-channel Synamps 2 EEG system, Compumedics Neuroscan, Inc

B) 64-channel Brain products ActiChamp system

3. Transcranial magnetic stimulation (TMS): Magventure MagPro

All the instruments are available for research purposes for any user with necessary ethics approvals and paying of user charges.

Magnetic Resonance Imaging (MRI)

MRI provides much greater contrast between the different soft tissues of the body compared to computed tomography (CT), making it especially useful in the diagnosis of neurological (brain), musculoskeletal, and cardiovascular diseases. Various imaging modalities also play important role providing crucial information, which can aid to various diagnostic process. The various imaging modalities which, are routinely used in National Neuroimaging facility are:

1. MR Spectroscopy (MRS) provides non-invasive neurochemical level estimations and enables clinical correlation.
2. Functional MRI (fMRI) as the name suggests reveals the changes in brain metabolic activity over time.
3. Structural MRI (or simply MRI) give us the detailed high-resolution pictures of brain structures as well as brain connectivity using diffusion weighted images.

The 3 Tesla Phillips whole body MRI scanner at our Facility is equipped with state-of-the-art hardware, software and data processing software required for each imaging modality. The facility is being used daily for performing structural and functional MRI (see Fig 1.) and MRS. In addition to understanding brain function and clinical research, the centre also is closely interacting with leading imaging centres within the country and across the globe.

Electroencephalography (EEG) is a test that measures and records the electrical activity of the brain. Special sensors are attached to the scalp (in a similar way as ECG) to detect brain electric activity and mV range and the signals are amplified via an amplifier that communicates and stores the information in a computer. Basic brain functions such as vision, auditory, somatosensory processing as well as higher order functions like memory, emotion, decision making and brain diseases such as epilepsy, dementia, and narcolepsy (sleeping disorder) can be studied by EEG.

Transcranial magnetic stimulation (TMS): TMS is a non-invasive neurostimulation technique assisting researchers to induce a transient change in electric currents at a target brain area by applying very small amounts of external field magnetic field. These changes are completely reversible and the technique gives us a window to study brain information processing with profound insights.

Clinical studies on patients with Alzheimer's Disease, Parkinson's Disease, Autism and Brain Tumours, as well as monitoring of aging in normal healthy brain, are being performed extensively in the National Neuroimaging facility. Understanding the basic neurobiology of various sensory and cognitive functions

using non-invasive neuroimaging tools are also undertaken by several labs at NBRC.

The following are the publications having data collected at NNF between April 2022 - March 2023.

Publications:

1. **Banerjee A.,** Singhal, S, Ghosh P, Kumar N. ***Parametric separation of phase-locked and non-phase-locked activity.*** J Neurophysiol. 2023 Jan 1;129(1):199-210. doi: 10.1152/jn.00467.2022

2. **Banerjee A.,** Majumdar G, Yazin F, Roy D. (2023). ***Emotion Dynamics as Hierarchical Bayesian Inference in Time.*** Cerebral Cortex, 33 (7), 3750-3772. https://doi.org/10.1093/cercor/bhac305

3. **Banerjee A.,** Mohan MV. (2022). ***A perturbative approach to study information communication in brain networks.*** Network Neuroscience. 6 (4): 1275–1295. https://direct.mit.edu/netn/article/doi/10.1162/netn_a_00260/111961.

4. **Banerjee A.,** Pathak A, Sharma V, Roy D. (2022). ***Biophysical mechanism underlying compensatory preservation of neural synchrony over the adult lifespan.*** Communications Biology 5 (1), 1-12. https://www.nature.com/articles/s42003-022-03489-4

5. **Mandal PK., Tripathi M.,** Goel A, Bush A I, Punjabi K, Joon S, Mishra R, Garg A, Kumar N K, Sharma P, Shukla D, Ayton SJ, Fazlollahi A, Maroon JC, Dwivedi D, Samkaria A, Sandal K, Megha K, Shandilya S. ***Hippocampal glutathione depletion with enhanced iron level in patients with mild cognitive impairment and Alzheimer's disease compared with healthy elderly participants.*** Brain Commun. 2022 Aug 20;4(5): fcac215. doi:10.1093/braincomms/fcac215. PMID: 36072647

6. **Mandal P.K.,** Gaur S, Roy RG, Samkaria A, Ingole R, Goel A. ***Schizophrenia, Bipolar and Major Depressive Disorders: Overview of Clinical Features, Neurotransmitter Alterations, Pharmacological Interventions, and Impact of Oxidative Stress in the Disease Process.*** ACS Chem Neurosci. 2022 Oct 5;13(19):2784-2802. doi: 10.1021/acschemneuro.2c00420. Epub 2022 Sep 20. PMID: 36125113.

7. **Mandal P K.,** Grewal M, More S, Saharan S, Shukla D. ***A method for metabolite signal quantitation for magnetic resonance spectroscopy data.*** US Patent (Patent office of the United States of America)

8. **Mandal PK.,** Roy RG, Maroon JC. ***Oxidative Stress Occurs Prior to Amyloid Aß Plaque Formation and Tau Phosphorylation in Alzheimer's Disease. Role of Glutathione and Metal Ions.*** ACS Chem Neurosci. 2023 Aug 10. doi: 10.1021/acschemneuro.3c00486.

9. **Mandal PK.,** Joon S, Pandey C. ***Brain and Behavior: Evidences of neuroimaging and neuropsychological testing in Alzheimer's Disease pathology.*** Indian Journal of Clinical Psychology 50 (1)

10. **Mandal P.K.,** Dwivedi D, Joon S, Goel A, Ahasan Z, Maroon JC, Singh P, Saxena R, Roy RG. ***Quantitation of Brain and Blood Glutathione and Iron in Healthy Age Groups Using Biophysical and In Vivo MR Spectroscopy: Potential Clinical Application.*** ACS Chem Neurosci. 2023 Jun 21;14(12):2375-2384. doi: 10.1021/acschemneuro.3c00168.

11. **Mandal PK.,** Jindal K, Maroon JC, Chhikara R, Samkaria A, Joshi M, Roy S, Arora Y. ***Brain Imaging Databases.*** ACS Chem Neurosci. 2023 Jun 7;14(11):1930-1934. doi: 10.1021/acschemneuro.3c00265. Epub 2023 May 15.

12. **Mandal PK.,** Guha RR, Kalyani A. ***Distribution Pattern of Closed and Extended Forms of Glutathione in the Human Brain: MR Spectroscopic Study.*** ACS Chem Neurosci. 2023 Jan 18;14(2):270-276. doi: 10.1021/acschemneuro.2c00573.

13. **Mandal PK., Tripathi M,** Goel A, Bush, AI, Punjabi K, Joon S, Mishra R, Garg, A, Kumar NK, Sharma P, Shukla D, Ayton S J, Fazlollahi A, Maroon J C, Dwivedi D, Samkaria A, Sandal K, Megha K, Shandilya S. ***Hippocampal glutathione depletion with enhanced iron level in patients with mild cognitive impairment and Alzheimer's disease compared with healthy elderly participants.*** Brain Commun. 2022 Aug 20;4(5):fcac215. doi: 10.1093/braincomms/fcac215.

14. **Mandal PK.,** Gaur S, Roy RG, Samkaria A, Ingole R, Goel A. ***Schizophrenia, Bipolar and Major Depressive Disorders: Overview of Clinical Features, Neurotransmitter Alterations, Pharmacological Interventions, and Impact of Oxidative Stress in the Disease Process.*** ACS Chem Neurosci. 2022 Oct 5;13(19):2784-2802. doi: 10.1021/acschemneuro.2c00420.

15. **Mandal PK.,** Roy RG, Samkaria A. ***Oxidative Stress: Glutathione and Its Potential to Protect Methionine-35 of Aß Peptide from Oxidation.*** ACS Omega. 2022 Jul 26;7(31):27052-27061. doi: 10.1021/acsomega.2c02760.

Report prepared by Dr. Arpan Banerjee, Scientist VI/ Professor

Magnetoencephalography (MEG) Resource Facility (Under DBT-SAHAJ Scheme, Funded by the Department of Biotechnology, Ministry of Science &Technology, Govt of India)

Investigators from AIIMS:

Prof. Manjari Tripathi (Adjunct Professor, NBRC)
Prof. P. Sarat Chandra
Dr. Jyotirmoy Banerjee

Investigators from NBRC:

Director-NBRC

Investigator from ACBR:

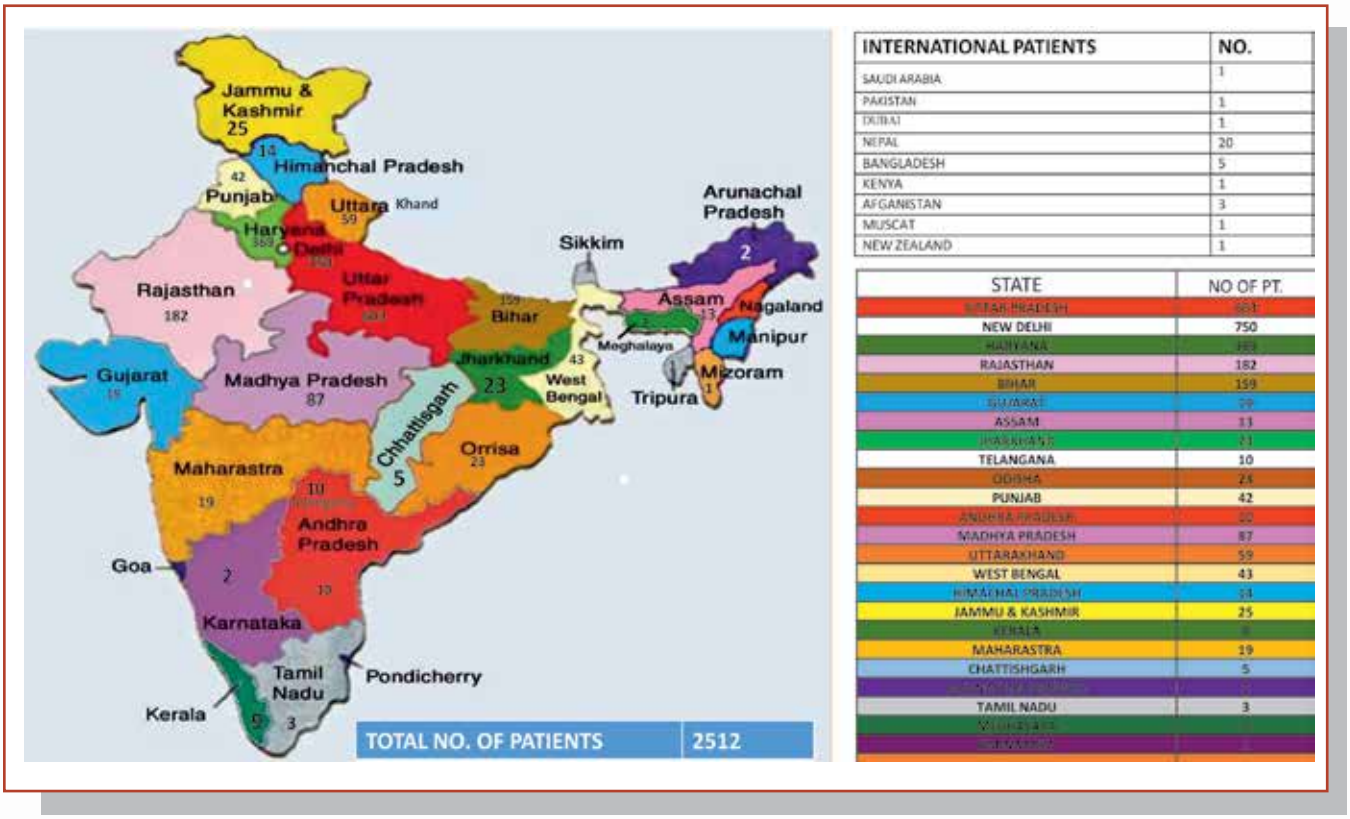
Dr. Aparna Dixit

Magnetoencephalography (MEG) Resource Facility at NBRC is a collaborative project between National Brain Research Centre (NBRC) and All India Institute of Medical Sciences (AIIMS) under the aegis of Department of Biotechnology (Government of India). The facility has been incorporated into the esteemed DBT-SAHAJ infrastructure, with the primary objective of creating a "National Service Facility" offering access to resources.

MEG unit in Magnetic Shielded Room (MSR) -NBRC

Orchestrated with a few facilities across the world, NBRC brings together a premier medical science institute and a dedicated neuroscience research centre to study difficult-to-treat epilepsy and other neurological conditions. The main aim of the centre is to develop a cure for drug-resistant epilepsy by bridging the gap between clinical and basic research, mediated by the close coordination between NBRC & AIIMS. For a comprehensive study, the AIIMS component of the centre is using magnetic resonance imaging (MRI), electroencephalography (EEG), video EEG, as well as functional imaging techniques like positron emission tomography (PET) and single photon emission tomography (SPECT) to locate the epileptogenic area. Meanwhile, the NBRC component of the centre, uses the non-invasive protocol of magnetoencephalography (MEG) for the localization with epileptogenic focus. We are presenting herewith, a brief report on our findings from the proposed objectives under this project, conducted during 2022-2023.

Establishing a diagnosis of drug resistant epilepsy (DRE) is an important milestone in the treatment of epilepsy as it marks the transition of a patient who is taking medications to control a condition and living a relatively normal life to someone who is at risk of worsening seizures, injuries or even death, and deals with social stigma and economic hardship associated with uncontrolled seizures. Identification of such patients and diagnosing drug refractory epilepsy (DRE) are very important steps in the management of these patients. MEG resource facility, one-of-its-kind in Northern India, proved very much fruitful in managing patients suffering with such conditions. Till March 2023, 2512 patients were evaluated using this facility from all over India (state-wise distribution of patients is shown in figure 2). International patients infact, have been also benefitted, especially patients from the SAARC nations.



INTERNATIONAL PATIENTS	NO.
SAUDI ARABIA	1
PAKISTAN	1
DUBAI	1
NEPAL	20
BANGLADESH	5
KENYA	1
AFGANISTAN	3
MUSCAT	1
NEW ZEALAND	1

STATE	NO OF PT.
UTTAR PRADESH	681
NEW DELHI	750
HARYANA	169
RAJASTHAN	182
BIHAR	159
GUJARAT	19
ASSAM	13
JHARKHAND	23
TELANGANA	10
ODISHA	23
PUNJAB	42
ANDHRA PRADESH	20
MADHYA PRADESH	87
UTTARAKHAND	59
WEST BENGAL	43
HIMACHAL PRADESH	14
JAMMU & KASHMIR	25
KERALA	9
MAHARASTRA	19
CHATTISHGARH	5
[illegible]	[illegible]
TAMIL NADU	3
[illegible]	[illegible]
[illegible]	[illegible]

Figure 2. Showing the national and international distribution of total patients being evaluated at MEG Resource facility.

Total Number of patients scanned till 31.03.2023 =2512 (Inclusive of 518 paid user)

Revenue Generation under DBT SAHAJ scheme-

FY 2022-23: INR 10,38,000 (346 Users)

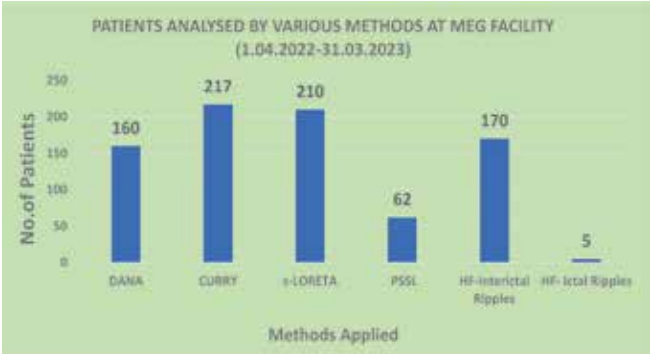
Total Revenue Generated (08.09.2021 to 31.03.2023): INR 15,54,000 (518 Users)

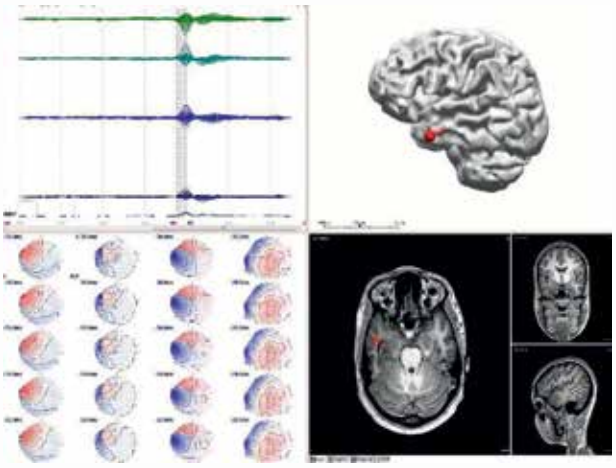
Cutting-Edge Methods for MEG Analysis:

- Ictal High Frequency Oscillations (HFO) are an Indicator of seizure onset areas (80Hz-200Hz).
- Pre-Spike Source Localisation (PSSL) is an indicator of seizure before inter-ictal spikes.
- Standardized Low Resolution Brain Electromagnetic Tomography Method (s-LORETA).
- Inter-ictal high frequency oscillations (80Hz-500Hz) are an indicator seizure onset areas (Working).
- Exploring aberrant functional networks in persons with epilepsy using connectomics.

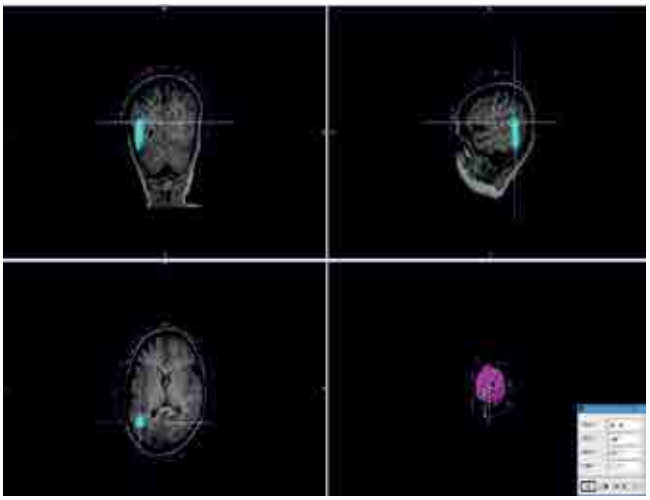
PATIENTS, WHO HAVE BEEN ANALYSED BY VARIOUS METHODS GIVEN BELOW: (01.04.2022-31.03.2023)

No. of patients Analysed in DANA[1]	No. of patients Analysed in CURRY[2]	No. of patients Analysed in s-LORETA	No. of patients Analysed in PSSL	No. of patients Analysed in High Frequency Interictal Ripples	No. of patients Analysed in High Frequency Ictal Ripples	Total No. of Patients have been Analysed
160	217	210	62	170	05	217





Epileptic Source Mapping in "CURRY"



Epileptic Source Mapping in "DANA"

[1] A software to examine epileptic source imaging.

[2] Neuro-imaging software for epilepsy detection.

One of the major advantages of this technique over the EEG is the lack of distortion of MEG signals by the skull and intervening soft tissue. In addition, the MEG preferentially records activity from tangential sources thus recording activity predominantly from sulci, which is not contaminated by activity from apical gyral (radial) sources. While the MEG is probably more sensitive than the EEG in detecting interictal spikes, especially in some locations such as the superficial frontal cortex and the lateral temporal neocortex, both techniques are usually complementary to each other. The diagnostic accuracy of MEG source localization is usually better as compared to scalp EEG localization. Functional localization of eloquent cortex is another major application of the MEG. The combination of high spatial and temporal resolution of this technique makes it an extremely helpful tool for accurate localization of visual, somatosensory and auditory cortices as well as complex cognitive functions like language.

Accurate localization of epileptogenic focus is of paramount importance for good seizure-free outcomes following surgery in patients with drug refractory epilepsy. It is also important to know the extent of overlap of the epileptogenic focus with eloquent cortex to avoid post-operative morbidity and prognostication. Invasive EEG is of great help to identify epileptogenic focus and extent of overlap with eloquent cortex. StereoElectroEncephalography (SEEG) implantation is usually done in MRI negative cases, when there is discordance between electro clinical and MRI, overlapping with eloquent cortex and dual pathology cases. Placement of SEEG electrodes is safe and an effective technique to localize epileptogenic zone.

SEEG implantation is currently allowing us to localize the epileptogenic networks accurately and we have been able to develop a paradigm to provide accurately labelled tissues for better cellular electrophysiological and molecular characterization. Such a strategy would allow us to create better models to understand the cellular and molecular mechanisms of epileptogenesis.

We analysed data from our centre, of patients undergoing stereotactic electrode implantation. The following are the situations that required invasive intracranial monitoring in our patients:

1. Seizures that were lateralized, but not localized; or seizures were localized, but not lateralized.
2. Seizures were neither localized nor lateralized.
3. Seizure localization was discordant with other data.
4. Relationship of seizure onset to lesion to be determined (e.g., dual pathology or multiple intracranial lesions).
5. Eloquent motor cortex mapping comparison of FMRI and direct cortical stimulation and NEXSTIM was done in 78 PWE.

SEEG electrodes were implanted with the assistance of stereotactic robotic device. An image guided volumetric T1-weighted MRI with contrast along with FLAIR sequences was used for preoperative planning. Digital Imaging and Communications in Medicine (DICOM) format images were digitally transferred to the robot's native planning software. The proposed targets of SEEG electrodes were decided according to the working hypothesis derived from the non-invasive investigations of the patient. All the proposed trajectories were planned using the planning software. The trajectories were evaluated in all planes (axial, sagittal, and coronal), and also along the reconstructed "probe's eye view", to look for any compromise to the vascular structures. Trajectory was adjusted appropriately without affecting the proposed target area. The procedure was performed under general anaesthesia to ensure the accuracy of registration. Stereotactic registration was carried out using predefined anatomical landmarks. Registration was validated and adjusted accordingly. The desired trajectories were selected on the touch-screen interface. The robotic device used at our institute has an arm with six degrees of freedom, with an adaptor at one end for holding the instruments. After trajectory confirmation, the arm movement was initiated using a foot pedal. The robotic arm automatically locks into position once the position of the selected

trajectory was reached. A 2-mm diameter handheld drill (Synthes) was introduced through the adaptor and used to create a skull opening. The dura mater was then opened with a dural perforator after coagulating it with monopolar cautery at low settings. A tract for the electrode was made using a tracker, following which the depth electrode was inserted. The adaptor to target distance was provided by the robotic software. Depth electrodes were inserted using orthogonal or oblique orientation. A guiding bolt was screwed onto the insertion site to hold the electrode in place. The electrode length was decided after subtracting the length of the adaptor and the anchoring bolt. The number and position of the depth electrodes was decided according to the working hypothesis. All patients had post-operative CT scan of the head to ensure proper position of the electrodes with no haemorrhage. Patients were monitored in the epilepsy monitoring unit. After adequate information was collected regarding the epileptogenic zone, the SEEG evaluations were discussed in-patient management conferences for final decisions. The electrodes were then removed in the under local anaesthesia and sedation.

Twenty-one patients underwent SEEG implantation during the study period at our centre (AIIMS). Out of them 17 were males (80.9%). Mean age of patients was 21.7 years (Range- 1.5years to 44 years). Five patients were less than 18 years of age (35.7%). Two patients (Patient 5 and 17) were not operated due to low frequency of seizures as epileptogenic zone was involving eloquent cortex (visual areas). Two patients (Patient 18 and 20) are yet to be planned for definitive surgery. There were no SEEG implantation related complications in any of the patients. Of the remaining seventeen patients, 13 patients (76.5%) are seizure-free (ILAE Class 1 outcome) at follow up. Mean follow up period is 16.1 months (range-5months to 36 months). One patient had left hemiplegia in post period and improved to motor power to 3/5 both in upper and lower limbs. There were no other significant post-operative complications. One patient (case 08) continued to have drop attacks in post-operative period and succumbed to death due to head injury. Language showed interesting reorganisation patterns to the other hemisphere/ anterior and superior to pars triangularis. Motor function also shifted to more anterion in 1 and posterior in another.

MEG investigation helped to increase the accuracy of localization of epileptogenic zone as well as the eloquent cortex, thereby enhanced the outcome of surgery. Ictal-MEG source localization added information towards delineating the ictal-onset zone (IOZ) and helped final decision-making in epilepsy-surgery. The findings of the study are published in European Journal of Neurology &Clinical Neurophysiology. *Tripathi M, Kaur K, Ramanujam B, Viswanathan V, Bharti K, Singh G, Singh V, Garg A, Bal CS, Tripathi M, Sharma MC, Pandey R, Dash D, Mandal P, Chandra PS. Diagnostic added value of interictal magnetic source imaging in presurgical evaluation of persons with epilepsy: A prospective blinded study. Eur J Neurol. (2021) 28(9):2940-2951.*

We also compared the diagnostic value and accuracy of ictal SPECT and inter-ictal magnetoencephalography (MEG) in localizing the site for surgery in persons with drug resistant epilepsy. SPECT was found to be non-informative for most patients, but reported better diagnostic output than MEG. It was found that MEG may be a useful alternative for patients in whom SPECT cannot be done or was non-localizing. MEG was useful in indicating sites for SEEG implantation. SEEG implantation was performed in 21 patients with DRE for better surgical outcome. The findings of the study are published in Seizure: European Journal of Epilepsy. *Kaur K, Garg A, Tripathi M, Chandra SP, Singh G, Viswanathan V, Bharti K, Singh V, Ramanujam B, Bal CS, Sharma MC, Pandey R, Vibha D, Singh RK, Mandal PK, Tripathi M. Comparative contribution of magnetoencephalography (MEG) and single-photon emission computed tomography (SPECT) in pre-operative localization for epilepsy surgery: A prospective blinded study. Seizure. (2021) 86:181-188.*

We invented a new “bloodless” technique for minimally invasive robotic thermocoagulative hemispherectomy (ROTCH). Such a method is being described in the literature for the first time. ROTCH seems to be a safe, feasible, and bloodless procedure, with a very low morbidity rate and promising outcomes. The

details of the study are published in Journal of Neurosurgery: Paediatrics. *Chandra PS, Doddamani R, Girishan S, Samala R, Agrawal M, Garg A, Ramanujam B, Tripathi M, Bal C, Nehra A, Tripathi M. Robotic thermocoagulativehemispherotomy: concept, feasibility, outcomes, and safety of a new "bloodless" technique. J NeurosurgPediatr. (2021) 2:1-12. doi: 10.3171/2020.10. PEDS20673. Due to its significance, this article has been placed on the Journal's cover page.*

Reduced endogenous KYNA[3] synthesis contributes to enhanced glutamatergic activity in MTLE-HS was demonstrated. Reduced endogenous KYNA synthesis was due to altered levels of KAT II and PLP. This study provides evidence that application of KYNA may have therapeutic potential. The findings of the study are published in British Journal of *Pharmacology: Dey S, Banerjee Dixit A, Tripathi M, Doddamani RS, Sharma MC, Lalwani S, Chandra PS, Banerjee J. Altered hippocampal kynurenine pathway metabolism contributes to hyperexcitability in human mesial temporal lobe epilepsy-hippocampal sclerosis. Br J Pharmacol. 2021;178(19):3959-3976.*

FCD is a diffuse lesion with poorly defined epileptogenic zones, and poor surgical outcome in FCD is associated with inaccurate localization of the EZ. Hence, identifying novel epileptogenic markers to aid in the localization of EZ in patients with FCD is very much needed. For this purpose, we, for the first time, performed RNA sequencing of surgically resected paired tissue samples obtained from electrocorticographically graded high (MAX) and low spiking (MIN) regions of FCD type II patients with autopsy controls. We identified significant changes in the MAX samples of the FCD type II patients when compared to non-epileptic controls, but not in the case of MIN samples. We found significant enrichment for myelination, oligodendrocyte development and differentiation, neuronal and axon ensheathment, phospholipid metabolism, cell adhesion and cytoskeleton, semaphorins, and ion channels in the MAX region. Through the integration of both MAX vs non-epileptic control and MAX vs MIN RNA sequencing (RNA Seq) data, PLP1, PLLP, UGT8, KLK6, SOX10, MOG, MAG, MOBP, ANLN, ERMN, SPP1, CLDN11, TNC, GPR37, SLC12A2, ABCA2, ABCA8, ASPA, P2RX7, CERS2, MAP4K4, TF, CTGF, Semaphorins, Opalin, FGFs, CALB2, and TNC were identified as potential key regulators of multiple pathways related to FCD type II pathology. We have identified novel epileptogenic marker elements that may contribute to epileptogenicity in patients with FCD and could be possible markers for the localization of EZ. This study has been published in Molecular Brain. *Srivastava A, Kumar K, Banerjee J, Tripathi M, Dubey V, Sharma D, Yadav N, Sharma MC, Lalwani S, Doddamani R, Chandra PS, Dixit AB. Transcriptomic profiling of high- and low-spiking regions reveals novel epileptogenic mechanisms in focal cortical dysplasia type II patients. Mol Brain. 2021;14(1):120. doi: 10.1186/s13041-021-00832-4.*

Role of HDACs and its sub-cellular distribution was studied in MTLE patients with hippocampal sclerosis. Knowledge regarding expression pattern and sub-cellular distribution of HDACs may help to devise specific HDACi therapy for epilepsy. Proteomic studies on MTLE patients have been conducted. The findings of the present study are published in Cellular & Molecular Neurobiology. *Srivastava A, Banerjee J, Dubey V, Tripathi M, Chandra PS, Sharma MC, Lalwani S, Siraj F, Doddamani R, Dixit AB. Role of Altered Expression, Activity and Sub-cellular Distribution of Various Histone Deacetylases (HDACs) in Mesial Temporal Lobe Epilepsy with Hippocampal Sclerosis. Cell Mol Neurobiol. 2022;42(4):1049-1064.*

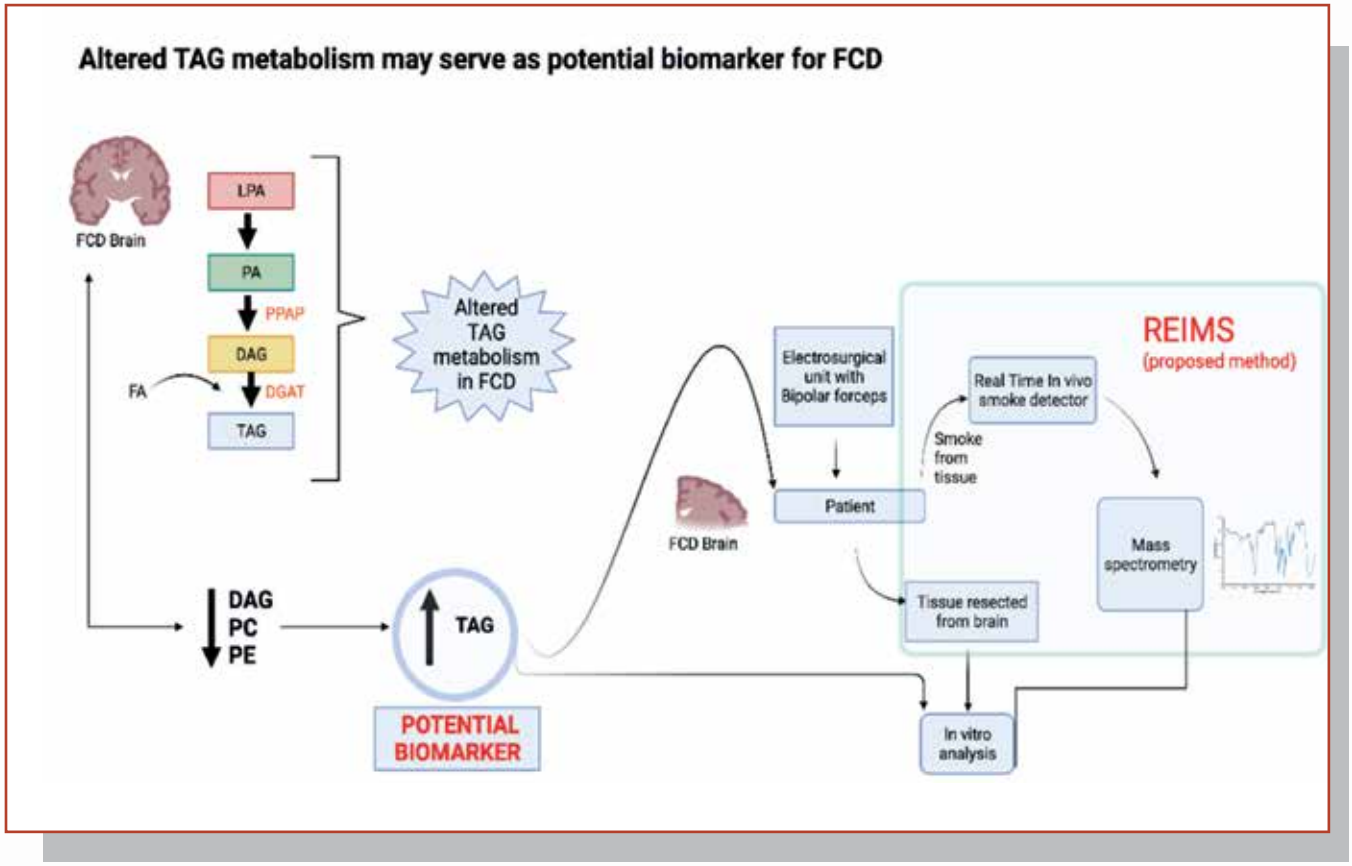
Alteration in the TGFβ signalling, CK2, Cdk5, cPLA2 enzyme, Fibronectin-integrin-Src pathway and MMPs were demonstrated in MTLE-HS patients. These molecules may represent new potential therapeutic target for treatment of MTLE. Bera A, Srivastava A, Dubey V, Dixit AB, Tripathi M, Sharma MC, Lalwani S, Chandra PS, Banerjee J. Altered hippocampal expression and function of cytosolic phospholipase A2 (cPLA2) in temporal lobe epilepsy (TLE). Neurol Res. 2022;44(8):748-753.Paul D, Dixit

[3] Kynurenic acid is a bioactive compound produced along Kynurenine pathway during disintegration of tryptophan.

AB, Srivastava A, Banerjee J, Tripathi M, Suman P, Doddamani R, Lalwani S, Siraj F, Sharma MC, Chandra PS, Singh RK. Altered expression of activating transcription factor 3 in the hippocampus of patients with mesial temporal lobe epilepsy-hippocampal sclerosis (MTLE-HS). Int J Neurosci. 2022; 21:1-7. Paul D, Dixit AB, Srivastava A, Banerjee J, Tripathi M, Suman P, Doddamani R, Lalwani S, Siraj F, Sharma MC, Chandra PS, Singh RK. Altered expression of activating transcription factor 3 in the hippocampus of patients with mesial temporal lobe epilepsy-hippocampal sclerosis (MTLE-HS). Int J Neurosci. 2022; 21:1-7.

Our studies demonstrated that Cdk5 differentially regulates excitatory synaptic activity in the hippocampal and ATL region of patients with MTLE-HS. We also demonstrated that it might have a potential role in increasing the stability of gephyrin-dependent γ2 subunit containing GABAA receptor clusters in FCD. Part of this study has been published in Neuroscience Letters. Banerjee J, Srivastava A, Sharma D, Dey S, Manjari Tripathi, Sharma MC, Sarat Chandra P, Banerjee Dixit A. Differential regulation of excitatory synaptic transmission in the hippocampus and anterior temporal lobe by cyclin dependent kinase 5 (Cdk5) in mesial temporal lobe epilepsy with hippocampal sclerosis (MTLE-HS). NeurosciLett. (2021):136096. doi: 10.1016/j.neulet.2021.136096.

We utilize liquid chromatography and tandem mass spectrometry to identify altered lipids in resected brain specimens from FCD patients compared to non-epileptic controls. Based on these results, we propose that a similar approach utilizing unique lipid mass spectra can be used for defining the EZs in FCD. The observed distinct lipid mass spectra of cortical tissues from FCD patients could be used for real-time guidance during surgery as well as for ex vivo examination of resected tissues for diagnostic purposes. This study has been published in Epilepsy Research: Kumar K, Yadav N, Banerjee J, Tripathi M, Sharma MC, Lalwani S, Siraj F, Chandra PS, Sengupta S, Dixit AB. Mass spectrometry-based lipidomic analysis reveals altered lipid profile in brain tissues resected from patients with focal cortical dysplasia (FCD). Epilepsy Res. 2021; 177:106773.



The current findings show association of altered TAG synthesis/metabolism with FCD pathology. Downregulation of DAGs, phosphatidylcholine, and phosphatidylethanolamine in FCD further suggests that degradation and/or decreased synthesis of these structural glycophospholipids and DAGs may contribute to increased TAGs. We propose that increased TAG levels could serve as potential biomarker of FD and the lipid mass spectra, if validated on a greater number of FCD patients, can aid in real time identification of resection margins akin to intelligent knife (iKnife) approach.

Publications:

1. **Tripathi M.,** Bera A, Srivastava A, Dubey V, Dixit AB, Sharma MC, Lalwani S, Chandra PS, Banerjee J. ***Altered hippocampal expression and function of cytosolic phospholipase A2 (cPLA2) in temporal lobe epilepsy (TLE).*** Neurol Res. 2022 Aug;44(8):748-753. doi: 10.1080/01616412.2022.2051131.

2. **Tripathi M.,** Paul D, Dixit AB, Srivastava A, Banerjee J, Suman P, Doddamani R, Lalwani S, Siraj F, Sharma MC, Chandra PS, Singh RK. ***Altered expression of activating transcription factor 3 in the hippocampus of patients with mesial temporal lobe epilepsy-hippocampal sclerosis (MTLE-HS).*** Int J Neurosci. 2022; 21:1-7.

3. **Tripathi M.,** Srivastava A, Banerjee J, Dubey V, Chandra PS, Sharma MC, Lalwani S, Siraj F, Doddamani R, Dixit AB. ***Role of Altered Expression, Activity and Sub-cellular Distribution of Various Histone Deacetylases (HDACs) in Mesial Temporal Lobe Epilepsy with Hippocampal Sclerosis.*** Cell Mol Neurobiol. 2022;42(4):1049-1064.

4. **Tripathi M.,** Dubey V, Dey S, Dixit AB, Chandra PS, Banerjee J. ***Differential glutamate receptor expression and function in the hippocampus, anterior temporal lobe and neocortex in a pilocarpine model of temporal lobe epilepsy.*** Exp Neurol. 2022; 347:113916.

5. **Tripathi M.,** Doddamani R, Kota RC, Ahemad N, Chandra PS. ***Endoscopic Total Corpus Callosotomy and Pan Commissurotomy for Lennox-Gastaut Syndrome.*** Neurol India. 2022;70(1): 63-67.

6. **Tripathi M.,** Kumar K, Banerjee AD, Dubey V, Siraj F, Sharma MC, Lalwani S, Chandra PS, Banerjee J. ***Transcriptomic profiling of nonneoplastic cortical tissues reveals epileptogenic mechanisms in dysembryoplastic neuroepithelial tumors.*** Funct Integr Genomics. 2022. doi: 10.1007/s10142-022-00869-1.

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8. **Tripathi M.,** Dey S, Banerjee AD, Doddamani RS, Sharma MC, Lalwani S, Chandra PS, Banerjee J. ***Altered hippocampal kynurenine pathway metabolism contributes to hyperexcitability in human mesial temporal lobe epilepsy-hippocampal sclerosis.*** Br J Pharmacol. 2021;178(19):3959-3976.

9. **Tripathi M.,** Sharma D, Dixit AB, Dey S, Doddamani R, Sharma MC, Lalwani S, Gurjar HK, Chandra PS, Banerjee J. ***Increased levels of a4-containing GABAA receptors in focal cortical dysplasia: A possible cause of benzodiazepine resistance.*** Neurochem Int. 2021; 148:105084.

10. **Tripathi M.,** Kumar K, Yadav N, Banerjee J, Sharma MC, Lalwani S, Siraj F, Chandra PS, Sengupta S, Dixit AB. ***Mass spectrometry-based lipidomic analysis reveals altered lipid profile in brain tissues resected from patients with focal cortical dysplasia (FCD).*** Epilepsy Res. 2021; 177:106773.

11. **Tripathi M.,** Srivastava A, Kumar K, Banerjee J, Dubey V, Sharma D, Yadav N, Sharma MC, Lalwani S, Doddamani R, Chandra PS, Dixit AB. ***Transcriptomic profiling of high- and low-spiking regions reveals novel epileptogenic mechanisms in focal cortical dysplasia type II patients.*** Mol Brain. 2021;14(1):120. doi: 10.1186/s13041-021-00832-4.

12. **Tripathi M.,** Banerjee J, Srivastava A, Sharma D, Dey S, Sharma MC, Chandra PS, Banerjee AD. ***Differential regulation of excitatory synaptic transmission in the hippocampus and anterior temporal lobe by cyclin dependent kinase 5 (Cdk5) in mesial temporal lobe epilepsy with hippocampal sclerosis (MTLE-HS).*** Neurosci Lett. 2021; 761:136096.

13. **Tripathi M., Mandal PK,** Kaur K, Garg A, Chandra PS, Singh G, Viswanathan V, Bharti K, Singh V, Ramanujam B, Bal CS, Sharma MC, Pandey R, Vibha D, Singh RK. ***Comparative contribution of magnetoencephalography (MEG) and single-photon emission computed tomography (SPECT) in pre-operative localization for epilepsy surgery: A prospective blinded study.*** Seizure. 2021; 86:181-188. doi: 10.1016/j.seizure.2021.02.005.

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16. **Tripathi M.,** Doddamani RS, Samala R, Subianto H, Ramanujam B, Chandra PS. ***Robotic-Guided StereoElectroEncephalography for Refractory Epilepsy: Technique and Nuances.*** Neurol India. 2021 May-Jun;69(3):587-591.

17. **Tripathi M.,** Doddamani RS, Samala R, Chandra PS. Letter to the Editor. ***Boltless Stereo Electro Encephalography: a necessity in very young children.*** J Neurosurg Pediatr. 2021 Jun 18:1-2.

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20. **Tripathi M.,** Chandra PS, Doddamani R, Girishan S, Samala R, Agrawal M, Garg A, Ramanujam B, Bal C, Nehra A. ***Robotic thermocoagulative hemispherectomy: concept, feasibility, outcomes, and safety of a new "bloodless" technique.*** J Neurosurg Pediatr. 2021; 2:1-12. doi: 10.3171/2020.10. PEDS20673.

21. **Tripathi M.,** Agrawal M, Samala R, Doddamani R, Ramanujan B, Chandra PS. ***Epilepsy surgery in COVID times-a unique conundrum.*** Childs Nerv Syst.

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22. **Tripathi M.,** Weil AG, Lewis EC, Ibrahim GM, Kola O, Tseng CH, Zhou X, Lin KM, Cai LX, Liu QZ, Lin JL, Zhou WJ, Mathern GW, Smyth MD, O'Neill BR, Dudley R, Ragheb J, Bhatia S, Delev D, Ramantani G, Zentner J, Ojemann J, Wang AC, Dorfer C, Feucht M, Czech T, Bollo RJ, Issabekov G, Zhu H, Connelly M, Steinbok P, Zhang JG, Zhang K, Hidalgo ET, Weiner HL, Wong-Kisiel L, Lapalme-Remis S, Chandra PS, Hader W, Wang FP, Yao Y, Olivier Champagne P, Guo Q, Li SC, Budke M, Pérez-Jiménez MA, Raftapoulos C, Finet P, Michel P, Schaller K, Stienen MN, Baro V, Cantillano Malone C, Pociecha J, Chamorro N, Muro VL, von Lehe M, Vieker S, Oluigbo C, Gaillard WD, Al Khateeb M, Al Otaibi F, Krayenbühl N, Bolton J, Pearl PL, Fallah A. ***Hemispherectomy Outcome Prediction Scale: Development and validation of a seizure freedom prediction tool.*** Epilepsia. 2021;62(5):1064-1073. doi: 10.1111/epi.16861.

23. **Tripathi M.,** Agrawal M, Samala R, Doddamani RS, Goyal A, Chandra PS. ***Is surgery effective for treating hypothalamic hamartoma causing isolated central precocious puberty? A systematic review.*** Neurosurg Rev. 2021. doi: 10.1007/s10143-021-01512-6.

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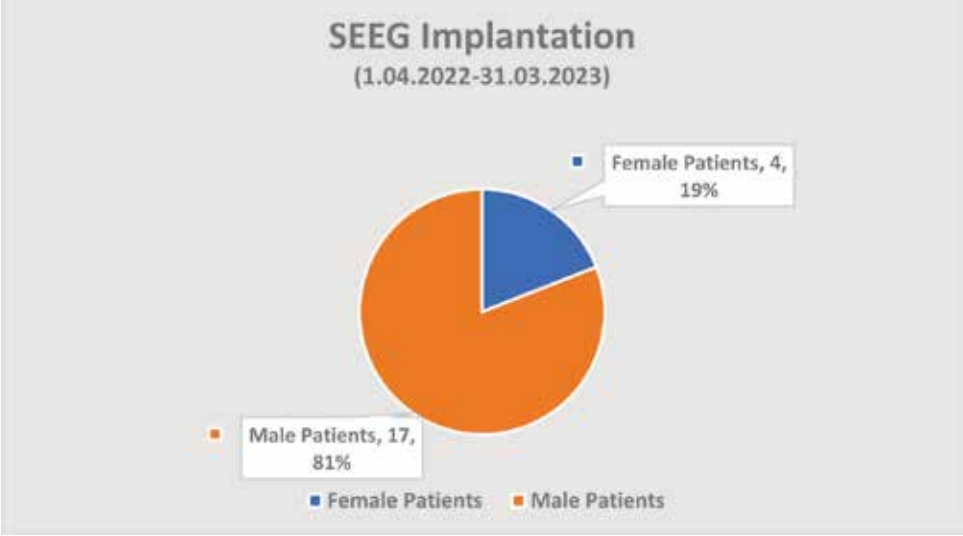
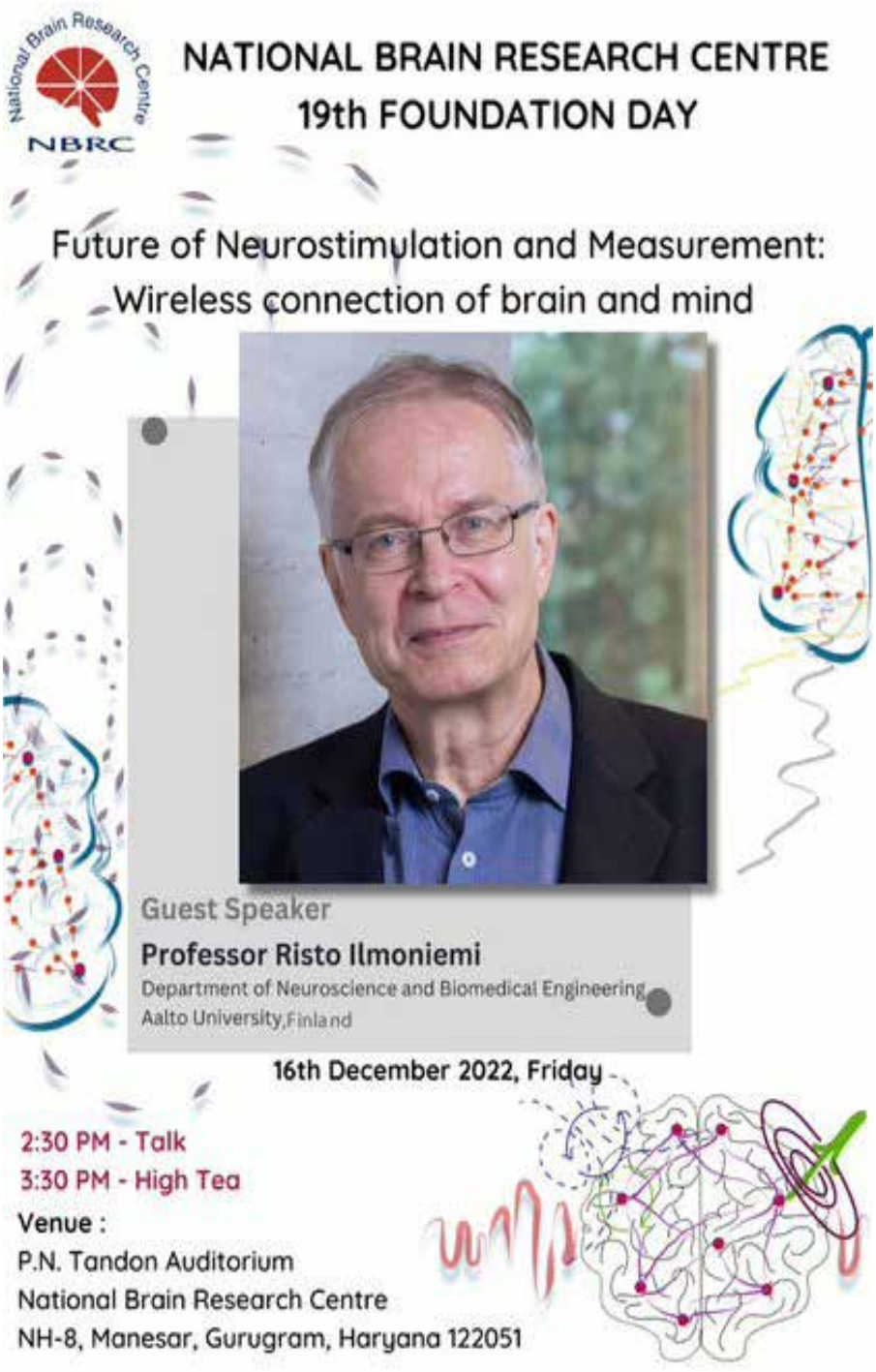
25. **Tripathi M.,** Ansari AQ, Sharma P. ***A patient-independent classification system for onset detection of seizures.*** Biomed Tech (Berl). 2021: 8;66(3):267-274.

26. **Tripathi M.,** Agrawal M, Chandra PS, Samala R, Doddamani RS, Ramanujan B. Letter. ***Risk Factors for Seizure Worsening After Epilepsy Surgery in Children and Adults: A Population-Based Register Study.*** Neurosurgery. 2021. 15;88(4): E364-E365. doi: 10.1093/neuros/nyaa559.



Events & Outreach

19th Foundation Day 2022



India's premier neuroscience institute, National Brain Research Centre (NBRC) observes 16 December every year as its foundation day when the first stone was laid at the foothills of Aravalli in the state of Haryana. NBRC celebrated its 19th Foundation Day on December 16th, 2022 at the P.N. Tandon Auditorium, located on its campus in Manesar, Haryana. The event was inaugurated by Director, NBRC by reading out a written message from Prof. P. N. Tandon. It was followed by a public lecture titled. "Future of Neurostimulation & Measurement: Wireless Connection of Brain & Mind", by Prof. Risto J. Ilmoniemi, Department of Neuroscience & Biomedical Engineering, Aalto University, Finland. He talked about the new age technology of trans-cranial stimulation using focused magnetic beam and its utility in treating neurological conditions. He discussed the utility of using multiple high-powered magnets to simultaneously stimulate a brain region as small as a cubic centimeter using the new prototype developed in his lab. The technology offers a non-invasive alternative to surgical intervention. The lecture was attended by a large audience.


NATIONAL BRAIN RESEARCH CENTRE
MANESAR
19th Foundation Day


Wireless connection to the brain and mind
Beauty and Motivations in Science
Wireless connection to the brain and mind
Beauty and Motivations in Science

India International Science Festival (IISF) 21st-24th January, 2023

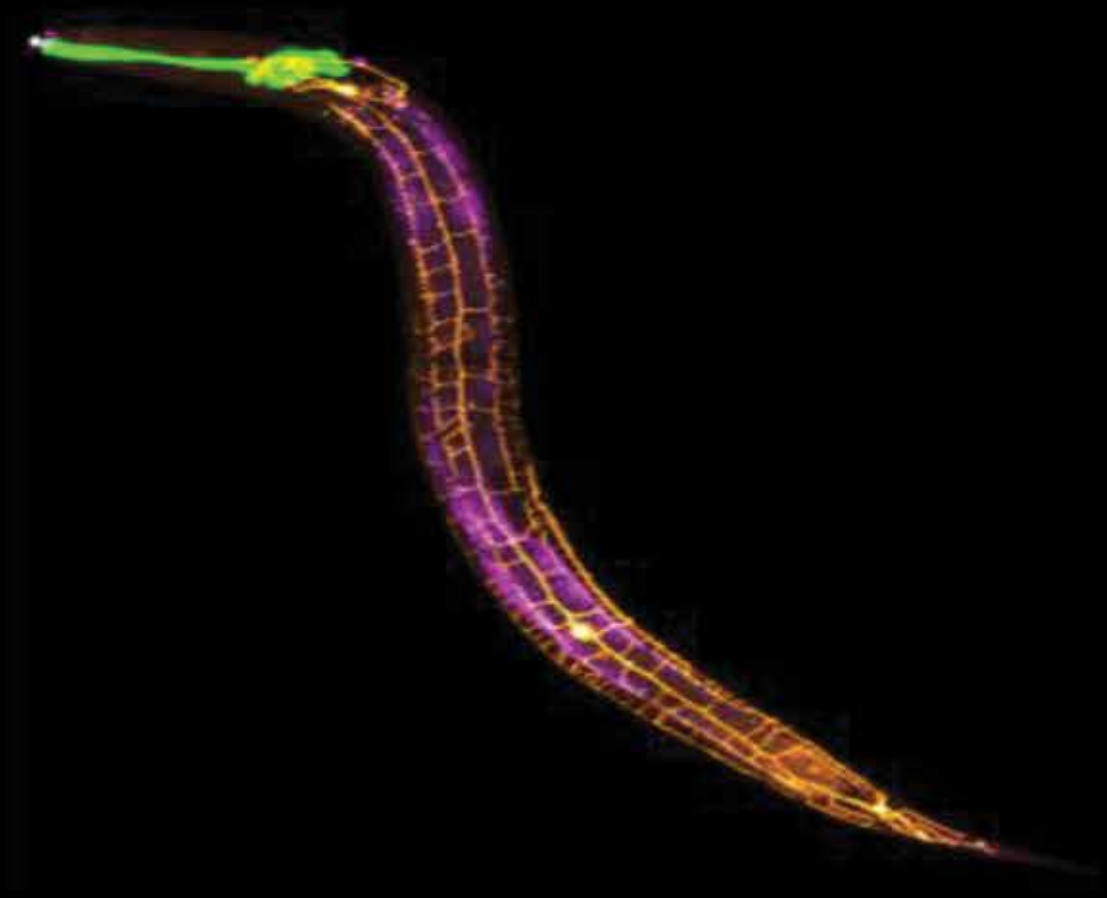
A four-day event on the 8th Edition of the India International Science Festival (IISF) with the theme “Marching Towards Amrit Kaal with Science, Technology, and Innovation”, happened at Maulana Azad National Institute of Technology (MANIT), Bhopal.

Certificate Course on Laboratory Animal Science (CCLAS) 6th-17th February

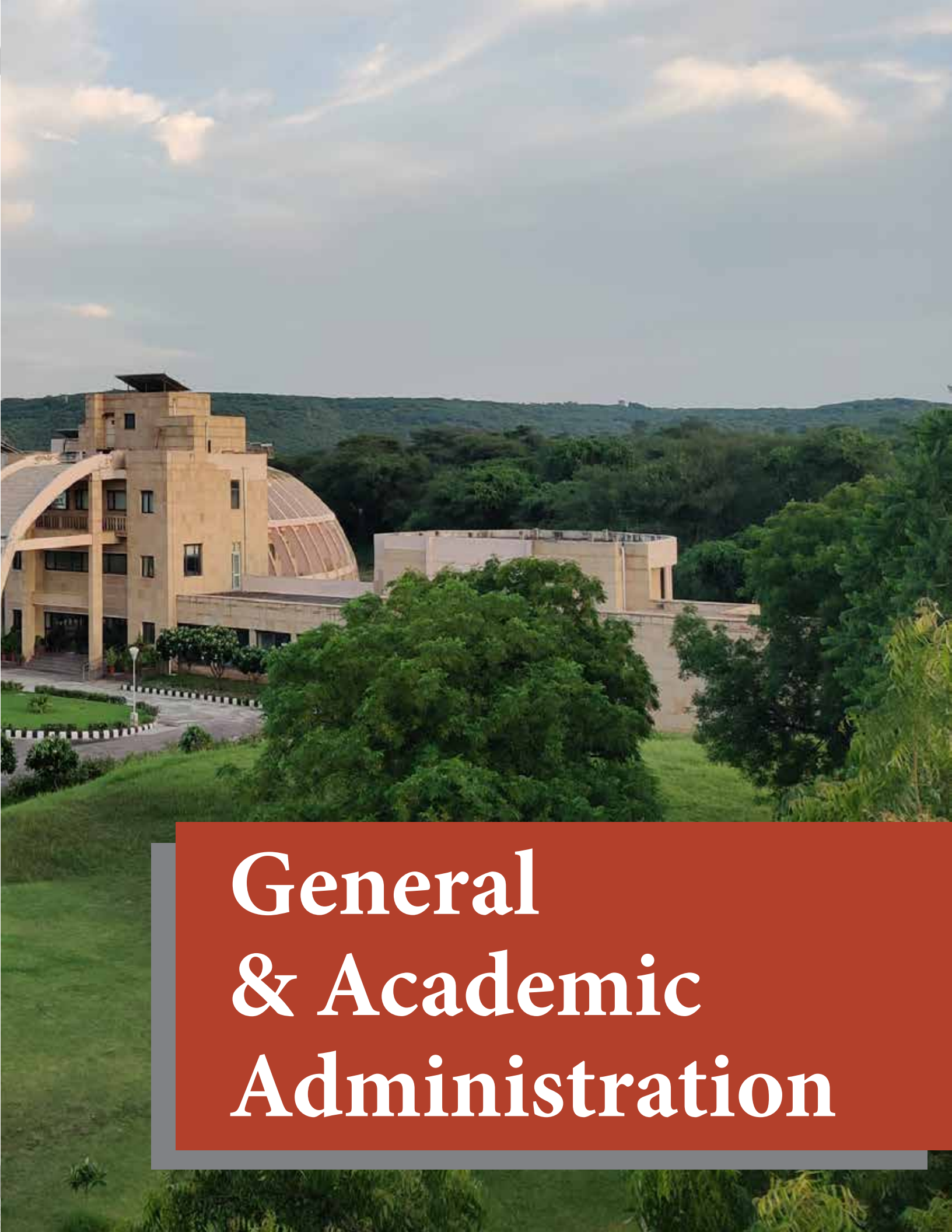
A two-week long "Certificate Course on Laboratory Animal Science (CCLAS)" was conducted at the National Brain Research Centre from 6th to 17th February, 2023. The course was designed to provide participants with a comprehensive understanding of the principles and practices of laboratory animal science, in accordance with the Federation of European Laboratory Animal Science Associations (FELASA) category C requirements.

Society on Neuroimmune Pharmacology Conference
15th -18th March, 2023

National Brain Research Centre (NBRC) hosted the 27th Society on Neuroimmune Pharmacology Conference (SNIP) 2023 showcasing the recent advances in the intersecting areas of neuroscience, immunology, pharmacology, and its translational aspects, in particular, HIV and drug abuse.



Sensory neuron network of *C. elegans*, showing mechano-sensory (PVD) neurons inside a worm for axon regeneration.
From the lab of Prof. Anindya Ghosh Roy.



General & Academic Administration

General & Academic Administration – A Profile

The Administration of the Institute consists of the following major wings:

1. General Administration is headed by the Chief Administrative Officer, responsible for overall Management of Establishment, Personnel & Administration Wing, Stores & Purchase Wing, Import & Project Cell, Finance & Accounts Wing, Estate Management & Engineering Maintenance Wing – Civil, Electrical & Mechanical.

2. Academic Administration is headed by the Registrar, responsible for the students' administration, project co-ordination, new students' admissions, course co-ordination etc. The officer is also responsible for administration of all the projects.

During the year under review, the administration of NBRC observed all the important days as directed by the Government of India such as Independence Day, Hindi Pakhwada, Vigilance Awareness week, International Yoga Day etc. The Administration achieved excellence in execution of the following activities at NBRC:

- The annual cultural festival of NBRC, 'TANTRIKA 2023' was organized within the campus, which included a variety of cultural and sports events. Students, officers, and staff of NBRC participated in the event. The following talks were organized during TANTRIKA 2023.

❖ A talk by the musician, Nikhil David was arranged on 31st March, 2023.

❖ A talk by Shri. Sathyanarayanan AR, CEO, Embright Infotech was organized on 24th March, 2023.

- Provided necessary logistics in conducting international and national conferences/seminars conducted within the campus as well outside the campus.
- Made major imports from different countries in terms of equipment and other consumables with meticulous planning and adhered to a precise schedule.
- The 19th Foundation Day of NBRC was held on 16th day of December, 2022. On this occasion, several programmes were organized within and outside the campus. The day-long celebrations included the poster presentations on ongoing research activities at NBRC. Students from various schools were invited to interact with NBRC scientists and they also visited the laboratories.
- A blood donation camp was also held on the Foundation Day. A quiz programme for the students from local schools was also conducted.
- On this august occasion of the 19th Foundation Day, Prof. Risto J. Ilmoniemi of Aalto University, Finland delivered a lecture to the students and scientific community at NBRC, Manesar.

Implementation of Official Language

NBRC Administration has given due importance for the implementation of Hindi as its Official Language and has made full efforts in implementing the use of official language in all the administrative jobs such as internal meetings, interviews, debates, general applications etc.

RTI Act

The provisions of RTI Act are being followed at NBRC in letter and spirit. All RTI applications received during 2022-23 seeking information on various matters concerning NBRC were disposed of within the prescribed time limit. The quarterly reports containing number of requests received with date, details of compliance, amount of charges etc., were shared with CIC and updated on NBRC website.

Women Empowerment

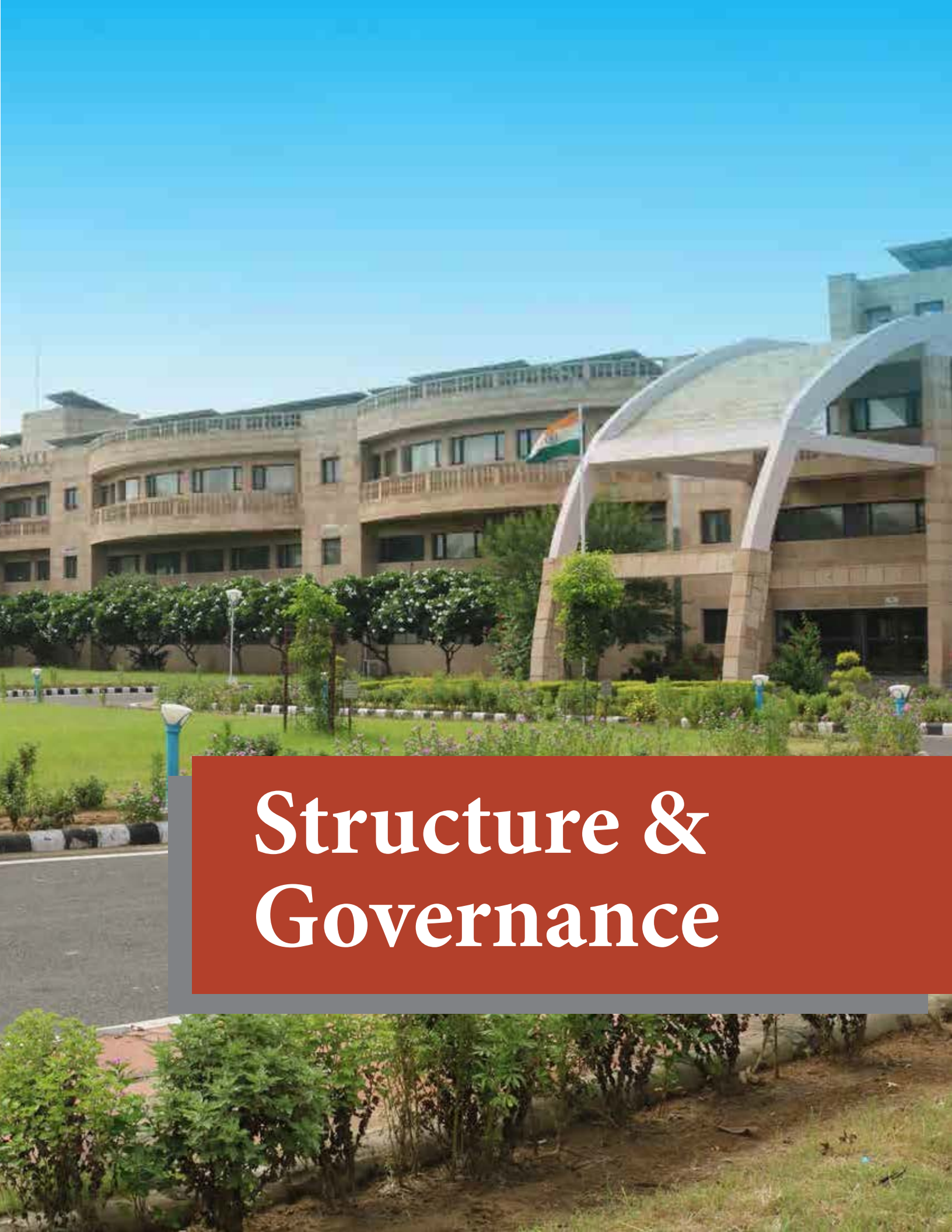
NBRC has a distinct feature of giving equal opportunity to women. The Committees, constituted to do various work of Administration, Academics and scientific activities, have women members to ensure equal & fair participation of women. There is also a committee for redressal of complaints relating to any sexual harassment of women at NBRC and grievances, if any, from aggrieved girl students/ women employees of NBRC. Any lady/ woman of NBRC, among the Students/ Employees, who is subjected to sexual harassment may approach any of the committee members.

Reservations and concessions in Employment & Admissions of Students

NBRC follows reservations & concessions as per rules of Government of India in employment; in the matter of students' admissions, the provision of exemption as provided in Gazette Notification No. 5 dated 4th January, 2007 is applicable.

Vigilance

The Institute has a Chief Vigilance Officer for maintaining virtue, integrity and efficiency within the organization. As per the guidelines of DBT, one of the scientists of NBRC has been nominated as part-time Chief Vigilance Officer of the Centre.



Structure & Governance

Members of NBRC Society

S. No.	Name	Designation
1.	**Dr. Jitendra Singh** Hon'ble Minister of State (IC) Ministry of S&T, Govt. of India New Delhi	President
2.	**Shri. Anil Vij** Hon'ble Minister in-charge of the Departments of Haryana Ayush, Health Services, Medical Education, and Science & Technology	Member (Ex-Officio)
3.	**Dr. Rajesh S. Gokhale** Secretary, Department of Biotechnology Ministry of Science & Technology Government of India New Delhi	Member (Ex-Officio)
4	**Dr. Rajiv Bahl** Secretary, Department of Health Research and Director General, Indian Council of Medical Research (ICMR), New Delhi	Member (Ex-Officio)
5	**Dr. Srivari Chandrasekhar,** Secretary, Ministry of Science and Technology Government of India New Delhi	Member (Ex-Officio)
6.	**Dr. Ashok Khemka** Principal Secretary, Department of Science & Technology, Govt. of Haryana	Member (Ex-Officio)
7.	**Shri. Chaitanya Murti** Joint Secretary (Admin), Department of Biotechnology, New Delhi	Member (Ex-Officio)
8.	**Shri. Vishvajit Sahay** Additional Secretary & Financial Advisor, Department of Biotechnology, Ministry of Science & Technology New Delhi	Member (Ex-Officio)
9.	**Prof. Krishanu Ray** Director National Brain Research Centre, Manesar, Haryana	Member Secretary (Ex-Officio)

S. No.	Name	Designation
10.	**Dr. Ashok Panagariya,** Former IMA President, Jaipur	Member
11.	**Prof. Vijaylakshmi Ravindranath,** Professor, Centre for Neuroscience, Indian Institute of Science (lISc), Bengaluru.	Member
12.	**Prof. Prabhu Nath Pandey,** Professor & Head, Department of Neurosurgery, Lok Nayak Jai Prakash Narayan Hospital, New Delhi.	Member
13.	**Prof. M. V. Padma Srivastava,** Professor & Head, Department of Neurology, Chief Neurosciences Centre, AIIMS, New Delhi.	Member
14.	**Prof. B. N. Gangadhar,** Former Director, National Institute of Mental Health and Neuro-Sciences (NIMHANS), Bengaluru.	Member
15.	**Dr. Senapathy 'Kris' Gopalakrishnan,** Co-Founder, Infosys Ltd., Bengaluru.	Member

Members of Governing Body

S. No.	Name	Designation
1.	**Dr. Rajesh S. Gokhale** Secretary Department of Biotechnology, C.G.O Complex, New Delhi – 110 003	Chairperson
2.	**Shri Chaitanya Murti** Joint Secretary (Admin), Department of Biotechnology, C.G.O Complex, New Delhi – 110 003	Member (Ex-Officio)
3.	**Shri. Vishvajit Sahay** Additional Secretary & Financial Advisor, Department of Biotechnology, C.G.O Complex, New Delhi – 110 003	Member (Ex-Officio)
4.	**Dr. Sanjay Kr. Mishra** Scientist - H Department of Biotechnology, C.G.O Complex, New Delhi – 110 003	Member (Ex-Officio)
5.	**Prof. Krishanu Ray** Director National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member (Ex-Officio)
6.	**Prof. Pravat Kr. Mandal** Scientist-VII National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member (Ex-Officio)
7.	**Dr. Suraksha S. Diwan** Scientist 'F', Department of Biotechnology, C.G.O Complex, New Delhi – 110 003	Member (Ex-Officio) (Nodal Officer of NBRC)
8.	**Shri. Tanmoy Bhattacharya** Chief Administrative Officer National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member Secretary (Ex-Officio)
9.	**Prof. Vidita Vaidya,** Professor, Department of Biological Science, Tata Institute of Fundamental Research (TIFR), Mumbai.	Member

S. No.	Name	Designation
10.	**Prof. Jayasri Das Sarma,** Department of Biological Sciences, Indian Institute of Science Education and Research (IISER), Kolkata.	Member
11.	**Prof. M. R. Satyanarayana Rao,** Honorary Professor, Chromatin Biology Laboratory, Neuroscience Unit (NSU), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru.	Member
12.	**Prof. Kameshwar Prasad,** Former Professor, Department of Neurology, All India Institute of Medical Sciences (AIIMS), and Director, RIMS, Ranchi New Delhi	Member

Members of the Finance Committee

S. No.	Name	Designation
1.	**Sh. Vishvajit Sahay** Additional Secretary & Financial Advisor, Department of Biotechnology, New Delhi – 110003	Chairperson
2.	**Dr. Sanjay Kr. Mishra** Scientist - H Department of Biotechnology, New Delhi	Member (Ex-Officio)
3.	**Prof. Krishanu Ray** Director National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member (Ex-Officio)
4.	**Shri. Tanmoy Bhattacharya** Chief Administrative Officer National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member (Ex-Officio)
5.	**In-Charge F&AO** National Brain Research Centre, Nainwal Road, Manesar – 122 052, Haryana	Member Secretary (Ex-Officio)
6.	**Prof. Pramod Kumar Garg** Executive Director Translational Health Science and Technology Institute (THSTI) NCR Biotech Science Cluster 3rd Milestone, Faridabad-121001 (Haryana)	Member
7.	**Shri Praveen Kumar Bansal,** Former Vice President, Income Tax Appellate Tribunal, Government of India	Member
8.	**Shri M. Satish Kumar Reddy,** IRS, Former Commissioner of Central Goods and Services Tax (CGST) and Customs, Government of India	Member

Members of Scientific Advisory Committee

S. No.	Name	Designation
1.	**Prof. Siddharta Roy,** J.C. Bose Fellow, Department of Biophysics Centenary Campus, Bose Institute Kolkata	Chairperson
2.	**Dr. Sanjay Kumar Mishra** Scientist – H, (Scientific coordinator, NBRC) Department of Biotechnology, New Delhi	Member (Ex-Officio)
3.	**Prof. Krishanu Ray** Director National Brain Research Centre, Nainwal Road, Manesar, Haryana	Member Secretary (Ex-Officio)
4	**Prof. Vidita Vaidya** Professor Department of Biological Science, Tata Institue of Fundamental Research (TIFR), Mumbai	Member
5	**Prof. Jayasri Das Sarma** Professor Department of Biological Sciences, Indian Institute of Science Education & Research (IISER), Kolkata	Member
6	**Prof. M.R. Satyanarayana Rao** Honorary Professor Chromatin Biology Laboratory, Neuroscience Unit (NSU), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru	Member
7	**Prof. Kameshwar Prasad** Director Rajendra Institute of Medical Sciences, Ranchi, Jharkhand	Member

S. No.	Name	Designation
8	**Prof. Venkatasubramanian Ganesan** Officer In-Charge Translational Psychiatry Laboratory Cognitive Neurobiology Division, Neurobiology Research Centre, National Institute of Mental Health & Neuro-Sciences (NIMHANS), Bengaluru	Member
9	**Prof. Ashalatha Radhakrishnan** Professor Department of Neurology, Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Thiruvananthapuram, Kerala	Member
10	**Prof. Rama Jayasundar** Professor & Head Department of Nuclear Magnetic Resonance (NMR), AIIMS, New Delhi	Member
11	**Prof. Vijay Kumar Kuchroo** Samuel L. Wasserstrom Professor of Neurology, Harvard Medical School, Boston, USA	Member

Members of Board of Studies
(As on 31-03-2023)

Prof. Krishanu Ray Director, National Brain Research Centre, Manesar, Haryana
Prof. Kunzang Chosdol Department of Biochemistry, All India Institute of Medical Sciences, New Delhi
Dr. Sushil Kumar Jha Associate Professor, Jawaharlal Nehru University, New Delhi
All the faculty members of NBRC
Offg. Registrar, Ex-Officio Member

Members of the Academic Council
(As on 31-03-2023)

Prof. Krishanu Ray Director, National Brain Research Centre Manesar, Haryana
Prof. K.Natarajan, University of Delhi, External Member
Prof. James Gomes, IIT Delhi, External Members
Prof. Chinmay K.Mukhopadhyay, JNU, New Delhi External Member
All Faculty members of NBRC
Offg. Registrar, Ex-Officio Member

Members of the Building Committee
(As on 31-03-2023)

Prof. Dinakar M. Salunke Chairperson Director, International Centre for Genetic Engineering and Biotechnology New Delhi
Dr. Amulya K. Panda Director, National Institute of Immunology (NII), New Delhi
Dr. S. K. Gupta Deputy Director (Retired) & Emeritus Scientist National Institute of Immunology (NII), New Delhi
Shri. V. H. Rao Senior Consultant Engineering, Mehrauli - Badarpur Road, Near Batra Hospital, Hamdard Nagar, New Delhi
Shri. M. K. Gupta Engineer-In-Charge (Civil) IUAC New Delhi
Prof. Sidhartha Satpathy HOD, Hospital Administration, AIIMS, New Delhi
Prof. Krishanu Ray, Director (Ex-officio) National Brain Research Centre Manesar, Haryana

Staff at NBRC
(April, 2022 to March, 2023)

Scientific Staff:

S. No.	Name	Designation
1.	Prof. Krishanu Ray	Director, NBRC w.e.f 28th October, 2022
2.	Prof. Pramod Kumar Garg	Additional Charge as Director, NBRC w.e.f 02.08.2022 to 27.10.2022
3.	Prof. Pravat Kumar Mandal	Scientist – VII/ Director-in-Charge, NBRC w.e.f 01.01.2021 to 30.06.2022
4.	Prof. Pankaj Seth	Scientist – VII
5.	Prof. Anirban Basu	Scientist – VII
6.	Prof. Shiv Kumar Sharma	Scientist-VII (On lien)
7.	Prof. Soumya Iyengar	Scientist – VII (Offg. Registrar)
8.	Prof. Nandini C. Singh	Scientist-VI (Working at UNESCO, New Delhi on deputation basis)
9.	Dr. Ellora Sen	Scientist – VI
10.	Dr. Ranjit Kumar Giri	Scientist – VI
11.	Dr. Sourav Banerjee	Scientist – VI (w.e.f 01.07.2022)
12.	Dr. Arpan Banerjee	Scientist – VI (w.e.f 09.01.2023)
13.	Dr. Anindya Ghosh Roy	Scientist – V
14.	Dr. Mayanglambam Dhruba Singh	Scientist-III
15.	Dr. Bhavani Shankar Sahu	Scientist-III
16.	Mr. Mahender Kumar Singh	Information Scientist

Administrative Staff:

S. No.	Name	Designation
1.	Mr. Tanmoy Bhattacharyya	Chief Administrative Officer
2.	Mr. Santosh Kumar Choudhary	Deputy Finance Officer
3.	Ms. Pooja Gosain	Administrative Officer
4.	Ms. Shiwani Tanwar	Administrative Officer (Acad.)
5.	Mr. Ravinder Pal	Stores & Purchase Officer
6.	Sanjay Kumar Gupta	Office Assistant
7.	Mr. Suraj Bhan	Office Assistant
8.	Mr. Himanshu Mal	Office Assistant (Working at ICSSR, New Delhi on deputation basis)
9.	Mr. Ajay Kumar Dehariya	Office Assistant
10.	Mr. Rakesh Kumar Yadav	Office Assistant
11.	Mr. Parmander Singh Rawat	Office Assistant
12.	Mr. Jitendra Kumar Meena	Office Assistant
13.	Mr. Bhupender Pal Sharma	Driver Grade-I
14.	Mr. Satish Kumar	Driver Grade-II

Technical Staff :

S. No.	Name	Designation
1.	Mr. Sanjeev Kumar Choudhary	Assistant Engineer
2.	Dr. D.D. Lal	Technical Officer
3.	Dr. Inderjeet Yadav	Veterinarian
4.	Mr. Jitender Ahlawat	Technical Officer – B
5.	Mr. Arvind Singh Pundir	Technical Officer – B
6.	Mr. Kedar Singh Bajetha	Computer Operator
7.	Ms. Seepika	Computer Operator
8.	Mr. Sachin Kumar	Computer Operator
9.	Ms. Tarnnum Mansoori	Computer Operator
10.	Mr. Sanjeev Bhardwaj	Computer Operator
11.	Dr. Kanhaiya Lal Kumawat	Technician-C
12.	Mr. Shankar Dutt Joshi	Technician-C
13.	Mr. Sumit Kumar Sinha Mahapatra	Technician-C
14.	Mr. D. Narender	Technician-C
15.	Mr. Mithlesh Kumar Singh	Technician-B
16.	Mr. Ankit Sharma	Technician-B
17.	Mr. Sanjay Kumar	Technician-B
18.	Mr. Yunis Khan	Technician-B
19.	Md. Irshad Alam	Technician-B
20.	Mr. Durga Lal Meena	Technician-B
21.	Mr. Manish Kumar	Technician-B
22.	Mr. P. Manish	Technician-B
23.	Mr. Dil Bahadur Karki	Technician-A
24.	Mr. Rammehar	Technician-A
25.	Mr. Hari Shankar	Technician-A
26.	Mr. Mahendra Singh	Technician-A
27.	Mr. Sanjay Kumar Singh	Technician-A

Research & Project Associates

(As on 31-03-2023)

Wellcome Trust India Alliance / DBT India Alliance Early Career Fellow

S/No	Faculty
1	Dr. Nivethida Thirugnanasambandam (Till 29-04-2022)
2	Dr. Swagata Dey

Project Assistant in 2022-23

S/No	Name
1	Mr. Varun Madan Mohan (Till 02-05-2022)
2	Mr. Shubham Singhal (Till 22-12-2022)
3	Mr. Dipani Alish Rajesh (Till 27-04-2022)
4	Ms. Sanchi Ahuja (Till 23-01-2023)
5	Ms. Pallavi Pant (Till 16-09-2022)
6	Mr. Arun EVR
7	Mr. Vinayak Ghosh
8	Ms. Avantika Samkaria
9	Ms. Rimil Guha Roy
10	Ms. Kavinila S
11	Mr. Souren Sadhukhan
12	Ms. Bhavya Gohil
13	Ms. Sanchi Ahuja (Till 23.01.2023)
14	Mr. Mukaram Hafiz Bhat (Till 30-12-2022)
15	Ms. Saumya Rastogi
16	Ms. Tuhina Sanwal
17	Ms. Mydhily Vasudevan
18	Mr. Samuel Bekins S
19	Mr. Kameev Sharma (Till 31-03-2023)

Research Associates in 2022-23

S/No	Name
1.	Dr. Sonika
2.	Ms. Nidhi Sharma
3.	Dr. Sushma Dagar
4.	Dr. Dharmendra Puri (Till 27-06-2022)
5.	Ms. Km Nisha
6.	Dr. Atreye Majumdar
7.	Dr. Dimpi
8.	Dr. Yashika Arora
9.	Dr. Shruti Patrick
10.	Dr. Anupama K.P.

ICMR Research Associate

S/No	Name
1.	Dr. Deepali Singh

SERB-National Post-Doctoral Fellowship

S/No	Name
1.	Dr. Soibam Shyamchand Singh(Till 28-10-2022)
2.	Dr. Suman Saha

Research Fellows

S/No	Name
1.	Ms. Tripti Joshi (From 12/02/2022 till 10/05/2022)
2.	Mr. Hriday Shankar Pandey (From 10/02/2022 till 30/08/2022)
3.	Ms. Chitra Mohinder Singh Singal (From 19/02/2022 till 26/07/2022)
4.	Ms. Priyanka Ghosh (From 09-08-2022 till 08-02-2023)
5.	Ms. Shruti Patrick (From 24-06-2022 till 23-12-2022)
6.	Mr. Biswaranjan Sahoo (From 28-10-2022 till 27-01-2023)
7.	Ms. Harjot Kaur Brar (From 23-12-2022 till 22-06-2023)
8.	Mr. Gourav Sharma (From 18-02-2023 till 17-05-2023)
9.	Ms. Sarbani Samaddar (From 23-02-2023 till 22-05-2023)
10.	Ms. Pooja Parishar (From 24-02-2023 till 23-05-2023)
11.	Mr. S Balakumar (From 18-02-2023 till 17-05-2023)

Project Employees in 2022-23

S/No	Faculty
1.	Mr. Manjit, Lab attendant (MEG Project)
2.	Mr. Om Prakash Jakhar, Nurse (MEG Project)
3.	Mr. Prem Chand, Manager (MEG Project)
4.	Ms. Priya Shrivastav, Nurse (MEG Project)
5.	Mr. Gaurav Singh, Technologist (MEG Project)
6.	Mr. Dharmendra Jakhar, Technical Assistant (Project) (MEG Project)
7.	Mr. Sachin Kumar, Lab Attendant (MEG Project)
8.	Mr. Deepak Kumar, Nursing Orderly (MEG Project)
9.	Ms. Meenu Yadav, Technician (MEG Project)
10.	Mr. Amit Kumar Srivastava, Nursing Orderly (MEG Project)
11.	Dr. P. Prarthana Chandra, Casualty Medical Officer (MEG Project) (Till 17.06.2022)
12.	Ms. Divyasree V.M, Nurse (MEG Project)
13.	Mr. Gaurav Rawat, Technician (Project) (MEG Project)
14.	Ms. S halini, Technical Assistant (Project)
15.	Mr. Neeraj Kasana, Technical Assistant (Project)
16.	Mr. Sukhvir Singh Pundir, Technical Associate (Computer / IT) (Till 29-04-2022)
17.	Dr. Ruby Goel, Scientist 'B' (Project) (Till 29-07-2022)
18.	Mr. Mantosh Patnaik, Research Assistant (Project) (Till 30-06-2022)
19.	Ms. Sruthy Ravivarma, Project Assistant (Project)
20.	Ms. Shallu, Scientist (Project) (Till 11-11-2022)
21.	Dr. Shah Zinkal Atul, Project Scientist-III (Project) (Till 28.10.2022)
22.	Ms. Risna K. R., Junior Research Fellow (Project)
23.	Dr. Yashika Arora, Project Scientist I (Project) (Till 27-09-2022)
24.	Ms. Dhurgadevi K.R, Project Assistant (Project) (Till 09-12-2022)
25.	Mr. Pawan Kumar Yadav, Technical Assistant (MEG Project) (Till 19-04-2022)
26.	Mr. Sainath Murli, Project Associate - I (Project) (Till 22-08-2022)
27.	Mr. Zohab Ahasan, R&D Engineer (Project) (Till 20-04-2022)
28.	Dr. Priyanka Chakraborty, Project Scientist – I (Till 28.10.2022)
29.	Ms. Anshika Goel, Research Scientist (Project) (Till 04-11-2022)
30.	Ms. Shardha Gaur, Neuropsychologist (Project) (Till 07-10-2022)
31.	Ms. Komal Jindal, Project Scientist-II (Project) (Till 21-10-2022)
32.	Mr. Ajay Pal, Project Associate –I (Project)
33.	Dr. Sonia Mor, Clinical Trail Specialist (Project)
34.	Mr. Saurav Roy, Scientist (Project)
35.	Ms. Sandhya, Research Manager (Project) (Till 31-01-2023)
36.	Ms. Aanchal Choudhary, Senior R&D Engineer (Project)
37.	Dr. Gaurav Sharma, Project Scientist - I (Project) (Till 28.10.2022)
38.	Ms. Aishwarya Iyengar, Junior Research Fellow (Project)
39.	Ms. Supraja B., Project Assistant (Project)

General & Integrated Students
(As on 31-03-2023)

Ph.D. Degrees Awarded (2022-23)

Sr. No	Name of the Students
1.	Dr. Chitra Mohinder Singh Singhal
2.	Dr. Tripti Joshi
3.	Dr. Hriday Shanker Pandey
4.	Dr. Apurva Agrawal
5.	Dr. Guncha Bhasin
6.	Dr. Indrajith R Nair
7.	Dr. Apoorv Sharma
8.	Dr. Shruti Patrick
9.	Dr. Surajit Chakraborty
10.	Dr. Priyanka Ghosh
11.	Dr. Biswaranjan Sahoo

M.Sc. Degrees Awarded (2022-23)

Sr. No	Name of the Students
1.	Ms. Dyutika Banerjee
2.	Ms. Janhvi Mahesh Dhongdi
3.	Ms. Mohima Mukherjee
4.	Ms. Mrittika Dey
5.	Ms. Muskaan Verma
6.	Ms. R. Madhumita
7.	Mr. Rajat Joshi
8.	Mr. Shuvrangshu Guha

Ph.D. Students (2022-23)

Sr. No	Name of the Students
1.	Mr. Apoorv Sharma (Till 11-11-2023)
2.	Mr. Biswaranjan Sahoo (Till 27-03-2023)
3.	Mr. Indrajith R Nair (Till 07-10-2022)
4.	Mr. S Balakumar
5.	Ms. Arti Kumari
6.	Ms. Mukta Kumari
7.	Md. Tipu Khan
8.	Ms. Priyanka Ghosh (Till 19-12-2022)
9	Ms. Sarbani Samaddar
10	Ms. Shruti Patrick (Till 11-11-2022)

Sr. No	Name of the Students
11	Mr. Surajit Chakraborty (Till 11-11-2022)
12	Ms. Bindu
13	Mr. Sibaram Behera
14	Ms. Tripti Joshi (Till 28-04-2022)
15	Mr. Abhishek Singh Narvaria
16	Ms. Deepti Dama
17	Mr. Karthick R
18	Ms. Nisha Chetana Sastry
19	Ms. Shivangi Sharma
20	Ms. Sunanda Sharma
21	Ms. Dipanjana Banerjee
22	Ms. Gargi Majumdar
23	Ms. Kamakshi Garg
24	Ms. Partika
25	Ms. Shalini Sharma
26	Ms. Stuti Mohapatra
27	Ms. Anjali
28	Mr. Ankit Yadav
29	Ms. Archana Mehta
30	Mr. Chandramouli Mukherjee
31	Ms. Sakshi Shukla (Till 29-07-2022)
32	Ms. Sonia Balahun Umdor
33	Mr. Arkaprovo Sarkar (Till 29-07-2022)
34	Ms. P. V. Vinitha
35	Ms. Rashi Sharma (Till 22-06-2022)
36	Ms. Athira M Sarath
37	Mr. Anirudh S
38	Mr. Dhyey Vyas
39	Mr. Shashank Saxena
40	Ms. Archana Panwar
41	Ms. Deepti Thapliyal
42	Ms. Krittika Biswas
43	Ms. Sania Sultana
44	Ms. Anushka
45	Ms. Archismita Chatterjee
46	Ms. Chakshu Mangal
47	Ms. Dikshalee Bassi
48	Ms. Dipti Chakraborty
49	Ms. Pallabi Kisku
50	Mr. Rohit Pant (Till 06-10-2022)
51	Mr. Swarnabh Chowdhury

Integrated Ph.D. Students (2022-23)

Sr. No	Name of the Students
1.	Ms. Guncha Bhasin (Till 17-08-2022)
2.	Ms. Uzma Din
3.	Ms. Chitra Mohinder Singh Singhal (Till 12-04-2022)
4.	Ms. Pooja Parishar
5.	Mr. Atanu Datta
6.	Mr. Hriday Shanker Pandey (Till 19-05-2022)
7.	Ms. Atrayee Basu (Till 14-01-2022)
8.	Mr. Gourav Sharma
9	Ms. Harjot Kaur Brar
10	Mr. Shubham Krishna

M.Sc. Students (2022-23)

Sr. No	Name of the Students
1.	Ms. Dyutika Banerjee (Till 29-07-2022)
2.	Ms. Janhvi Mahesh Dhongdi (Till 29-07-2022)
3.	Ms. Mohima Mukherjee (Till 29-07-2022)
4.	Ms. Mrittika Dey (Till 29-07-2022)
5.	Ms. Muskaan Verma (Till 29-07-2022)
6.	Ms. R. Madhumita (Till 29-07-2022)
7.	Mr. Rajat Joshi (Till 29-07-2022)
8.	Mr. Shuvrangshu Guha (Till 29-07-2022)
9	Ms. Debadrita Mondal
10	Mr. Mihir Prafulla Pradhan
11	Mr. Rishabh V Bapat
12	Ms. Sreyashi Bhattacharjee
13	Mr. Aninda Sundar Modak
14	Mr. Shivam Malviya
15	Ms. Soumi Sen
16	Ms. Tulika Khargonkar
17	Mr. Tanmay Singhal
18	Mr. Sudipto Chaki
19	Ms. Triparna Chakraborty
20	Ms. Ayisha Mariyam P M (Till 14-03-2023)
21	Mr. Arkaprava Bhattacharya
22	Ms. Shreya Borthakur
23	Mr. Shreyas Govind Miraj
24	Ms. Aastha Vartak
25	Ms. Mahima Elsa Joji
26	Ms. Ankita Roy

Integrated Students of M.Sc.-Ph.D. (2022-23)

Sr. No	Name of the Students
1.	Ms. Himali Arora
2.	Ms. Meenakshi Bhaskar
3.	Mr. Neeraj Kumar
4.	Mr. Anagh Pathak
5.	Ms. Kirti
6.	Ms. Ritu Moni Borah
7.	Mr. Azman Akhter
8.	Ms. Guneet Kaur
9	Ms. Kirti Saluja
10	Ms. Pallavi Singh
11	Ms. S Indira Priya
12	Ms. Shashwati Tripathi
13	Ms. Vinsea AV Singh
14	Ms. Mohima Mukherjee

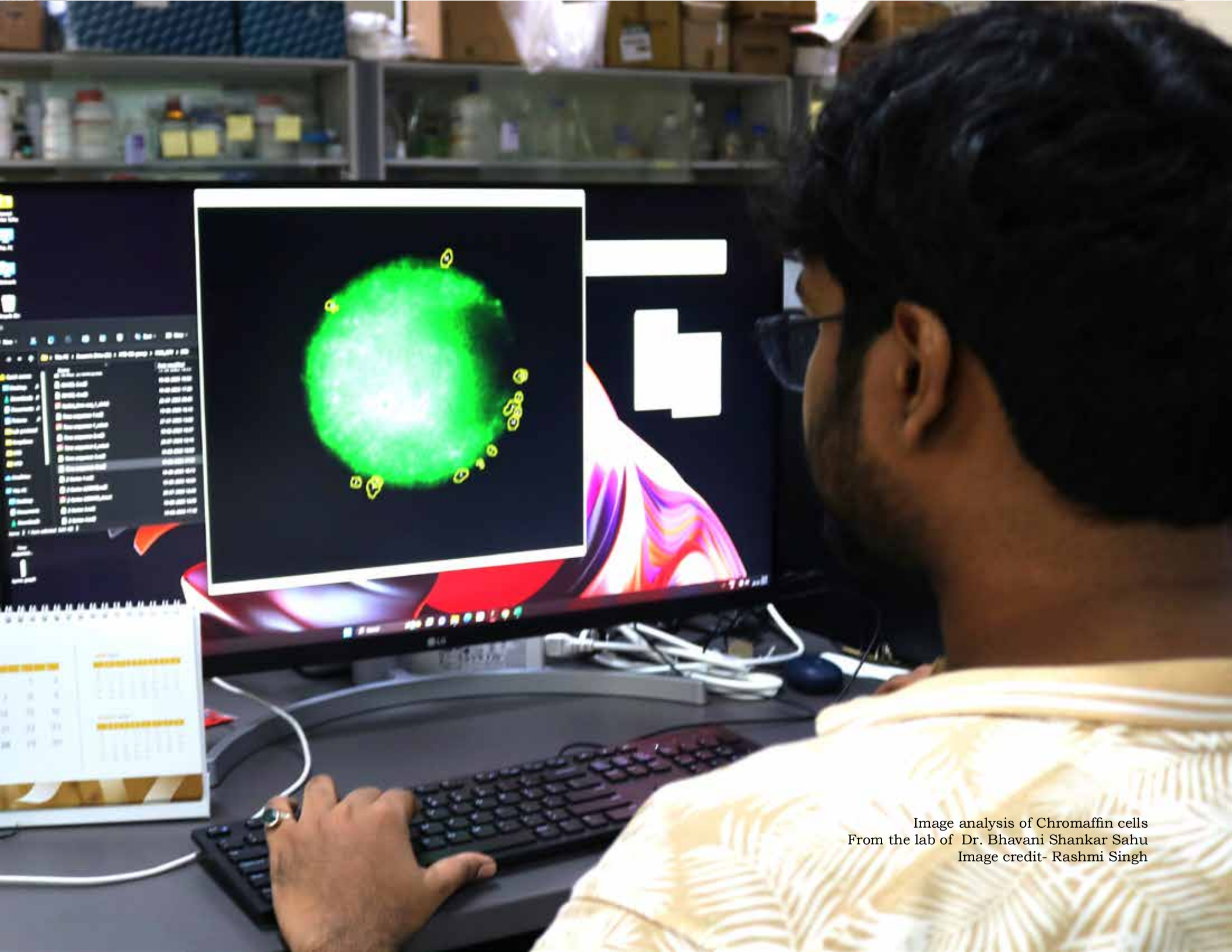


Image analysis of Chromaffin cells
From the lab of Dr. Bhavani Shankar Sahu
Image credit- Rashmi Singh


FINANCE
FINANCE
National Brain Research Centre
NBRC

KUMAR KHARE & CO.
CHARTERED ACCOUNTANTS
S-160, L.G.F. GREATER KAILASH PART-I
NEW DELHI-110048
Phone – 41733110, 9811133110
E-mail alok@kumarkhareca.com website: kumarkhareca.com

INDEPENDENT AUDITOR'S REPORT

To the Members
NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURUGRAM, HARYANA-122052

REPORT ON THE FINANCIAL STATEMENTS

Opinion

We have audited the accompanying financial statements of **National Brain Research Centre** ("the Society"), which comprise the Balance Sheet as of March 31, 2023, Receipts & Payments Account and the Income & Expenditures Account for the year ended on that date, and a summary of significant accounting policies and other explanatory information (hereinafter referred to as "the Financial Statement").

Basis for Opinion

We conducted our audit of the Financial Statements in accordance with the Standards on Auditing. Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the society in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India (ICAI) together with the independence requirements that are relevant to our audit of the financial statements under the provisions of the Act and the Rules made thereunder, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the ICAI's Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the Financial Statements.

Emphasis of Matter

We draw attention to the following matters in the Notes to the Ind AS financial statements:

a) ***Point No. 9.1 & 9.2 of Notes to accounts to its financial statements in respect of Provident Fund, Gratuity & Leave Encashment for the employee.***

b) ***Point No. 11.1, 11.2 & 22.1 of Notes to accounts to its financial statements in respect of the balance confirmation of advance from the parties under current assets and current liabilities.***

Our opinion is not modified in respect of these matters.

Responsibilities of Management for the Financial Statements

The Society's Board of members are responsible for the preparation and presentation of these financial statements that give a true and fair view of the financial position, financial performance and cash flows of

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S-160, L.G.F. GREATER KAILASH PART-I
NEW DELHI-110048
Phone – 41733110, 9811133110
E-mail alok@kumarkhareca.com website: kumarkhareca.com

the society in accordance with the AS and other accounting principles generally accepted in India. This responsibility also includes the maintenance of adequate accounting records in accordance with the provisions of the bye laws for safeguarding the assets of the Society and for preventing and detecting the frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial control, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the society 's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the society or to cease operations, or has no realistic alternative but to do so.

Auditor's Responsibility for the Audit of the Financial Statements

I. A) Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

B.) As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

i) Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

ii) Obtain an understanding of internal financial controls relevant to the audit in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Society's internal control.

iii) Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

iv) Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or

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E-mail alok@kumarkhareca.com website: kumarkhareca.com

conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention to our auditor's report to the related disclosures in the Financial Statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Society to cease to continue as a going concern.

v) Evaluate the overall presentation, structure and content of the Financial Statements, including the disclosures, and whether the Financial Statements represent the underlying transactions and events in a manner that achieves fair presentation

C.) Materiality is the magnitude of misstatements in the Financial Statements that, individually or in aggregate, makes it probable that the economic decisions of a reasonably knowledgeable user of the Financial Statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit work and in evaluating the results of our work; and (ii) to evaluate the effect of any identified misstatements in the Financial Statements.

D.) We communicate with Society's Board of members regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

E.) We also provide Society's Board of members with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

2. We believe that our audit provides a reasonable basis for our opinion:

a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit.

b) in our opinion proper books of account as required by law have been kept by the society so far as it appears from our examination of those books.

c) the Balance Sheet, the Receipts & Payment Account and the Income & Expenditures Account dealt with by this Report are in agreement with the books of account.

3. In our opinion and to the best of our information and according to the explanations given to us, the financial statements give a true and fair view in conformity with the accounting principles generally accepted in India.

a) As it relates to Balance sheet, of the state of affairs of the society as at 31st March, 2023;

KUMAR KHARE & CO.
CHARTERED ACCOUNTANTS
S-160, L.G.F. GREATER KAILASH PART-I
NEW DELHI-110048
Phone – 41733110, 9811133110
E-mail alok@kumarkhareca.com website: kumarkhareca.com

b) As it related to Income and Expenditures Account, of the Deficit over Income for the year ended on that date.

c) As it related to the Receipts & Payments Account, of the receipts and payment for the year ended on that date.

For Kumar Khare & Co.
Chartered Accountants
Firm Regn. No.: 006740C
UDIN:23546026BGVHVQ9457

Sunil Kumar
Partner
Membership No. 546026

Place: New Delhi
Date: 11th October,2023

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM, HARYANA
BALANCE SHEET AS AT MARCH 31,2023

(Amount-Rs.)

CORPUS / CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
Corpus/Capital Fund	1	1,48,10,43,000.00	1,44,50,02,000.00
Reserve and Surplus	2	(46,43,94,801.66)	(34,84,43,881.71)
Earmarked/Endowment Funds	3	27,43,44,842.99	40,88,26,613.90
Secured Loans and Borrowings	4	0.00	0.00
Unsecured Loans and Borrowings	5	0.00	0.00
Deferred Credit Liabilities	6	0.00	0.00
Current Liabilities and Provisions	7	28,61,36,115.54	6,55,19,052.44
Total (Liabilities)		**1,57,71,29,156.87**	**1,57,09,03,784.63**
ASSETS			
Fixed Assets	8	1,08,42,33,436.61	91,29,48,701.68
Investments - From Earmarked/Endowment Funds	9	0.00	0.00
Investments-Others	10	1,48,36,671.22	1,33,98,826.39
Current Assets, Loans, Advances etc.	11	47,80,59,049.04	64,45,56,256.56
Miscellaneous Expenditure (to the extent not written off or adjusted)		0.00	0.00
Total (Assets)		**1,57,71,29,156.87**	**1,57,09,03,784.63**
Significant Accounting Policies	24		
Contingent Liabilites and Notes on Accounts	24		

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052 (Haryana)

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN 006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI CHARTERED ACCOUNTANTS

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM, HARYANA
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED March 31, 2023

(Amount-Rs.)

INCOME	Schedule	Current Year	Previous Year
Income from Sales/Services	12	13,37,685.00	12,69,504.00
Grants/ Subsidies (Revenue) from DBT	13	26,66,97,722.00	25,10,00,000.00
Fees/Subscriptions	14	11,12,193.00	4,61,205.00
Income from Investments (Income on Invest. From earmarked/endow. Funds transferred to funds)	15	0.00	0.00
Income from Royalty, Publication etc.	16	0.00	0.00
Interest Earned	17	82,92,713.50	1,49,89,764.00
Other Income	18	38,50,044.00	39,08,862.56
Increase/(decrease) in stock of Finished goods and work-in-progress	19	0.00	0.00
Total Income (A)		**28,12,90,357.50**	**27,16,29,335.56**
EXPENDITURE			
Establishment Expenses	20	8,52,73,435.00	8,20,99,531.00
Other Administrative etc.	21	21,47,20,365.18	21,15,39,734.72
Expenditure on Grants, Subsidies etc.	22	0.00	0.00
Interest Paid	23	0.00	0.00
Depreciation (Net Total at the year-end-corresponding to Schedule 8)		9,72,47,477.27	8,61,52,411.21
Total Expenditure (B)		**39,72,41,277.45**	**37,97,91,676.93**
Balance being excess of Expenditure over Income (B-A)		(11,59,50,919.95)	(10,81,62,341.37)
Transfer to Special Reserve (Specify each)		0.00	0.00
Transfer to /from General Reserve		0.00	0.00
Balance Being Surplus/ (Deficit) carried to Corpus/Capital Fund		**(11,59,50,919.95)**	**(10,81,62,341.37)**
Significant Accounting Policies	24		
Contingent Liabilites and Notes on Accounts	24		

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122051
गुरुग्राम/Gurugram

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE, MANESAR
NH-8, NAINWAL MORE, MANESAR, GURGAON, HARYANA
RECEIPTS AND PAYMENTS FOR THE YEAR ENDED March 31, 2023

RECEIPTS	CURRENT YEAR	PREVIOUS YEAR	PAYMENTS	CURRENT YEAR	PREVIOUS YEAR
	Amount in (Rs.)			Amount in (Rs.)	
I. Opening Balances			I. Expenses		
a) Cash in Hand	93,695.00	39,098.00	i) Establishment Expenses	1,13,95,615.00	1,41,10,120.00
b) Bank Balances			ii) Administrative Expenses	22,63,479.85	24,48,451.17
i) In Deposit Accounts			II. Payment Made Against Funds For Various Projects		
ii) Saving Accounts	24,25,77,995.48	49,71,09,024.36	i) Recurring /Capital expenditure	14,06,69,361.37	1,25,87,481.46
iii) CPF Investments	83,69,470.39	87,78,018.19	ii) Capital Grant Refunded to DBT	5,79,59,000.00	
II. Grants Received			iii) Revenue Grant Refunded to DBT	1,33,02,278.00	
a) From Government of India			iv) Refund of Interest	7,77,208.00	21,91,677.00
Plan			v) Bank Deposits	4,40,65,000.00	
i) Recurring Income	28,00,00,000.00	25,10,00,000.00	III. Maintenance Cost		
ii) Non-Recurring Income	9,40,00,000.00	4,15,00,000.00	i) Lab Maintenance Expenses	34,85,354.58	36,46,909.22
Plan (Recurring)			ii) Office Maintenance	3,67,63,634.97	3,89,01,031.00
b) Fellowship Grant	1,73,000.00	8,53,865.00	iii) Vehicle Running & Maintenance	8,98,001.00	8,02,547.00
c) Delcon Projects (Including Interest)	82,92,01,000.00	42,05,40,321.00	IV. Investment and Deposit Made		
III. Receipt made against funds for various projects			i) Out of Earkmarked/Endowment funds	-	15,59,688.00
i) Recurring Receipt/ Capital Grant (Including Interest)	16,26,20,693.67	2,93,17,861.88	V. Expenditure of Fixed Assets & Capital Work-in-progress		
			i) Purchase of Fixed Assets	64,99,985.20	2,28,19,506.14
ii) Bank Deposits	12,10,47,043.00	15,16,37,535.00	VI. Training Expenses	44,46,408.41	33,05,874.78
IV. Interest Received			VII. Other Payments(Specify)		
i) On Bank Deposits	36,36,439.00		i) Advances to Supplier	1,58,70,403.77	16,71,37,976.61
ii) Savings Account	34,01,283.00	50,33,880.00	ii) Advances to Staff	52,95,413.00	21,48,164.00
iii) On CPF Fund	2,32,924.00		iii) Leave Encashment/ LTC/ Bonus	5,34,320.00	4,53,360.00
iv) Other Interest			iv) Security Deposit Paid	1,00,788.00	12,02,328.00
V. Any Other Receipt			v) EMD Refunded	33,84,316.00	13,40,700.00
Indirect Income			vi) TDS Paid	8,60,53,676.00	4,39,52,571.00
i) Advance to Supplier Received	41,770.33	5,369.00	vii) Imprest	2,38,000.00	2,28,000.00
ii) Advance to Staff Received	8,38,900.00	6,56,953.00	viii) Payment of Current Liabilities	96,42,72,332.21	84,24,70,441.18
iii) Sale of Tender Documents	11,000.00	12,500.00	ix) Prepaid Insurance	-	-
iv) Fees received	2,35,420.00	2,55,680.00			
v) Misc. Receipts	31,190.00	2,385.00	VIII. Closing balances		
vi) Earnest Money Deposit Received	14,11,900.00	33,33,766.00	a) Cash in Hand	0.00	93,695.00
vii) Sale of Scrap	-	3,900.00	b) Bank Balance		
viii) Guest House Charges	2,68,194.00	1,19,050.00	i) In Deposit Accounts		
ix) Hostel Deposit	3,10,000.00	3,43,000.00	ii) Saving Accounts	34,27,61,948.29	24,25,77,995.48
x) CPF Fund Received			iii) CPF Investments	86,02,357.22	83,69,470.39
xi) Library Deposit	96,000.00	1,02,000.00			
xii) Current Liabilities Rec.	5,12,906.00	6,05,072.00			
xiii) Other Receipts	5,28,057.00	10,98,709.00			
TOTAL	1,74,96,38,880.87	1,41,23,47,987.43	TOTAL	1,74,96,38,880.87	1,41,23,47,987.43

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

PROF. KRISHANU RAY
DIRECTOR
NBRC

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-000240C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 (Amount-Rs.)

SCHEDULE 1-CORPUS/CAPITAL FUND:

	Current Year		Previous Year	
1 Grant-in-Aid - Balance as at the beginning of the year		1,44,50,02,000.00		1,40,35,02,000.00
Add: Contribution towards Corpus/Capital Fund	9,40,00,000.00		4,15,00,000.00	
Less: Contribution towards Corpus/Capital Refund	(5,79,59,000)			
Add/(Deduct): Balance of net income/(expenditure) transferred from the Income and Expenditure Account		3,60,41,000.00		4,15,00,000.00
Balance as at the year end		**1,48,10,43,000.00**		**1,44,50,02,000.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 (Amount-Rs.)

SCHEDULE 2 - RESERVES AND SURPLUS:

	Current Year		Previous Year	
1 **Capital Reserve:**				
As per last Account	0.00		0.00	
Addition during the Year	0.00		0.00	
Less : Deductions during the year (deficit)	0.00	0.00	0.00	0.00
2 **Revaluation Reserve:**				
As per last Account	0.00		0.00	
Addition during the Year	0.00		0.00	
Less : Deductions during the year (deficit)	0.00	0.00	0.00	0.00
3 **Special Researve:**				
As per last Account	0.00		0.00	
Addition during the Year	0.00		0.00	
Less : Deductions during the year (deficit)	0.00	0.00	0.00	0.00
4 **General Reserve**				
As per last Account	(34,84,43,881.71)		(23,80,89,863.34)	
Addition during the Year	-		-	
Surplus during the yar (as per I&E A/c)	(11,59,50,919.95)		(10,81,62,341.37)	
Less : Deductions during the year (deficit)	-	(46,43,94,801.66)	21,91,677.00	(34,84,43,881.71)
Balance as at the year end		**(46,43,94,801.66)**		**(34,84,43,881.71)**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

PROF. KRISHANU RAY
DIRECTOR
NBRC

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN 006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

Amount in (Rs.)

SCHEDULE 3 - EARMARKED/ENDOWMENT FUNDS	FUND-WISE BREAK UP							
	Project Fund		Fixed Assets Fund (Project)		Contributory Provident Fund		DeLcon E-library Consortium	
a) Opening Balance of Project Fund		9,78,96,766.78		22,08,08,248.67		44,15,958.00		8,30,73,852.45
b) Additions to the Funds:								
i. Donations/grants/Additions to Fund	5,56,05,756.48		4,85,98,177.00		0.00		82,92,01,000.00	
ii. Income from investments made on account of funds	0.00		0.00		0.00		0.00	
iii. Other additions (Interest Earned)	33,54,908.31	5,89,60,664.79	0.00	4,85,98,177.00	2,32,924.00	2,32,924.00	8,21,108.00	83,00,22,108.00
Total (a+b)		15,68,57,431.57		26,94,06,425.67		46,48,882.00		91,30,95,960.45
c) Utilisation/Expenditure towards objectives of funds								
i. Capital Expenditure								
Fixed Assets (net)	4,82,88,646.00		0.00		0.00		3,09,531.00	
Others	0.00		0.00		0.00		0.00	
Total		4,82,88,646.00		0.00		0.00		3,09,531.00
ii. Revenue Expenditure								
-Salaries, Wages and allowances etc	1,93,54,874.00		0.00		0.00		16,88,129.00	
-Rent	0.00		0.00		0.00		0.00	
-Others	3,77,66,735.36		0.00		0.00		90,44,47,220.02	
-Depreciation	0.00		3,75,29,431.60		0.00		0.00	
Total		5,71,21,609.36		3,75,29,431.60		0.00		90,61,35,349.02
Total (C)		10,54,10,255.36		3,75,29,431.60		0.00		90,64,44,880.02
d) Refund of unspent fund during the year	1,80,30,371.72						22,48,918.00	0.00
		1,80,30,371.72						
NET BALANCE AS AT THE YEAR-END (a+b-c-d)		3,34,16,804.49		23,18,76,994.07		46,48,882.00		44,02,162.43

Notes
1) Disclosures shall be made under relevant heads based on conditions attaching to the grants
2) Plan funds received from the Central/State Governments are to be shown as separate Funds and not to be mixed up with any other Funds.
3) Net additions during the year represents additions net of deductions during the year.

SCHEDULE 4 - SECURED LOANS AND BORROWINGS: NIL

SCHEDULE 5 - UNSECURED LOANS AND BORROWINGS: NIL

SCHEDULE 6 - DEFERRED CREDIT LIABILITIES: NIL

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre

PROF. KRISHANU RAY
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प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-006744C

Sunil Kumar
Partner
Membership No-546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

Amount in (Rs.)

FUND-WISE BREAK UP SCHEDULE 3 - EARMARKED/ENDOWMENT FUNDS				TOTALS			
Endowment Fund for Building		Donation		Current Year		Previous Year	
	0.00		0.00		40,61,94,825.90		63,86,15,715.38
0.00		0.00		93,34,04,933.48		45,99,06,918.19	
0.00		0.00		0.00		0.00	
0.00	0.00	0.00	0.00	44,08,940.31	93,78,13,873.79	38,92,647.00	46,37,99,565.19
	0.00		0.00		1,34,40,08,699.69		1,10,24,15,280.57
0.00		0.00		4,85,98,177.00		1,40,34,404.31	
0.00		0.00		0.00		0.00	
	0.00		0.00		4,85,98,177.00		1,40,34,404.31
0.00		0.00		2,10,43,003.00		1,89,57,007.00	
0.00		0.00		0.00		0.00	
0.00		0.00		94,22,13,955.38		62,06,43,778.36	
0.00		0.00		3,75,29,431.60		3,88,06,623.00	
	0.00		0.00		1,00,07,86,389.98		67,84,07,408.36
	0.00		0.00		1,04,93,84,566.98		69,24,41,812.67
				2,02,79,289.72		11,46,854.00	
					2,02,79,289.72		11,46,854.00
	0.00		0.00		27,43,44,842.99		40,88,26,613.90

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-0067[illegible]C

Sunil Kumar
Partner
Membership No. 516026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGAON
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 — Amount in (Rs.)

SCHEDULE-7 CURRENT LIABILITIES AND PROVISIONS

	Current Year		Previous Year	
A. Current Liabilities				
1. Acceptances		0.00		0.00
2. Sundry Creditors				
-For Goods	71,75,213.00		42,58,739.00	
- Others	0	71,75,213.00	0	42,58,739.00
3. Advances Received (Security Deposit refundable)		98,92,574.22		41,78,780.42
4.Interest accured but not due on:				
-Secured Loans/borrowings	0.00		0.00	
-Unsecured loans/borrowings	0.00		0.00	
		0.00		0.00
5. Satutory Liabilities:				
-Overdue	0.00		0.00	
-Others (TDS & GST payable)	41,73,182.00		1,55,13,402.00	
		41,73,182.00		1,55,13,402.00
6. Others current Liabilities		25,70,26,850.52		3,36,99,835.22
Total (a)		**27,82,67,819.74**		**5,76,50,756.64**
B. Provisions				
1. For Taxation		0.00		0.00
2. Gratuity		61,62,367.00		61,62,367.00
3. Superannuation/Pension		0.00		0.00
4. Accumulated Leave Encashment		17,05,928.80		17,05,928.80
5. Trade Warranties/Claims		0.00		0.00
6. Others (Specify)		0.00		0.00
Total (b)		**78,68,295.80**		**78,68,295.80**
Balance as at the year end (a+b)		**28,61,36,115.54**		**6,55,19,052.44**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122051 / Manesar-[illegible]
[illegible]

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122051
[illegible], Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-0[illegible]C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURUGRAM
NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGAON
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

SCHEDULE 8 - FIXED ASSETS/ DEPRECIATION

	DESCRIPTION	Rate of Dep.	GROSS BLOCK: Cost /valuation As at beginning of the Year	Additions during the Year: More than 6 Months	Additions during the Year: Less than 6 Months	Deductions during the Year	Cost /valuation As at end of the Year	DEPRECIATION: As at the beginning of the Year	Depreciation for current year	On Deductions during the year	Total Depn. Upto 31.03.22	NET BLOCK: As at Current year-end	As at Previous year-end
	FIXED ASSETS: (Core Grant)												
1	LAND												
	a) Freehold		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	b) Leasehold		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	BUILDINGS												
	a) On Freehold Land		0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	b) On Leasehold Land	10%	75,39,65,741.73	0.00	0.00	0.00	75,39,65,741.71	23,05,39,468.90	5,21,42,627.28	0.00	28,28,82,096.18	47,10,83,645.55	52,34,26,272.83
	c) Ownership Flats/Premises		0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	d) superstructures on land		0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	not belonging to the entity		0.00				0.00	0.00	0.00		0.00	0.00	0.00
3	PLANT MACHINERY & EQUIPMENT	15%	40,38,64,302.64	1,04,38,063.70	23,07,92,959.83	0.00	65,26,75,325.44	27,05,70,230.55	3,71,82,229.30	0.00	30,77,52,459.85	34,49,22,865.59	13,28,94,072.09
4	VEHICLES	15%	41,45,034.00	0.00	0.00	0.00	41,45,034.00	28,14,961.96	1,99,510.81	0.00	30,14,472.76	11,30,561.24	13,30,072.44
5	FURNITURE, FIXTURES	10%	4,19,28,757.00	1,08,489.00	5,64,045.00	0.00	4,26,01,291.00	2,85,67,433.29	13,75,183.52	0.00	2,99,42,616.81	1,26,58,674.19	1,33,61,323.71
6	OFFICE EQUIPMENT	15%	4,90,31,998.95	12,09,989.00	19,11,037.00	0.00	5,21,33,024.95	3,43,98,423.46	25,19,862.45	0.00	3,69,18,285.90	1,52,34,739.05	1,46,33,575.49
7	COMPUTER /PERIPHERALS	40%	1,92,39,723.81	10,64,391.00	33,74,375.00	0.00	2,36,78,489.81	1,33,77,702.36	34,45,440.86	0.00	1,68,23,142.22	68,55,347.59	58,62,021.65
8	ELECTRIC INSTALATIONS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	LIBRARY BOOKS	40%	3,81,824.00	0.00	20,118.00	0.00	4,01,942.00	4,46,347.61	58,214.16	0.00	5,04,561.76	97,380.24	3,35,476.39
10	TUBEWELLS & W. SUPPLY		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	OTHER FIXED ASSETS (Patents & Copyrights)	25%	53,55,643.00	0.00	0.00	0.00	53,55,643.00	48,58,604.21	1,24,409.70	0.00	49,82,413.91	3,73,229.09	4,97,038.79
	TOTAL OF THE CURRENT YEAR		1,27,77,13,025.13	2,08,98,932.70	23,66,62,534.10	0.00	1,53,51,76,491.93	58,35,72,572.13	9,72,47,477.27	0.00	68,28,20,049.40	85,23,56,442.55	69,21,40,453.02
B	PROJECT EQUIPMENTS	15%	83,36,04,380.51	1,61,77,747.00	3,04,20,430.00	0.00	88,22,02,557.51	61,27,96,131.85	3,75,29,431.60	0.00	65,03,25,563.45	23,18,76,994.06	22,08,08,248.66
	TOTAL (A+B+C)		2,11,13,17,405.64	3,70,76,679.70	27,50,82,964.10	0.00	2,41,73,79,049.44	1,19,83,68,703.98	13,47,76,908.87	0.00	1,33,31,45,612.85	1,08,42,33,436.61	91,29,48,701.68

Note to be given as to cost of assets on hire purchase basis included above)

SCHEDULE 9 - INVESTMENT FROM EARMARKED/ENDOWMENT FUNDS: NIL

As per our separate report of even date attached

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

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T. BHATTACHARYYA
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मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

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Prof. Krishanu Ray
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National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co
Chartered Accountants
FRN
Anil Kumar
Partner
Membership No.
Date 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 Amount in (Rs.)

SCHEDULE 10 - INVESTMENTS-OTHERS

	Current Year	Previous Year
1 In Government Securities	0.00	0.00
2 Other approved Securities	0.00	0.00
3 Shares	0.00	0.00
4 Debentures and Bonds	0.00	0.00
5 Subsidiaries and Joint Ventures	0.00	0.00
6 Others (CPF Fund)	1,48,36,671.22	1,33,98,826.39
Total	**1,48,36,671.22**	**1,33,98,826.39**

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हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

Amount in (Rs.)

SCHEDULE 11 - CURRENT ASSETS, LOANS, ADVANCES ETC.	Current Year		Previous Year	
A. Current Assets				
1 Inventories:				
a) Stores and Spares	0.00		0.00	
b) Loose Tools	0.00		0.00	
c) Stock-In-Trade				
Finished Goods	0.00		0.00	
Wrok-in-progress	0.00		0.00	
Raw Materials	0.00	0.00	0.00	0.00
2 Sundry Debotrs:				
a)Debts Outstanding for a period exceeding six months	0.00		0.00	
b) Others	0.00	0.00	0.00	0.00
3 Cash balances in hand (including cheque/drafts and imprest)	0.00	0.00	93,695.00	93,695.00
4 Bank Balances:				
a) With Scheduled Banks:				
-On Current Accounts				
-On Deposit Accounts (includes margin money)	10,94,06,408.00		18,51,66,840.00	
-On Savings Accounts	34,27,61,948.29		24,25,77,995.48	
		45,21,68,356.29		42,77,44,835.48
b) With non-Scheduled Banks:				
-On Current Accounts	0.00		0.00	
-On Deposit Accounts	0.00		0.00	
-On Savings Accounts	0.00	0.00	0.00	0.00
5 Post Office-Savings Accounts		0.00		0.00
Total (A)		45,21,68,356.29		42,78,38,530.48

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मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No: 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

Amount in (Rs.)

SCHEDULE 11 - CURRENT ASSETS, LOANS, ADVANCES ETC. (Contd.)	Current Year		Previous Year	
B. LOANS, ADVANCES AND OTHER ASSESTS				
1 Loans:				
a) Staff	55,98,105.87		47,25,404.87	
b) Other Entities engaded in activities/objectives similar to that of the entity	0.00		0.00	
c) Other (Imprest)	24,533.00		33,973.00	
		56,22,638.87		47,59,377.87
2 Advances and other amounts recoverable in cash or in kind or for value to be received				
a) On Capital Account	0.00		0.00	
b) Prepayments (Insurance & Expenses)	11,19,291.00		22,09,686.00	
C) Other - Advance to Parties	11,77,595.75		19,22,12,200.48	
- Other Advances (Security Deposit Paid)	57,62,502.45		57,62,502.45	
		80,59,389.20		20,01,84,388.93
3 Income Accured:				
a) On Investments from Earmarked/Endowment Funds	0.00		0.00	
b) On Investments-Others (Accrued Int. on CPF)	1,01,368.00		0.00	
c) On Loans and Advances	0.00		0.00	
d) Others (SB A/C)	0.00	1,01,368.00	0.00	0.00
b) (includes income due unrealised-Rs.....)				
		1,21,07,296.68		1,17,73,959.28
4 Claims Receivable (TDS Receivable) & Income Tax		2,58,90,692.75		21,67,17,726.08
Total (B)		47,80,59,049.04		64,45,56,256.56
Total (A+B)				

TANMOY BHATTACHARYYA
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Chief Administrative Officer
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PROF. KRISHANU RAY
DIRECTOR
NBRC

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Prof. Krishanu Ray
निदेशक / Director
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National Brain Research Centre
मानेसर/Manesar-122 52
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-[illegible]

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 — Amount in (Rs.)

SCHEDULE 12 - INCOME FROM SALES/SERVICES	Current Year	Previous Year
1 Income from Sales		
- Sale of Scrap	-	-
2) Income from Services		
- Guest House Charges & Rental Income	3,34,515.00	1,97,600.00
- Overhead Charges	10,03,170.00	10,71,904.00
- Others	-	-
Total	**13,37,685.00**	**12,69,504.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
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National Brain Research Centre
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FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023 Amount in (Rs.)

SCHEDULE 13 - GRANTS/SUBSIDIES		
(Irrevocable Grants & Subsidies Receivecd)	Current Year	Previous Year
1 Central Government (DBT)		
2 State Government(s)	26,66,97,722.00	25,10,00,000.00
3 Government Agencies	0.00	0.00
4 Institutions/Welfare Bodies	0	0.00
5 International Organisations	0.00	0.00
6 Others (Specify)	0.00	0.00
Total	26,66,97,722.00	25,10,00,000.00

TANMOY BHATTACHARYYA
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National Brain Research Centre
Manesar-122051 / Haryana

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FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF INCOME AND EXPENDITURE FOR THE YEAR ENDED March 31, 2023

SCHEDULE 14 - FEES/ SUBSCRIPTIONS — Amount in (Rs.)

		Current Year	Previous Year
1	Entrance Fees	3,48,693.00	4,24,205.00
2	Annual Fees/Subscriptions	7,63,500.00	37,000.00
3	Seminar/Program Fees	0.00	0.00
4	Consultancy Fees	0.00	0.00
5	Others (Fellowship Grants)	0.00	0.00
	Total	**11,12,193.00**	**4,61,205.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
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Chief Administrative Officer
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National Brain Research Centre

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हरियाणा/Haryana

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For Kumar Khare & Co
Chartered Accountants
FRN-0067400

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF BALANCE SHEET AS AT March 31, 2023

Amount in (Rs.)

SCHEDULE 15 - INCOME FROM INVESTMENTS	Investment from Earmarked Fund		Investment-Others	
(Income on invest. From Earmarked/Endowment Funds transferd to Funds)	Current Year	Previous Year	Current Year	Previous Year
1 Interest				
a) On Govt. Securities	0.00	0.00	0.00	0.00
b) Other Bonds/Debentures	0.00	0.00	0.00	0.00
2 Dividents:				
a) On Shares	0.00	0.00	0.00	0.00
b) On Mutual Fund Securities	0.00	0.00		0.00
3 Rents	0.00	0.00	0.00	0.00
4 Others (Project Receipts)	0.00	0.00	0.00	0.00
Total (B)	0.00	0.00	0.00	0.00
TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS				

SCHEDULE 16 -INCOME FROM ROYALITY, PUBLICATION ETC. NIL

TANMOY BHATTACHARYYA
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For Kumar Khare & Co
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF INCOME AND EXPENDITURE FOR THE YEAR ENDED March 31, 2023

SCHEDULE 17 -INTEREST EARNED — Amount in (Rs.)

	Current Year	Previous Year
1 On Term Deposits:		
a) With Scheduled Banks	64,67,524.00	93,05,937.00
b) With Non-Scheduled Banks	0.00	0.00
c) With Institutions	0.00	0.00
d) Others(Int. received on Security Deposit received)	2,59,241.50	0.00
2 On Savings Accounts:		
a) With Scheduled Banks	14,11,052.00	55,49,031.00
b) With Non-Scheduled Banks	0.00	0.00
C) Post Office Savings Accounts	0.00	0.00
d) others	0.00	0.00
3 On Loans:		
a) Employees/Staff	0.00	0.00
b) Others (Int. on HBA)	1,54,896.00	1,34,796.00
4 Interest on Debtors and Others Receivables	0.00	0.00
Total	**82,92,713.50**	**1,49,89,764.00**

TANMOY BHATTACHARYYA
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हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF INCOME AND EXPENDITURE FOR THE YEAR ENDED March 31, 2023

SCHEDULE 18 -OTHER INCOME — Amount in (Rs.)

		Current Year	Previous Year
1	Profit on Sale/disposal of Assets:		
	a) Owned assets	0.00	0.00
	b) Assets acquired out of grants, or received free of cost	0.00	0.00
2	Export Incentives realized		
3	Fees of Miscellaneous Services		
4	Miscellaneous Income	38,50,044.00	39,08,862.56
5	Prior Period Income	0.00	0.00
	Total	**38,50,044.00**	**39,08,862.56**

SCHEDULE 19 -INCREASE/(DECREASE) IN STOCK OF FINISHED GOODS & WORK IN PROGRESS — **NIL**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre

PROF. KRISHANU RAY
DIRECTOR
NBRC

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached

For Kumar Khare & Co
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF INCOME AND EXPENDITURE FOR THE YEAR ENDED March 31, 2023

SCHEDULE 20 -ESTABLISHMENT EXPENSES — Amount in (Rs.)

	Current Year	Previous Year
a) Salaries and Wages	7,16,05,620.00	6,69,15,925.00
b) Allowances and Bonus	0.00	0.00
c) Contribution to Provident Fund	0.00	0.00
d) Contribution to Pension Scheme	0.00	2,11,489.00
e) Staff Welfare Expenses	35,683.00	1,04,998.00
f) Expenses on Employees Retirement and Terminal Benefits	0.00	0.00
g) Others - Children education reimbursement	12,15,000.00	13,77,000.00
- Leave encashment	5,40,668.00	2,70,156.00
- LTC expenses	2,88,687.00	7,54,433.00
- Medical reimbursement	14,72,088.00	12,19,668.00
- NPS(employer subscription)	89,17,071.00	1,08,88,180.00
- overtime allowance	7,542.00	19,175.00
- Medical insurance (Staff)	11,91,076.00	3,38,507.00
Total	8,52,73,435.00	8,20,99,531.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

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Sunil Kumar
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NATIONAL BRAIN RESEARCH CENTRE
NH-8, NAINWAL MORE, MANESAR, GURGRAM
SCHEDULE FORMING PART OF INCOME AND EXPENDITURE FOR THE YEAR ENDED March 31, 2023

SCHEDULE 21 -OTHER ADMINISTRATIVE EXPENSES

Amount in (Rs.)

		Current Year	Previous Year
1	Electricity and Power	3,65,92,530.35	3,88,92,783.00
2	Insurance	77,112.00	38,207.00
3	Repairs and maintenance	4,40,83,929.72	4,74,20,656.73
4	Excise Duty	0.00	0.00
5	Rent (Lease Rent), Rates and Taxes	14,05,777.00	14,05,777.00
6	Vechicles Running and Maintenance	1,33,607.00	1,85,211.00
7	Postage, Telephone and Communication Charges	6,29,924.00	5,36,598.00
8	Printing and Stationary	5,91,842.00	12,07,592.00
9	Travelling and Conveyance Expenses	32,38,446.00	11,04,992.00
10	Expenses on Seminar/Workshops	8,22,979.00	4,84,864.00
11	Subscription Expenses	48,22,842.20	31,11,444.27
12	Expenses on Fees	2,24,175.00	90,211.00
13	Auditor Remuneration	1,59,300.00	1,35,000.00
14	Hospitality Expenses	2,07,849.00	1,10,357.00
15	Professional Charges	11,40,639.00	6,92,011.00
16	Irrecoverable Balances Written-off	7,09,071.91	0.00
17	Medical Expenses (Students)	4,68,353.00	5,80,814.00
18	Freight and Forwarding Expenses	0.00	0.00
19	Bandwidth charges-Core	3,55,268.00	2,47,800.00
20	Advertisement and Publicity	4,95,914.00	14,42,738.17
21	Prior Period Expenses	19,69,909.94	0.00
22	Others - Bank charges	5,935.13	6,195.00
	- Misc. expenses	3,26,330.00	2,88,020.00
	- Books and Periodicals	1,10,115.00	83,365.00
	- Honorarium (others)	6,91,080.00	4,31,250.00
	- Petrol, Diesel & CNG etc.	9,73,593.00	8,88,447.00
	- Skilled manpower	2,72,08,032.00	2,66,37,058.00
	- Manpower(Housekeeping & Security)	2,00,03,997.00	1,77,81,520.00
	- Horticulture	16,05,107.00	20,29,273.00
	- Training and networking expense	3,98,58,120.00	3,54,62,853.00
	- Laboratory & Animal Consumables	2,55,78,305.93	2,89,58,078.05
	- Interest on Taxes	1,64,381.00	0.00
	- Office expenses	65,100.00	4,74,838.50
23	Accreditation Fee	0.00	7,30,981.00
	Total	21,47,20,365.18	21,15,39,734.72

SCHEDULE 22 -EXPENDITURE ON GRANTS, SUBSIDIES ETC. NIL

SCHEDULE 23 -INTEREST PAID NIL

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER
NBRC

PROF. KRISHANU RAY
DIRECTOR
NBRC

As per our separate report of even date attached
For Kumar Khare & Co
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
New Delhi

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, GURUGRAM

• SIGNIFICANT ACCOUNTING POLICIES & NOTES ON ACCOUNTS FORMING PART OF THE BALANCE SHEET AS AT 31ST MARCH, 2023 AND INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31STMARCH,2023.

• SIGNIFICANT ACCOUNTING POLICIES & NOTES ON ACCOUNTS

1. Accounting Convention:

1.1 The financial statements of National Brain Research Centre (***NBRC***) are prepared on the basis of historical cost convention and on the accrual basis of accounting.

1.2 The NBRC is prepared based on the 'Uniform Format of Accounting' prescribed for the Central Autonomous Bodies by the Ministry of Finance, Govt. of India for preparing the Income & Expenditure Account, Receipts & Payments Account, Balance Sheet & other Schedules thereto.

2. Inventory Valuation:

2.1 All purchases of chemicals, glassware, consumables and printing & stationery have been booked/charged to consumption/expenditure at the time of purchases. Inventories had been so booked, based on their purchase cost & other costs incurred in bringing the inventories to their present location & condition.

2.2 Further, all entries relating to purchase of consumables/equipment or other fixed assets in accounts are being passed only at the time of submission of satisfactory inspection/installation report irrespective of the date of actual receipt of the supplies/equipment.

3. Property Plant & Equipment & Intangible Assets:

3.1 Property Plant & Equipment & Intangible Assets are stated at written down value. i.e., at their cost of acquisition inclusive of inward freight, duties and taxes & incidental & direct expenses related to the acquisition.

3.2 In respect of projects involving construction, related pre-operational expenses (including interest on loans for specific project prior to its completion), form part of the value of the assets capitalized.

3.3 Property Plant & Equipment & Intangible Assets received by way of non-monetary grants, (other than towards the corpus Fund), are capitalized at values stated, by corresponding credit to Capital Reserve

3.4 Property Plant & Equipment & Intangible Assets have been created mainly out of grants received from the Department of Biotechnology, Ministry of Science and Technology, Government of India.

4. Depreciation:

4.1 Depreciation provided for current year on the fixed assets of Project for Rs. 3,75,29,431.60 (previous year Rs. 3,88,06,623.00) and which has been directly debited to the fixed assets funds account. These assets were created through the non-Recurring and project-based grant from the funding agencies. Depreciation for other than project assets amounting to Rs. 97,247,477.27 for current financial year (Rs. 8,61,52,411.21 for previous year) had been debited to Income & Expenditure Account. Depreciation is being charged as per Income Tax Act 1961 on W.D.V basis.

Note: - Assets which have been put to use for more than 182 days has been charged in full and for the remaining Assets charged at the rate 50% of the depreciation rates as above.

4.2 Depreciation has been charged during the year of acquisition and no depreciation is provided during the year of asset sold/discarded. In respect of additions to/deductions from fixed assets during the year, depreciation is considered on pro-rata basis.

4.3 Fixed Assets are stated at the cost of acquisition inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisition.

5. Investments:

5.1 Investments classified as "long term investments" are carried at cost, provision for decline, other than temporary, is made in carrying cost of such investments.

5.2 Investments classified as "Current" are carried at lower of cost and fair value. Provision for shortfall on the value of such investments is made for each investment considered individually and not on a global basis.

5.3 Cost included acquisition expenses like brokerage, transfer stamps.

5.4 Investments in term deposits with banks are valued on cost.

5.5 Interest received on term deposits are accounted for on accrual basis.

6. Government Grants / Subsidies:

6.1 Government grants of the nature of contribution towards capital cost of setting up projects are treated as Capital Reserve/Fund.

6.2 Government grants are accounted for in accordance with the sanctioned terms & on realization basis.

6.3 Interest on Government Grant has been considered under the respective projects in view of the project sanctioned terms, as in the past.

6.4 Grants in respect of specific fixed assets acquired are shown as the deduction from the cost of the related assets

6.5 Recurring grant have been recognized in the Income and Expenditure Account in the year of receipt of grant in aid whereas, non- recurring grants have been treated capital reserve/corpus fund.

7. Foreign Currency Transactions/ Grants:

7.1 Transactions denominated in foreign currency are accounted at the exchange rate prevailing at the date of the transaction.

7.2 Current assets, foreign currency current liabilities are converted at the exchange rate prevailing as at the year end.

8. Lease:

The NBRC is located on the leasehold land at Manesar taken from Indian Vaccine Corporation Ltd. for Rs. 14, 05,777/- per annum lease amount. The annual lease rental being charged against revenue for respective year.

9. Retirement Benefits:

9.1 The NBRC is not registered with the Provident Fund authorities and it maintains a separate Contributory Provident Fund (CPF), which is yet to be recognized and the CPF fund required the separate accounting. At present all the employees have been joined under New Pension Scheme (NPS). The pension of the Government Servant appointed on or after 01.01.2004 is regulated by the new defined contribution pension system (known as National pension system), notified by the Ministry of Finance, Government of India.

9.2.The NBRC has not made any provision for gratuity and leave encashment during the financial year 2022-23 as against the requirement of AS-15 issued by ICAI. However, the amount of gratuity and leave encashment to the extent of Rs. 61,62,367.00 and Rs. 17,05,929.00 respectively as on 31st March, 2023, (Rs. 61,62,367.00 and Rs. 17,05,929.00 respectively as on 31st March, 2022) against provision made earlier.

10. Taxation:

In view of the tax exemption status the National Brain Research Centre is a Society, registered under Societies Registration Act-1860 at Autonomous bodies. Also, The NBRC has been granted permanent registration under section 12AB vide URN-AAFFN2348KE20217 dated 23.09.2021.and Provisional registration under section 80G(5) vide URN-AAFFN2348KF20231 dated 24.03.2023.

11. Current Assets, Loans & Advances:

11.1 In the opinion of the Management, the current assets, loans and advances have a value on realization in the ordinary course of business, equal at least to the aggregate amount shown in the Balance Sheet. However, advances appearing under the head Current assets, Loans & Advances under Schedule-11 are subject to confirmation from respective parties.

11.2 The current assets and current liabilities of NBRC includes various old outstanding balances.

12. Bank Balance:

All Banks accounts have been reconciled till 31st March, 2023.

13. Fraud/Manipulation of funds encountered by NBRC:

No Fraud was detected during the year.

14. Outstanding Balances of Closed Projects:

The Institute has a policy of incurring expenditure on various projects in accordance with the sanctioned budget under various heads of accounts irrespective of the actual releases during a financial year. Since the actual release of money by the sponsoring agency is subject to various factors, the expenditure on approved heads of accounts is being incurred within the overall sanction of the project.

15. Contingent Liabilities

15.1 Claims against the Entity not acknowledged as debt. Rs. NIL (Previous year Rs. NIL).
15.2 In respect of:

- Bank guarantees given by/on behalf of the entity Rs. NIL (Previous year Rs. NIL).
- Letters of Credit opened by Bank on behalf of the Entity Rs. NIL (Previous year Rs. NIL).
- Bills discounted with banks Rs. NIL (Previous year Rs. NIL).

15.3 Disputed demands in respects of Income tax (TDS) Rs. 24,39,835.00 (Previous year Rs. 78,03,805.00) which is under representation before the concerned authorities. Further, TDS deducted and to be received as refund amounts to Rs. 61,12,027.68 out of which Rs. 40,30,217.52 is pending since 2008-09. The appeal has already been made to Income tax Authority (CIT -Chandigarh) in the prior years.

15.4 There is an outstanding Income Tax Demand for A.Y. 2017-18 amounting to Rs. 2,99,76,345.00 against which appeals to (CIT Appeal- Faceless / Chandigarh has already been filed in prior years.

16. Capital Commitments

Estimated value of contract remaining to be executed on capital account and not provided for (net of advances) Rs. –Nil (Previous year Rs. NIL).

17. Lease Obligations

Future obligations for rentals under finance lease arrangements for plant and machinery amount to Rs. NIL (Previous year Rs. NIL).

18. Foreign Currency Transactions

18.1 Value of Imports Calculated on C.I.F Basis:

- Purchase of finished Goods Rs. NIL.
- Raw Materials & Components (Including in transit) Rs. NIL.
- Capital Goods Rs. NIL.
- Purchased Consumables /Non-Consumables for Rs. 2,55,78,305.93
- Transactions determined in foreign currency are accounted at the exchange rate prevailing on the date of transaction.

18.2 Expenditure in foreign currency:

a) Travelling charges Rs. 13,70,248 (Previous year Rs.1,71,593/-)

b) Remittances and Interest payment to Financial Institutions/ Banks in Foreign Currency Rs. NIL.

c) Other expenditure:-

-Commission on Sales Rs. NIL.

-Legal and Professional Expenses Rs. NIL.

-Miscellaneous Expenses Rs. NIL.

18.3 Receipt:

Value of Grants for Project from foreign entity-Rs. 23,17,772/-.

19. Remuneration to auditors:

- As Auditors Rs. 1,35,000/- (Previous year Rs. 1,35,000.00).
Audit fee 70000, other Taxation Matter Fee 65,000/-)

20. Receipt & Payment Accounts:

The Receipt & Payment Account has been prepared using direct method presenting all receipts &payments during the year under major heads, in the interest of better disclosure.

21. GST Reconciliation:

There are Input Credit balances in GST ledger in GST portal which required reconciliation and rectification in the Annual Return.

22. Others:

22.1 The Balance in the name of various parties under the head Current Liabilities are subject to confirmation/ reconciliation by respective parties. The total amount payable to Sundry Creditors is Rs. 71,75,213.00 (previous year Rs. 42,58,739.00).

22.2 Schedules 1 to 23 along with Annexures 1 to 77 are annexed to and form an integral part of the Balance Sheet as at 31st March, 2023 and the Income and Expenditure Account for the year ended on that date.

22.3 (a) An amount of Rs.26,31,788/- was kept under Donation Received from American Association of South Asia Neurosurgeon & other parties, now transferred to our Income head under Other Miscellaneous Income.

(b) An amount of Rs. 2,03,53,608/- has been capitalized towards custom duty for procurement of MRI machine in the F.Y.2021-22. Whereas, the original machine has put to used in the current financial year 2022-23. Hence, Rs.28,24,063/- being excess charges on account of Depreciation is deducted from the current financial year receptively.

22.4 Accounting polices not referred to otherwise be consistent with Generally Accepted Accounting Principles (GAAP).

22.5 Corresponding to the previous year figures have been regrouped/rearranged wherever considered necessary inconformity with the current year's presentation of the accounts of the institute.

For and on behalf of
National Brain Research Centre

Tanmoy Bhattacharyya
(Chief Administrative Officer)

Place: New Delhi
Date: 11/10/2023

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

Krishanu Ray
(Director)

डॉ. कृष्णानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Cent
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report
of even date attached.
For Kumar Khare& Co.

(Chartered Accounts)
(FRN-006740C)

(CA Sunil Kumar)
Partner
M.No.546026

NATIONAL BRAIN RESEARCH CENTRE, NH-8, NAINWAL MORE, MANESAR GURGAON
ANNEXURE OF PROJECT GRANTS AND EXPENDITURE FOR THE YEAR ENDED 31.03.2023

S. No./ Annx. No.	NAME OF PROJECT	Opening Balance as on 01.04.2022	Grants received during the year 2022-23	Interest/other income earned during the year 2022-23	Capital Exp. during the year 2022-23	Revenue Expenditure during the year 2022-23			Refund of Unspent Balance/Interest	Closing Balance as on 31.03.2023
						Manpower	Others	Total Expenditure		
2	CSIR Japanese Encephalities - Dr. Anirban Basu	1,77,708.96	0.00	0.00	0.00	0.00	1,74,546.00	1,74,546.00	3,163.00	-0.04
3	Elucidating the role of long non coding RNAs	-30,236.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-30,236.00
4	MicroRNA mediated Reg. of Neural stem(Dr. Anirban Basu)	14,054.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14,054.62
5	Tata innovation fellowship award- Dr. Anirban Basu	-5,775.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5,775.53
6	Therapeutic Role DBT(Dr. Anirban Basu)	63,731.00	0.00	0.00	0.00		5,815.00	5,815.00	57,916.00	0.00
7	J C BOSE FELLOWSHIP (Dr. Anirban Basu)	17,00,000.00	7,00,000.00	28,682.00	0.00	3,00,000.00	20,81,970.00	23,81,970.00	0.00	46,712.00
8	Mapping of Common Mental Disorders Over Lifespan- Dr Arpan Banerjee	1,67,39,733.00	0.00	0.00	5,77,753.00	21,70,988.00	39,277.00	22,10,265.00	1,39,51,715.00	0.00
9	Early Dignostics of structural and functional- Dr Arpan Banerjee	6,91,538.00	0.00	0.00	0.00	0.00	4,24,117.00	4,24,117.00	0.00	2,67,421.00
10	Dementia Tissue MRI studies(Dr. Dipanjan Roy)	17,34,635.00	0.00	17,090.00	0.00			0.00	25,635.00	17,26,090.00
11	Oscillatory network dynamics DST(Dr. Dipanjan Roy)	81,783.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81,783.00
12	Ramalinga Swamy - Dr. Dipanjan Roy	18,114.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18,114.47
13	Implications in tumor progression- Dr. Ellora Sen	6,20,816.00	0.00	0.00	0.00	0.00	0.00	0.00	6,20,816.00	0.00
14	National Bioscience Award- Dr. Ellora Sen	26,403.29	0.00	0.00	0.00			0.00	0.00	26,403.29
15	NON CANONICAL FUNCTION(SERB)- Dr. ELLORA SEN	11,80,000.00	0.00	18,516.00	0.00	9,99,800.00	1,65,000.00	13,64,800.00	0.00	33,716.00
16	Neurobiology of Dyslexia Brain & Behaviour-Dr.Nandini C.Singh	6,14,968.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,14,968.00
17	Fetal neural stem cells to oligodendrocytes (Dr. Pankaj seth)	5,58,000.00	0.00	12,099.00	0.00	0.00	55,547.00	55,547.00	0.00	5,14,552.00
18	Dyslexia Linked RNA(Dr. Pankaj Seth)	7,97,811.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,97,811.05
19	Effect of Hypoxia on different Neural-Dr Pankaj Seth	-90,215.87	12,23,003.00	0.00	0.00	0.00	1,20,600.00	1,20,600.00	11,632.00	10,00,555.13
20	Hypoxia Ind. Change in Blood Brain- Dr Pankaj Seth	42,877.92	0.00	1,657.00	0.00	10,290.00	0.00	10,290.00	34,245.00	-0.08
21	A CROSS-CULTURE PERSPECTIVE(DST-NETHERLANDS) - Dr PRAVAT MANDAL	3,21,147.00	0.00	0.00	0.00	0.00	24,769.00	24,769.00	11,847.00	2,84,531.00
22	Characterizing biomarkers of Alzheimer's disease Dr Pravat Mandal	-10,011.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-10,011.50
23	Dementia Imaging studies(Dr. Pravat Kumar Mandal)	4,56,853.00	0.00	4,350.00	1,60,480.00	0.00	1,21,096.00	1,21,096.00	7,643.00	1,71,984.00
24	Novel Imaging Dignostics Indo-Aus grant(Dr. Pravat Kur	4,50,462.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,50,462.00
25	SPECIFIC BRAIN TEMPLATE DST Dr. PRAVAT K MANDA	-3,67,110.50	0.00	0.00	0.00	0.00		0.00	0.00	-3,67,110.50
26	Tata innovation fellowship Award - Dr. Pravat Mandal	-5,212.00	0.00	0.00	0.00	0.00		0.00	0.00	-5,212.00
27	Crispri System - Dr. Sourav Banarjee	-7,47,783.32	0.00		0.00	0.00	0.00	0.00	0.00	-7,47,783.32
28	DBT Mirna Meditate Control - Dr. Sourav Banarjee	1,89,009.97	0.00	0.00	0.00			0.00	0.00	1,89,009.97
29	Sourav	2,07,562.00	0.00	0.00	0.00	0.00	24,015.00	24,015.00	0.00	1,83,547.00
30	Research(INSPIRE)- Dr. Yogita	2,22,009.18	0.00	0.00	0.00	0.00		0.00	0.00	2,22,009.18
31	DST-CSRI (Dr. Prem Chand)	28,916.16	0.00	0.00	0.00			0.00	0.00	28,916.16
32	Centre for Excellence for Epilepsy(Phase-II)	4,07,16,269.00	3,78,84,497.00	10,38,000.00	4,61,89,230.00	95,44,221.00	2,12,78,745.90	3,08,22,966.90	6,25,084.00	20,00,685.10
33	Dementia Science Programme	48,56,387.49	0.00	57,729.00	0.00	2,46,774.00	0.00	2,46,774.00	83,191.00	45,84,151.49
34	Dementia Basic Biology(Dr. Shiv Kumar Sharma)	26,51,197.83	0.00	26,428.00	0.00	0.00	0.00	0.00	50,535.00	26,27,090.83
35	Distributed Information Centre	-2,47,800.00	0.00	2,47,800.00	0.00	0.00	0.00	0.00	0.00	0.00

S. No./ Annx. No.	NAME OF PROJECT	Opening Balance as on 01.04.2022	Grants received during the year 2022-23	Interest/other income earned during the year 2022-23	Capital Exp. during the year 2022-23	Revenue Expenditure during the year 2022-23			Refund of Unspent Balance /Interest	Closing Balance as on 31.03.2023
						Manpower	Others	Total Expenditure		
36	Epilepsy Project of NBRC	53,82,067.30	0.00	0.00	0.00	1,30,869.00		1,30,869.00	0.00	52,51,198.30
37	PDF-SERB-Dr Sandeep Kumar	1,40,015.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,40,015.00
38	PDF-SERB(Soibam Shramchand)	-58,472.00	0.00	0.00	0.00			0.00	0.00	-58,472.00
39	DST- Inspired Fellow (Sriparna Mukherjee)	4,288.00	0.00	0.00	0.00			0.00	0.00	4,288.00
40	TWAS-DBT (Saliu Ibrahim)	11,045.00	0.00	0.00	0.00			0.00	0.00	11,045.00
41	Workshop & Conference(NBRC)	-5,20,940.31	0.00	7,30,940.31	0.00		2,35,058.00	2,35,058.00	0.00	-25,058.00
42	BHAVANI SHANKAR SAHU	9,80,816.00	0.00	41,950.00	0.00		0.00	0.00	0.00	10,22,766.00
43	UNDERSTANDING THE REGULATED SECRETORY PATHWAY AND ITS ROLE REGULATING PHYSIO-METABOLIC FUNCTION- Dr BHAVANI SHANKAR SAHU	12,90,647.60	19,22,000.00	29,637.00	0.00	11,85,000.00	5,62,656.00	17,47,656.00	29,136.00	14,65,492.60
44	ROLE OF EPHRINS/EPH RECEPTORS IN HIV MEDIATED NEUROPATHOGENSIS- DR PANKAJ SETH	10,08,589.57	0.00	0.00	0.00	3,41,005.00	5,48,464.00	8,89,469.00	1,288.00	1,17,832.57
45	ARTIFICIAL INTELLIGENCE - DR PRAVAT K. MANDAL	1,32,125.00	9,21,148.00	0.00	0.00	6,04,204.00	1,91,792.00	7,95,996.00	10,441.00	2,46,836.00
46	CORTEX A NEUROANATOMICAL STUDY- DR SOUMYA	3,28,736.39	6,24,644.00	13,719.00	0.00	0.00	1,54,323.00	1,54,323.00	0.00	8,12,776.39
47	CRISPR-CAS13- DR SOURAV BANERJEE	13,25,458.79	17,80,000.00	15,087.00	0.00	2,32,258.00	12,30,204.00	14,62,462.00	15,087.00	16,42,996.79
48	THROUGH EMOTIONAL PRIMING- DR SHUBHAM	6,58,747.00	0.00	0.00	0.00			0.00	0.00	6,58,747.00
49	DR SWAGATA DEY	17,10,384.00	15,37,015.00	26,110.00	1,69,339.00	10,54,657.00	16,09,126.00	26,63,783.00	0.00	4,40,387.00
50	INSPIRED FELLOW- DR SWAGATA DEY	-32,795.00	0.00	0.00	0.00	0.00	-32,795.00	-32,795.00	0.00	0.00
51	WELLCOME TRUST/DBT INDIA ALLIANCE FELLOW-DR NIVETHIDA T.	25,90,875.33	3,21,184.00	0.00	0.00	3,42,000.00	25,70,058.89	29,12,058.89	0.00	0.44
52	THE WELLCOME TRUST/DST INDIA ALLIANCE EARLY CAREER FELLOW- DR NIVETHIDA T.	22,68,754.04	0.00	0.00	10,00,000.00	1,00,000.00	57,434.00	1,57,434.00	22,68,754.00	-11,57,433.96
53	C V Raman Interest Income Fellow(Dr. Rolland Kipre)	26,543.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26,543.00
54	Banerjee	18,438.00	0.00	0.00	0.00			0.00	0.00	18,438.00
55	Vision Guide Speech Perception- Dr. Arpan Banerjee	5,85,272.00	0.00	0.00	0.00			0.00	0.00	5,85,272.00
56	Nandini C. Singh	60,474.00	0.00	0.00	0.00			0.00	0.00	60,474.00
57	DBT ITPAR Grant-Dr Nandini C. Singh	5,56,234.89	0.00	0.00	0.00			0.00	0.00	5,56,234.89
58	CSIR -Project Dr. Nihar Ranjan Jana	73,089.50	0.00	0.00	0.00			0.00	0.00	73,089.50
59	Tata Innovation Fellowship- Dr. Nihar Ranjan Jana	3,09,758.91	0.00	0.00	0.00			0.00	0.00	3,09,758.91
60	INDO-US & NIH R01 - Dr. Pankaj Seth	-6,31,828.42	0.00	0.00	0.00			0.00	0.00	-6,31,828.42
61	Pankaj Seth	92,588.71	0.00	0.00	0.00			0.00	0.00	92,588.71
62	PDF-SERB(AMIT NASKAR)	-1,28,935.00	0.00	0.00	0.00			0.00	0.00	-1,28,935.00
63	PDF-SERB(Avhok Datuxalu)	45,920.00	0.00	0.00	0.00			0.00	0.00	45,920.00
64	DBT Tata Innovation Fellowship -Dr P.K.Roy	6,67,424.60	0.00	0.00	0.00			0.00	0.00	6,67,424.60
65	Study of Neuronal Regeneration after Injury using Caenorhabditis Elegans-Dr. Anindya Ghosh Roy	96,567.21	10,00,000.00	9,529.00	0.00	3,07,933.00	4,47,165.00	7,55,098.00	0.00	3,50,998.21
66	International Centre for Genetic Engineering and Biotechnology(ICGEB)- Dr BHAVANI SHANKAR SAHU	95,477.29	12,18,470.48	0.00	0.00	0.00	10,67,755.57	10,67,755.57	0.00	2,46,192.20
67	Austin Spectrum Disorders: Genes and the Gut Microbiome: Utilizing Song Birds(Zebra Finches) as a	6,45,349.72	0.00	0.00	0.00	1,39,000.00	7,00,906.00	8,39,906.00	2,21,443.72	-4,16,000.00
68	Exploring Auditory Perception in House Crows using functional Magnetic Resonance Imaging and Neuroanatomical Techniques- DR SOUMYA IYENGAR	8,63,895.56	0.00	9,483.00	9,010.00	3,72,000.00	2,59,030.00	6,31,030.00	0.00	2,33,338.56
69	DST INSPIRE FACULTY AWARD -Dr. XYZ(2020-21)	15,24,000.00	0.00	61,570.00	0.00	0.00	0.00	0.00	0.00	15,85,570.00

S. No./ Annx. No.	NAME OF PROJECT	Opening Balance as on 01.04.2022	Grants received during the year 2022-23	Interest/other income earned during the year 2022-23	Capital Exp. during the year 2022-23	Revenue Expenditure during the year 2022-23			Refund of Unspent Balance/Interest	Closing Balance as on 31.03.2023
						Manpower	Others	Total Expenditure		
70	NPDF-DR. SUMAN SAHA	9,60,000.00	0.00	0.00	0.00	6,44,032.00	1,00,000.00	7,44,032.00	0.00	2,15,968.00
71	LABORATORY ANIMALS LTD (DR. INDERJEET)	4,37,866.88	4,00,000.00	8,72,460.00	1,82,834.00	0.00	15,02,398.00	15,02,398.00	0.00	25,094.88
72	ICMR-Deepali Singh	95,801.00	97,333.00	73,793.00	0.00	1,39,939.00	90,297.00	2,30,236.00	0.00	36,691.00
73	ICMR-NEW PROJECT(2021-22)	6,24,644.00	0.00			0.00	6,24,644.00	6,24,644.00	0.00	0.00
74	ICL-Arpan Banerjee	0.00	23,07,885.00					0.00		23,07,885.00
75	SNBI-B S Sahu	0.00	19,26,500.00	18,279.00			5,91,896.00	5,91,896.00		13,52,883.00
76	SARS-COV2-Pankaj Seth	0.00	9,60,000.00				7,25,825.00	7,25,825.00		2,34,175.00
77	ICMR-Tipu Khan	0.00	7,82,077.00			4,89,904.00	15,000.00	5,04,904.00		2,77,173.00
	Total (A)	9,78,96,766.78	5,56,05,756.48	33,54,908.31	4,82,88,646.00	1,93,54,874.00	3,77,66,735.36	5,71,21,609.36	1,80,30,371.72	3,34,16,804.49
1	DELCON E-LIBRARY CONSORTIUM (B)*	8,30,73,852.45	82,92,03,000.00	8,21,108.00	3,09,531.00	16,88,129.00	90,44,47,220.02	90,61,35,349.02	22,48,918.00	44,02,162.43
	Grand Total (A+B)	18,09,70,619.23	88,48,06,756.48	41,76,016.31	4,85,98,177.00	2,10,43,003.00	94,22,13,955.38	96,32,56,958.38	2,02,79,289.72	3,78,18,966.92

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

Prof. Krishanu Ray
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

As per our separate report of even date attached

Sunil Kumar Parmar
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-1

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DBT E- LIBRARY CONSORTIUM (DeLCON)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
23,88,51,744.84	**Opening Balance**	8,30,73,852.45		**Capital Expenditure**	
41,84,72,640.00	Grant-in-Aid	90,98,11,501.81		Equipment (Delcon)	3,09,531.00
	Less: Return of unspent grant	(8,06,10,501.81)		**Funiture & fixtures**	
				Revenue expenditure	
20,67,681.00	Interest Income	8,21,108.00	57,09,80,719.39	E-Library Journal Cost	90,41,77,081.02
	other Income			Computer/software/peripheral	44,514.00
			10,91,788.00	Manpower (Delcon) expenses	16,88,129.00
				Other Meeting Expenses	3,000.00
			2,46,612.00	Contingency	1,34,772.00
			15,377.00	Travelling Expenses (Elibrary Consortia)	87,853.00
			39,83,717.00	Int. refund to DBT	22,48,918.00
	Closing Balance		**8,30,73,852.45**	**Closing Balance**	**44,02,162.43**
65,93,92,065.84	TOTAL	91,30,95,960.45		TOTAL	91,30,95,960.45

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

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Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN 006740C

Sunil Kumar
Partner
Membership No. 546926
Date: 11/10/2023
Place: New Delhi

Annexure- 2

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
CSIR JAPANESE ENCCEPHALITIES DR ANIRBAN BASU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
1,06,867.00	**Opening Balance**	**1,77,708.96**		**Capital Expenditure**	
3,76,040.00	Grant-in-Aid	-		Lab Equipment	
3,163.00	Interest	-		**Revenue Expenditure**	
			3,02,546.00	Consumables(Lab)	1,74,546.00
				Manpower	
			5,815.04	Contingency	-
				Travel / Workshop	
				Fellowship	
				Overhead	-
				Interest Refunded	3,163.00
	Closing Balance		1,77,708.96	**Closing Balance**	(0.04)
4,86,070.00	TOTAL	1,77,708.96	4,86,070.00	TOTAL	1,77,708.96

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 3

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Elucidating the role of long non coding RNAs (lnCRNAs) in neuronal cell death during Japanese Encephalitis (JE)- (Dr. Anirban Basu)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
50,702.00	**Opening Balance**	(30,236.00)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
			80,938.00	Consumables (Lab)	-
				Manpower	
				Travel	
				Overhead	
				Contingency	
	Closing Balance		(30,236.00)	**Closing Balance**	(30,236.00)
50,702.00	**TOTAL**	(30,236.00)	50,702.00	**TOTAL**	(30,236.00)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-0067

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 4

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
MicroRNA mediated Reg. of Neural stem (Dr. Anirban Basu)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
11,40,610.62	**Opening Balance**	14,054.62		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
			10,53,417.00	Consumables (Lab)	-
				Manpower	
				Travel	
			47,204.00	Int. refund to DBT	-
			25,935.00	Contingency	-
	Closing Balance*		14,054.62	**Closing Balance**	14,054.62
11,40,610.62	**TOTAL**	**14,054.62**	**11,40,610.62**	**TOTAL**	**14,054.62**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-5

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
TATA INNOVATION FELLOWSHIP AWARD- Dr. ANIRBAN BASU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(5,775.53)	**Opening Balance**	(5,775.53)		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
	Interest Income			**Revenue Expenditure**	
-		-	-	Consumables(Lab)	-
			-	Manpower	-
			-	Travel / Workshop	-
			-	Contingency	-
			-	Fellowship	-
			-	Refund to DBT	-
	Closing Balance		(5,775.53)	**Closing Balance**	(5,775.53)
(5,775.53)	**TOTAL**	(5,775.53)	(5,775.53)	**TOTAL**	(5,775.53)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 6

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Therapeutic Role DBT (Dr. Anirban Basu)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
8,38,132.96	**Opening Balance**	63,731.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
13,707.00	Interest Income	-		**Revenue Expenditure**	
			7,79,490.00	Consumables (Lab)	5,815.00
				Manpower	
				Travel	
				Overhead	
			8,618.96	Contingency	-
			-	Refunded (Grant+Interest)	57,916.00
	Closing Balance*		63,731.00	**Closing Balance**	-
8,51,839.96	**TOTAL**	63,731.00	8,51,839.96	**TOTAL**	63,731.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
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हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI

Sunil Kumar
Partner
Membership No: 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 7

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
J C BOSE FELLOWSHIP (Dr. Anirban Basu)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	**17,00,000.00**		**Capital Expenditure**	
19,00,000.00	Grant-in-Aid	7,00,000.00		Lab Equipment	
	Interest Income	28,682.00		**Revenue Expenditure**	
				Consumables (Lab)	
			1,00,000.00	Fellowship	3,00,000.00
				Travel	
			1,00,000.00	Overhead	30,000.00
				Contingency	20,51,970.00
	Closing Balance*		**17,00,000.00**	**Closing Balance**	**46,712.00**
19,00,000.00	**TOTAL**	**24,28,682.00**	**19,00,000.00**	**TOTAL**	**24,28,682.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 8

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Comparative Mapping of Common Mental Disorders (CMD) Over Lifespan- Dr Arpan Banerjee
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
2,47,50,681.00	Opening Balance	1,67,39,733.00		**Capital Expenditure**	
	Grant-in-Aid	1,31,18,480.00	52,19,743.00	Lab Equipment	5,77,753.00
	Less: Return of unspent grant	(1,31,18,480.00)			
2,70,107.00	Interest Income	-		**Revenue Expenditure**	
				Consumables(Lab)	23,882.00
			30,61,312.00	Manpower	21,70,988.00
				Contingency	15,395.00
				Travel	
				Fellowship	
				Refund of unspent Grant	1,31,18,480.00
				Overhead	
				Interest refunded	8,33,235.00
	Closing Balance		1,67,39,733.00	**Closing Balance**	-
2,50,20,788.00	**TOTAL**	1,67,39,733.00	2,50,20,788.00	**TOTAL**	1,67,39,733.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122051 / Manesar-122051

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 516026
Date: 11/10/2023
Place: New Delhi

Annexure-9

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA

Early diagnosis of Structural and Functional Decline in Brain Circuits stemming from Traumatic injuries in professional athelets playing contact sports (MYASDS):- Dr Arpan Banerjee

RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
14,42,723.00	**Opening Balance**	6,91,538.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
36,151.00	Interest Income	-		**Revenue Expenditure**	
			6,88,975.00	Consumables (Lab)	4,24,117.00
			52,258.00	Manpower	-
				Travel	
				Overhead	
			46,103.00	Contingency	-
	Closing Balance*		6,91,538.00	**Closing Balance**	2,67,421.00
14,78,874.00	TOTAL	6,91,538.00	14,78,874.00	TOTAL	6,91,538.00

TANMOY BHATTACHARYYA
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PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN 004740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 10

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Dementia Tissue MRI studies (Dr. Dipanjan Roy)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
17,26,831.00	**Opening Balance**	**17,34,635.00**		**Capital Expenditure**	
	Grant-in-Aid	17,09,000.00		Lab Equipment	
	Less: Return of unspent grant	(17,09,000.00)		**Revenue Expenditure**	
				Consumables (Lab)	
25,635.00	Interest Income	**17,090.00**		Manpower	
				Travel	
			-	Overhead	
				Contingency	
			17,831.00	Interest refunded	25,635.00
	Closing Balance*		**17,34,635.00**	**Closing Balance**	**17,26,090.00**
17,52,466.00	**TOTAL**	17,51,725.00	17,52,466.00	**TOTAL**	17,51,725.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No: 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 11

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Oscillatory network dynamics DST (Dr. Dipanjan Roy)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
81,783.00	**Opening Balance**	81,783.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
				Consumables (Lab)	
			-	Manpower	
				Travel	
				Overhead	
			-	Contingency	
				Interest returned	
	Closing Balance*		81,783.00	**Closing Balance**	81,783.00
81,783.00	TOTAL	81,783.00	81,783.00	TOTAL	81,783.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

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Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
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T. BHATTACHARYYA
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National Brain Research Centre
मानेसर/Manesar-122051

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-0067406

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 12

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Role of default mode brain network in normal cognative function "Ramalingaswami Fellowship":- Dr. Dipanjan Roy
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
2,45,459.47	**Opening Balance**	18,114.47		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-	Interest Income			**Revenue Expenditure**	
				Consumables (Lab)	
			84,933.00	Manpower	
				Travel	
			-	Overhead /other Adjusted	
			1,42,412.00	Contingency	
	Closing Balance*		18,114.47	**Closing Balance**	18,114.47
2,45,459.47	**TOTAL**	18,114.47	2,45,459.47	**TOTAL**	18,114.47

TANMOY BHATTACHARYYA
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PROF. KRISHANU RAY
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हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 13

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
IMPLICATIONS IN TUMOR PROGRESSION- Dr. ELLORA SEN
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
10,45,345.49	**Opening Balance**	6,20,816.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-	Interest Income			**Revenue Expenditure**	
-		-	3,96,075.00	Consumables(Lab)	
				Manpower	
				Travel / Workshop	
			16,120.49	Contingency	
			-	Fellowship	
				Refund of Unspent Grant to DBT	6,20,816.00
			12,334.00	Int. refund to DBT	
	Closing Balance		6,20,816.00	**Closing Balance**	-
10,45,345.49	**TOTAL**	6,20,816.00	10,45,345.49	**TOTAL**	6,20,816.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

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Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740N

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 14

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
NATIONAL BIOSCIENCE AWARD- Dr. ELLORA SEN
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
26,403.29	**Opening Balance**	26,403.29		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	
	Interest income				
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel / Workshop	
			-	Fellowship	
			-	Overhead	
	Closing Balance		26,403.29	**Closing Balance**	26,403.29
26,403.29	TOTAL	26,403.29	26,403.29	TOTAL	26,403.29

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
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T. BHATTACHARYYA
Chief Administrative Officer
National Brain Research Centre
Manesar-122051 / Manesar-122051
Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

FRN-000740C
NEW DELHI

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 15

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
NON CANONICAL FUNCTION(SERB)- Dr. ELLORA SEN
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	**11,80,000.00**		**Capital Expenditure**	
12,70,000.00	Grant-in-Aid	-	-	Lab Equipment	
	Interest income	18,516.00			
-		-		**Revenue Expenditure**	
				Consumables(Lab)	9,99,800.00
				Manpower	
				Contingency	
				Travel / Workshop	
			-	Fellowship	1,65,000.00
			90,000.00	Overhead	
	Closing Balance		**11,80,000.00**	**Closing Balance**	**33,716.00**
12,70,000.00	**TOTAL**	**11,98,516.00**	**12,70,000.00**	**TOTAL**	**11,98,516.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006748C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 16

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Neurobiology of Dyslexia Brain & Behavior-Dr.Nandini C.Singh
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
6,14,968.00	**Opening Balance**	6,14,968.00		**Capital Expenditure**	
	Grant-in-Aid	-		Lab Equipment	
	Interest Earned			**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Interest Returned	
				Transter to RMLH	
	Closing Balance		6,14,968.00	**Closing Balance**	6,14,968.00
6,14,968.00	**TOTAL**	6,14,968.00	6,14,968.00	**TOTAL**	6,14,968.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
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National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure: 17

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA

Role of FAM43A(SERB)(DR PANKAJ SETH)

RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	5,58,000.00		**Capital Expenditure**	
5,58,000.00	Grant-in-Aid			Lab Equipment	
	Interest Income	12,099.00		**Revenue Expenditure**	
				Consumables (Lab)	14,213.00
				Manpower	
				Travel	
				Unspent Amount refunded to DBT	
				Overhead	41,334.00
				Contingency	
	Closing Balance*		5,58,000.00	**Closing Balance**	5,14,552.00
5,58,000.00	TOTAL	5,70,099.00	5,58,000.00	TOTAL	5,70,099.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
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For Kumar Khare & Co.
Chartered Accountants
FRN 006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 18

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Dyslexia Linked RNA (Dr. Pankaj Seth)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
7,97,811.05	**Opening Balance**	7,97,811.05		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Overhead	
				Contingency	
				Interest Returned to DST	
	Closing Balance*		7,97,811.05	**Closing Balance**	7,97,811.05
7,97,811.05	**TOTAL**	7,97,811.05	7,97,811.05	**TOTAL**	7,97,811.05

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

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मुख्य प्रशासनिक अधिकारी
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PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 19

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Effect of hypoxia on different neural cell types in vitro- a model to design therapeutic strategies against cerebral palsy in preterm infants:- Dr. Pankaj Seth
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
7,36,580.30	**Opening Balance**	(90,215.87)		**Capital Expenditure**	
-	Grant-in-Aid	12,23,003.00	-	Lab Equipment	
11,632.00	Interest Income	-		**Revenue Expenditure**	
			5,53,273.17	Consumables (Lab)	
			2,64,194.00	Manpower	
			3,568.00	Travel	
				Overhead	1,00,000.00
			471.00	Contingency	20,600.00
			16,922.00	Int. Refund to DBT	11,632.00
	Closing Balance*		(90,215.87)	**Closing Balance**	**10,00,555.13**
7,48,212.30	**TOTAL**	11,32,787.13	7,48,212.30	**TOTAL**	11,32,787.13

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As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 20

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Hypoxia Induced Changes in Blood Brain Barrier:- Dr. Pankaj Seth
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
10,34,526.92	**Opening Balance**	42,877.92		**Capital Expenditure**	
-	Grant-in-Aid			Lab Equipment	
-	Interest Income	1,657.00		**Revenue Expenditure**	
			6,05,204.00	Consumables (Lab)	
			3,47,194.00	Manpower	10,290.00
			8,914.00	Travel	
			15,358.00	Int. refund to DBT	1,657.00
			14,979.00	Contingency	
				Refund of unspent grant	32,588.00
	Closing Balance*		42,877.92	**Closing Balance**	(0.08)
10,34,526.92	TOTAL	44,534.92	10,34,526.92	TOTAL	44,534.92

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122051
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-21

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
A CROSS-CULTURE PERSPECTIVE (DBT-NETHERLANDS) -Dr. PRAVAT KUMAR MANDAL
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(4,49,027.00)	**Opening Balance**	3,21,147.00		**Capital Expenditure**	
15,40,000.00	Grant-In-Aid	3,05,331.00		Lab. Equipment	
	Less: Return of unspent grant	(3,05,331.00)			
	Adjusted Amount			**Recurring Expenditure**	
	Interest Income earned		39,287.00	Contingency	6,310.00
	Adjusted Amount			Travel	18,459.00
			7,30,539.00	Manpower/Salaries	
				Refund of unspent grant	11,847.00
			-	Int. Refud to DBT	
	Closing Balance*		3,21,147.00	**Closing Balance**	2,84,531.00
10,90,973.00	**TOTAL**	3,21,147.00	10,90,973.00	**TOTAL**	3,21,147.00

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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000749C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 22

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
CHARACTERIZING BIOMARKERS OF ALZHEIMER'S DISEASE :A LONGITUDIANAL MULTII MODAL BRAIN IMAGING STUDY (BRAIN IMAGINING)
Dr. PRAVAT KUMAR MANDAL
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(10,011.50)	**Opening Balance**	(10,011.50)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income				
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel / Workshop	
				Fellowship	
				Overhead	
				Patient Brain Imaging study	
	Closing Balance		(10,011.50)	**Closing Balance**	(10,011.50)
(10,011.50)	**TOTAL**	(10,011.50)	(10,011.50)	**TOTAL**	(10,011.50)

TANMOY BHATTACHARYYA
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Prof. Krishanu Ray
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 23

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Dementia Imaging Studies(Dr. Pravat Kumar Mandal)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
8,23,440.00	**Opening Balance**	**4,56,853.00**	-	**Capital Expenditure**	
	Grant-in-Aid	3,92,667.00	-	Lab Equipment	1,60,480.00
	Less: Return of unspent grant	(3,92,667.00)		**Revenue Expenditure**	
7,643.00	Interest Income	**4,350.00**		Consumables (Lab)	
			3,57,264.00	Manpower	
				Travel	50,000.00
			-	Overhead	
				Contingency	71,096.00
			16,966.00	Int. refund to DBT	7,643.00
	Closing Balance*		**4,56,853.00**	**Closing Balance**	**1,71,984.00**
8,31,083.00	**TOTAL**	**4,61,203.00**	**8,31,083.00**	**TOTAL**	**4,61,203.00**

TANMOY BHATTACHARYYA
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Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-24

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Novel Imaging Dignostics Indo-Australia Grant (Dr. Pravat Kumar Mandal)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
11,79,085.00	**Opening Balance**	4,50,462.00		**Capital Expenditure**	
22,90,000.00	Grant-in-Aid			Lab Equipment	
5,870.00	Interest Income			**Revenue Expenditure**	
			1,16,134.00	Consumables (Lab)	
			20,04,111.00	Manpower	
			2,00,000.00	Travel	
				Overhead	
			51,460.00	Contingency	
			6,46,918.00	Other Cost	
			5,870.00	Int. Refund to DBT	
	Closing Balance*		4,50,462.00	**Closing Balance**	4,50,462.00
34,74,955.00	**TOTAL**	4,50,462.00	34,74,955.00	**TOTAL**	4,50,462.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-25

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
SPECIFIC BRAIN TEMPLATE DST Dr. PRAVAT KUMAR MANDAL
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(3,67,110.50)	**Opening Balance**	(3,67,110.50)		**Capital Expenditure**	
	Grant-In-Aid		-	Lab. Equipment	
	Interest Income			**Recurring Expenditure**	
				Contingency	
				Travel	
				Fellowship	
				Manpower/Salaries	
				Other cost	
				Overhead	
				Interest Returned	
	Closing Balance*		(3,67,110.50)	**Closing Balance**	(3,67,110.50)
(3,67,110.50)	**TOTAL**	(3,67,110.50)	(3,67,110.50)	**TOTAL**	(3,67,110.50)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
Chief Administrative Officer
National Brain Research Centre
Manesar-122052

PROF. KRISHANU RAY
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प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000710C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 26

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
TATA INNOVATION FELLOWSHIP AWARD- Dr. PRAVAT MANDAL
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(5,212.00)	**Opening Balance**	(5,212.00)		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
	Interest Income			**Revenue Expenditure**	
-		-	-	Consumables(Lab)	-
			-	Manpower	-
			-	Travel / Workshop	-
				Contingency	
			-	Fellowship	
			-	Overhead	-
	Closing Balance		-	Int. refund to DBT	
			(5,212.00)	**Closing Balance**	(5,212.00)
(5,212.00)	TOTAL	(5,212.00)	(5,212.00)	TOTAL	(5,212.00)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
Manesar-122051 / Manesar-122051

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-27

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
CRSPRI SYSTEM- Dr. SOURAV BANARJEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(7,25,783.32)	**Opening Balance**	(7,47,783.32)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
				Consumables(Lab)	
			22,000.00	Manpower	
				Travel / Workshop	
				Contingency	
				Fellowship	
				Overhead	
	Closing Balance		(7,47,783.32)	**Closing Balance**	(7,47,783.32)
(7,25,783.32)	TOTAL	(7,47,783.32)	(7,25,783.32)	TOTAL	(7,47,783.32)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 28

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DBT MIRNA MEDITATE CONTROL- Dr. SOURAV BANARJEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
1,89,009.97	**Opening Balance**	1,89,009.97		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
-		-		Consumables(Lab)	
				Manpower	
				Travel / Workshop	
				Contingency	
			-	Fellowship	
			-	Overhead	
	Closing Balance		1,89,009.97	**Closing Balance**	1,89,009.97
1,89,009.97	**TOTAL**	1,89,009.97	1,89,009.97	**TOTAL**	1,89,009.97

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CHIEF ADMINISTRATIVE OFFICER

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DIRECTOR

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Prof. Krishanu Ray
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Chief Administrative Officer
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For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 29

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Regulation of fear memory formation by long non-coding RNAs and RNA binding protiens: Mechanism of combinational control(SERB):- Dr. Sourav Banerjee
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
4,70,621.00	**Opening Balance**	2,07,562.00		**Capital Expenditure**	
14,00,000.00	Grant-in-Aid		-	Lab Equipment	
10,499.00	Interest Income			**Revenue Expenditure**	
			11,48,565.00	Consumables (Lab)	21,752.00
			3,22,000.00	Manpower	
			43,023.00	Travel	2,263.00
			1,00,000.00	Overhead	
			59,970.00	Contingency	
	Closing Balance*		**2,07,562.00**	**Closing Balance**	**1,83,547.00**
18,81,120.00	**TOTAL**	2,07,562.00	18,81,120.00	**TOTAL**	2,07,562.00

TANMOY BHATTACHARYYA
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For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 30

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
INNOVATION IN SCIENCE PURSUIT FOR INSPIRED RESEARCH (DST -INSPIRE)- DR YOGITA
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
2,22,009.18	**Opening Balance**	2,22,009.18		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
			-	Manpower	
				Contingency	
				Travel / Workshop	
				Fellowship	
				Overhead	
	Closing Balance		2,22,009.18	**Closing Balance**	2,22,009.18
2,22,009.18	**TOTAL**	2,22,009.18	2,22,009.18	**TOTAL**	2,22,009.18

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हरियाणा/Haryana

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For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 31

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DST-CSRI (Dr. Prem Chand)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
28,916.16	**Opening Balance**	28,916.16		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income			**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Contingency	
				Overhead	
				Fellowship	
				Interest Returned to DST	
	Closing Balance		28,916.16	**Closing Balance**	28,916.16
28,916.16	TOTAL	28,916.16	28,916.16	TOTAL	28,916.16

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

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National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI CHARTERED ACCOUNTANTS

Sunil Kumar
Partner
Membership No: 516026
Date: 11/10/2023
Place: New Delhi

Annexure- 32

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Centre for Excellence for Epilepsy (Phase-II)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
7,27,52,455.00	**Opening Balance**	**4,07,16,269.00**		**Capital Expenditure**	
-	Grant-in-Aid	3,78,84,497.00	5,29,216.00	Lab Equipment	4,61,89,230.00
6,25,884.00	Interest Income			**Revenue Expenditure**	
5,16,000.00	User Charges(MEG test)	10,38,000.00	2,47,84,916.00	Consumables (Lab)	1,94,66,979.90
			69,37,649.00	Manpower	95,44,221.00
			21,237.00	Travel	41,695.00
			62,815.00	Maintenance	17,37,185.00
			17,146.00	Contingency	32,886.00
			78,868.00	Journal & Books	
			7,46,223.00	Int. refund to DBT	6,25,884.00
	Closing Balance*		**4,07,16,269.00**	**Closing Balance**	**20,00,685.10**
7,38,94,339.00	TOTAL	7,96,38,766.00	7,38,94,339.00	TOTAL	7,96,38,766.00

TANMOY BHATTACHARYYA
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T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 33

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Dementia Science Programme
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
89,56,266.32	**Opening Balance**	**48,56,387.49**		**Capital Expenditure**	
-	Grant-in-Aid	45,25,343.49	31,89,464.83	Lab Equipment	
	Less: Return of unspent grant	(45,25,343.49)		**Revenue Expenditure**	
			1,44,443.00	Consumables (Lab)	
83,191.00	Interest Income	**57,729.00**	7,26,398.00	Manpower	2,46,774.00
			581.00	Travel	
			9,572.00	Contingency	
				Overhead	
				PMAG Meeting	
			1,12,611.00	Int. Refund to DBT	83,191.00
	Closing Balance*		**48,56,387.49**	**Closing Balance**	**45,84,151.49**
90,39,457.32	**TOTAL**	**49,14,116.49**	**90,39,457.32**	**TOTAL**	**49,14,116.49**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
Chief Administrative Officer
National Brain Research Centre
Manesar-122051 / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 34

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Dementia Basic Biology (Dr. Shiv Kumar Sharma)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
40,07,933.50	**Opening Balance**	**26,51,197.83**		**Capital Expenditure**	
	Grant-in-Aid	26,00,662.83	13,02,113.67	Lab Equipment	
	Less: Return of unspent grant	(26,00,662.83)		**Revenue Expenditure**	
50,535.00	Interest Income	**26,428.00**	31,372.00	Consumables (Lab)	
				Manpower	
			1,162.00	Travel	
				Overhead	
			29,917.00	Contingency	
			42,706.00	Int. Refund to DBT	50,535.00
	Closing Balance*		**26,51,197.83**	**Closing Balance**	**26,27,090.83**
40,58,468.50	TOTAL	26,77,625.83	40,58,468.50	TOTAL	26,77,625.83

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
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राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
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हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 35

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DISTRIBUTED INFORMATION CENTRE PROJECT
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(2,47,800.00)	**Opening Balance**	(2,47,800.00)		**Capital Expenditure**	
-	Grant-in-Aid			Computer and Communication Equipment	
	Interest Earned			Software	
	Written off	2,47,800.00	-	**Revenue Expenditure**	
			-	Contingency & Maintenance	
				Printing & Stationery	
				Travelling Expenses	
				Training	
			-	Salary & Wages	
			-	Repair & Maintenance (Equip)	
				Journals Subscription/ Database	
				Telephone & ISDN charges	
				Traineeship	
				Studentship	
			-	Internet & bandwitdth Charges	-
	Closing Balance*		(2,47,800.00)	**Closing Balance**	-
(2,47,800.00)	TOTAL	-	(2,47,800.00)	TOTAL	-

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-0067400

FRN-0067400C NEW DELHI

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 36

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
EPILEPSY PROJECT
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
53,82,067.30	**Opening Balance**	53,82,067.30		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest on FDR			Bioinformatics facility	
				Revenue Expenditure	
				Contingency	
				Consumables	
				Manpower	1,30,869.00
				Overhead	
				Travel	
	Closing balance		53,82,067.30	**Closing Balance**	**52,51,198.30**
53,82,067.30	TOTAL	53,82,067.30	53,82,067.30	TOTAL	**53,82,067.30**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
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T. BHATTACHARYYA
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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 541020
Date: 11/10/2023
Place: New Delhi

Annexure- 37

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
PDF-SERB (Sandeep Kumar)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
1,40,015.00	**Opening Balance**	1,40,015.00		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
-	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	-
				Travel	-
				Contingency/Research Grant	
				Overhead	
				Fellowship	
	Closing Balance*		-	**Closing Balance**	1,40,015.00
1,40,015.00	TOTAL	1,40,015.00	1,40,015.00	TOTAL	1,40,015.00

TANMOY BHATTACHARYYA
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National Brain Research Centre
मानेसर/Manesar-122051
हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 38

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
PDF-SERB (Soibam Shyamchand)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(58,472.00)	**Opening Balance**	(58,472.00)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
			-	Research Grant/Contingency	
				Overhead	
			-	Fellowship	
	Closing Balance*		(58,472.00)	**Closing Balance**	(58,472.00)
(58,472.00)	**TOTAL**	(58,472.00)	(58,472.00)	**TOTAL**	(58,472.00)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

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T. BHATTACHARYYA
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 39

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DST- Inspired Fellow (Sriparna Mukherjee)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
4,288.00	**Opening Balance**	4,288.00		**Capital Expenditure**	
-	Grant-in-Aid			Lab Equipment	
-	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Contingency	
				Overhead	
			-	Fellowship	
	Closing Balance*		4,288.00	**Closing Balance**	4,288.00
4,288.00	**TOTAL**	4,288.00	4,288.00	**TOTAL**	4,288.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 40

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
TWAS-DBT (Saliu Ibrahim)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
11,045.00	**Opening Balance**	11,045.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Contingency	
				Overhead	
			-	Fellowship	
	Closing Balance*		11,045.00	**Closing Balance**	11,045.00
11,045.00	**TOTAL**	11,045.00	11,045.00	**TOTAL**	11,045.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
[illegible]-122051 / Manesar-122051
[illegible] / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
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राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 41

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Workshop & Conference (NBRC)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(5,20,940.31)	**Opening Balance**	(5,20,940.31)			
-	Other Worshop fund balances (705940.31)				
	SNIP Conference 185000.00				
-	Sponsorship fee-SNIP 2022	25,000.00	-	TA/DA and other Meeting Expenses-SNIP	2,35,058.00
	Interest Income/Others				-
	Written-off A/c	7,05,940.31			
	Closing Balance*		(5,20,940.31)	**Closing Balance**	(25,058.00)
(5,20,940.31)	TOTAL	2,10,000.00	(5,20,940.31)	TOTAL	2,10,000.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
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हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 540926
Date: 11/10/2023
Place: New Delhi

Annexure- 42

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
IBRO RETURNED HOME START-UP GRANT-DR BHAVANI SHANKAR SAHU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
13,39,062.00	**Opening Balance**	9,80,816.00		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
	Interest Income	41,950.00			
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
			3,58,246.00	Contingency	
				Travel	
				Fellowship	
				Overhead/others	
	Closing Balance*		9,80,816.00	**Closing Balance**	10,22,766.00
13,39,062.00	TOTAL	10,22,766.00	13,39,062.00	TOTAL	10,22,766.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 43

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
UNDERSTANDING THE REGULATED SECRETORY PATHWAY AND ITS ROLE REGUATING PHYSIO-METABOLIC FUNCTION- Dr BHAVANI SHANKAR SAHU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
12,32,511.47	**Opening Balance**	12,90,647.60		**Capital Expenditure**	
18,69,448.00	Grant-in-Aid	23,18,269.60	-	Lab Equipment	-
	Less: Return of unspent grant	(3,96,269.60)			
-		-		**Revenue Expenditure**	
7,158.00	Interest Income	29,637.00		Consumables(Lab)	
-		-		Manpower	
			3,59,996.87	Contingency	5,62,656.00
				Travel	
			14,32,506.00	Fellowship	11,85,000.00
			25,967.00	Int. refund to DBT	29,136.00
	Closing Balance*		**12,90,647.60**	**Closing Balance**	**14,65,492.60**
31,09,117.47	**TOTAL**	32,42,284.60	**31,09,117.47**	**TOTAL**	32,42,284.60

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 44

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
ROLE OF EPHRINS/EPH RECEPTORS IN HIV MEDIATED NEUROPATHOGENSIS- DR PANKAJ SETH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
5,55,614.57	**Opening Balance**	10,08,589.57		**Capital Expenditure**	
13,02,000.00	Grant-in-Aid	7,44,492.37		Lab Equipment	
	Less: Return of unspent grant	(7,44,492.37)			
1,288.00	Interest Income			**Revenue Expenditure**	
			7,01,099.00	Consumables(Lab)	5,27,442.00
			54,767.00	Manpower	3,41,005.00
			3,297.00	Contingency	21,022.00
			-	Travel	
			41,150.00	Int. Refud to DBT	1,288.00
				Fellowship	
			50,000.00	Overhead	
	Closing Balance*		10,08,589.57	**Closing Balance**	1,17,832.57
18,58,902.57	TOTAL	10,08,589.57	18,58,902.57	TOTAL	10,08,589.57

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 45

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
ARTIFICIAL INTELLIGENCE FOR EARLY PREDICTIVE DIAGNOSIS OF ALZHEIMER'S DISEASE USING MULTI-MODEL IMAGING DATA- DR PRAVAT K. MANDAL
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
7,31,918.00	**Opening Balance**	1,32,125.00		**Capital Expenditure**	
14,44,800.00	Grant-in-Aid	11,00,000.00	8,95,686.00	Lab Equipment	
	Less: Return of unspent grant	(1,78,852.00)			
10,441.00	Interest Income				
		-		**Revenue Expenditure**	
			70,182.00	Consumables(Lab)	19,463.00
			8,45,045.00	Manpower	6,04,204.00
			33,453.00	Contingency	12,637.00
			83,868.00	Travel	1,59,692.00
				Fellowship	
			1,26,800.00	Overhead	
			-	Int. refund to DBT	10,441.00
	Closing Balance*		**1,32,125.00**	**Closing Balance**	**2,46,836.00**
21,87,159.00	**TOTAL**	**10,53,273.00**	**21,87,159.00**	**TOTAL**	**10,53,273.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
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निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 540026
Date: 11/10/2023
Place: New Delhi

Annexure- 46

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
THE SENSITIVE PERIOD OF THE HUMAN AUDITORY CORTEX A NEUROANATOMICAL STUDY- DR SOUMYA IYENGAR
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
8,34,640.63	**Opening Balance**	3,28,736.39		**Capital Expenditure**	
	Grant-in-Aid	6,24,644.00	-	Lab Equipment	-
-	Interest Income	13,719.00			
		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
			5,05,904.24	Contingency	1,24,052.00
				Travel	
				Fellowship	
				Overhead	30,271.00
	Closing Balance*		3,28,736.39	**Closing Balance**	**8,12,776.39**
8,34,640.63	TOTAL	9,67,099.39	8,34,640.63	TOTAL	9,67,099.39

TANMOY BHATTACHARYYA
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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
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हरियाणा / Haryana

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Prof. Krishanu Ray
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National Brain Research Centre
मानसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546020
Date: 11/10/2023
Place: New Delhi

Annexure- 47

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
CRISPR-CAS13- MEDIATED ENGINEERING OF ENDOGENOUS LONG NON-CODING RNAs FOR FLUORESCENT TAGGING TO STUDY RNA DYNAMICS- DR SOURAV BANERJEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
22,47,724.00	**Opening Balance**	13,25,458.79		**Capital Expenditure**	
13,16,523.00	Grant-in-Aid	27,34,915.79	16,51,161.21	Lab Equipment	
-	Less: Return of unspent grant	(9,54,915.79)			
-	Interest Income	**15,087.00**		**Revenue Expenditure**	
			2,02,788.00	Consumables(Lab)	11,24,150.00
			2,05,833.00	Manpower	2,32,258.00
			24,067.00	Contingency	35,189.00
			46,893.00	Travel	20,865.00
				Fellowship	
			50,000.00	Overhead	50,000.00
			58,046.00	Int. refund	15,087.00
	Closing Balance*		13,25,458.79	**Closing Balance**	16,42,996.79
35,64,247.00	TOTAL	31,20,545.79	35,64,247.00	TOTAL	31,20,545.79

TANMOY BHATTACHARYYA
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PROF. KRISHANU RAY
DIRECTOR

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निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-0067400

Sunil Kumar
Partner
Membership No. 546028
Date: 11/10/2023
Place: New Delhi

Annexure- 48

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
EEG CORRELATES OF INSIGHT AND ITS FACILITATING THROUGH EMOTIONAL PRIMING- DR SHUBHAM KUMAR
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
6,58,747.00	**Opening Balance**	6,58,747.00	-	**Capital Expenditure**	-
	Grant-in-Aid			Lab Equipment	
	Interest Income	-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Fellowship	
				Overhead	
	Closing Balance*		6,58,747.00	**Closing Balance**	6,58,747.00
6,58,747.00	TOTAL	6,58,747.00	6,58,747.00	TOTAL	6,58,747.00

TANMOY BHATTACHARYYA
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PROF. KRISHANU RAY
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Chief Administrative Officer
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National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 5[illegible]020
Date: 11/10/2023
Place: New Delhi

Annexure- 49

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
THE WELLCOME TRUST/DBT INDIA ALLIANCE EARLY CAREER FELLOW- DR SWAGATA DEY
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
31,41,239.00	**Opening Balance**	**17,10,384.00**		**Capital Expenditure**	
79,897.00	Grant-in-Aid	15,37,015.00	27,801.00	Lab Equipment	1,69,339.00
49,009.00	Interest Income	26,110.00			
				Revenue Expenditure	
			3,77,203.00	Consumables(Lab)	13,24,814.00
				Manpower	17,857.00
				Contingency	
				Travel	
			10,36,800.00	Fellowship	10,36,800.00
			1,17,957.00	Overhead	2,84,312.00
	Closing Balance*		**17,10,384.00**	**Closing Balance**	**4,40,387.00**
32,70,145.00	**TOTAL**	**32,73,509.00**	**32,70,145.00**	**TOTAL**	**32,73,509.00**

TANMOY BHATTACHARYYA
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 50

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
INSPIRED FELLOW- DR SWAGATA DEY
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	(32,795.00)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income				
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
			32,795.00	Contingency	(32,795.00)
				Travel	
				Fellowship	
				Overhead	
	Closing Balance*		(32,795.00)	**Closing Balance**	-
-	TOTAL	(32,795.00)	-	TOTAL	(32,795.00)

TANMOY BHATTACHARYYA
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T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

KUMAR KHARE & CO. FRN-006740C NEW DELHI CHARTERED ACCOUNTANTS

Annexure- 51

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
THE WELLCOME TRUST/DBT INDIA ALLIANCE EARLY CAREER FELLOW- DR NIVETHIDA T.
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
6,11,983.00	**Opening Balance**	25,90,875.33		**Capital Expenditure**	
50,75,730.00	Grant-in-Aid	3,21,184.00	-	Lab Equipment	-
61,778.00	Interest Income				
				Revenue Expenditure	
				Consumables(Lab)	
			3,72,000.00	Manpower	62,000.00
			8,19,468.67	Contingency	23,20,871.89
				Travel	
			16,80,000.00	Fellowship	2,80,000.00
			2,87,147.00	Overhead	2,49,187.00
	Closing Balance*		25,90,875.33	**Closing Balance**	0.44
57,49,491.00	**TOTAL**	29,12,059.33	57,49,491.00	**TOTAL**	29,12,059.33

TANMOY BHATTACHARYYA
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National Brain Research Centre
मानेसर/Manesar-123052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 52

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
THE WELLCOME TRUST/DBT INDIA ALLIANCE EARLY CAREER FELLOW- DR NIVETHIDA T.
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	22,68,754.04		**Capital Expenditure**	
26,61,280.00	Grant-in-Aid			Lab Equipment	10,00,000.00
	Interest Income				
				Revenue Expenditure	
			11,726.00	Consumables(Lab)	
			69,355.00	Manpower	1,00,000.00
			1,11,444.96	Contingency	57,434.00
				Travel	
			1,00,000.00	Cash Award	
			1,00,000.00	Overhead	
				Refund of Unspent Grant	22,68,754.00
	Closing Balance*		22,68,754.04	**Closing Balance**	**(11,57,433.96)**
26,61,280.00	TOTAL	22,68,754.04	26,61,280.00	TOTAL	22,68,754.04

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
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निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
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T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
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हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006760C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 53

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
C V Raman Interest Income Fellow (Dr. Rolland Kipre)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
26,543.00	**Opening Balance**	26,543.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Contingency	
				Overhead	
				Fellowship	
				Returned to FICCI	
	Closing Balance*		26,543.00	**Closing Balance**	26,543.00
26,543.00	**TOTAL**	26,543.00	26,543.00	**TOTAL**	26,543.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
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National Brain Research Centre
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 54

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
NEURO -COGNITIVE NETWORKS UNDERLYING GOAL DIRECTED BEHAVIOR :DR. ARPAN BANERJEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
18,438.00	**Opening Balance**	18,438.00		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
	Interest Income				
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Fellowship	
				Overhead	
	Closing Balance*		18,438.00	**Closing Balance**	18,438.00
18,438.00	TOTAL	18,438.00	18,438.00	TOTAL	18,438.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

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Administrative Officer
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National Brain Research Centre
मानेसर/Manesar-122051
हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-0067400

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 55

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
VISION GUIDE SPEECH PERCENTION- Dr. ARPAN BANERJEE (DBT)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
5,85,272.00	**Opening Balance**	5,85,272.00		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest income	-			
	Excess Grant Utilised Recovered Back-Salary			**Revenue Expenditure**	
-		-		Consumables(Lab)	
				Manpower	
				Contingency	
				Travel / Workshop	
			-	Fellowship	
			-	Overhead	
	Closing Balance*		5,85,272.00	**Closing Balance**	5,85,272.00
5,85,272.00	TOTAL	5,85,272.00	5,85,272.00	TOTAL	5,85,272.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
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Prof. Krishanu Ray
निदेशक / Director
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हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 56

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA

A LONGITUDIANAL STUDY TO RESPONSIVENESS TO SONG BASED STIMULI IN CHILDREN WITH AUTISM BEHAVIOR AND DIFFUSION TENSOR IMAGING: NANDINI C. SINGH

Dr.

RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
60,474.00	**Opening Balance**	60,474.00		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Fellowship	
				Overhead	
	Closing Balance*		60,474.00	**Closing Balance**	60,474.00
60,474.00	TOTAL	60,474.00	60,474.00	TOTAL	60,474.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
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National Brain Research Centre
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हरियाणा/Haryana

श्री. भट्टाचार्य
BHATTACHARYYA
प्रशासनिक अधिकारी
Administrative Officer
मस्तिष्क अनुसंधान केन्द्र
Brain Research Centre
...051 / Manesar-122051
...(Haryana)

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 541026
Date: 11/10/2023
Place: New Delhi

Annexure- 57

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DBT ITPAR GRANT-Dr.Nandini C.Singh
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
556234.89	**Opening Balance**	5,56,234.89		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Overhead	
			-	Refund to DST	
	Closing Balance*		5,56,234.89	**Closing Balance**	5,56,234.89
5,56,234.89	TOTAL	5,56,234.89	5,56,234.89	TOTAL	5,56,234.89

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
वरिष्ठ प्रशासनिक अधिकारी
Senior Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

KUMAR KHARE & CO. FRN-006740C NEW DELHI CHARTERED ACCOUNTANTS

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 58

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
CSIR-DR. NIHAR RANJAN JANA
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
73,089.50	**Opening Balance**	73,089.50		**Capital Expenditure**	
-	Grant-in-Aid	-		Lab Equipment	
-		-		**Revenue Expenditure**	
				Contingency	
			-	Consumables	-
			-	Manpower	-
				Overhead	
				Travel	
	Closing Balance*		73,089.50	**Closing Balance**	73,089.50
73,089.50	TOTAL	73,089.50	73,089.50	TOTAL	73,089.50

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 526026
Date: 11/10/2023
Place: New Delhi

Annexure-59

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
TATA INNOVATION FELLOWSHIP- DR NIHAR RANJAN JANA
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
3,09,758.91	**Opening Balance**	3,09,758.91		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
	Interest Income eraned				
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel / Workshop	
				Fellowship	
			-	Overhead	
				Transferred to IIT Kharagpur	
	Closing Balance*		3,09,758.91	**Closing Balance**	3,09,758.91
3,09,758.91	TOTAL	3,09,758.91	3,09,758.91	TOTAL	3,09,758.91

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006748C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure-60

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
INDO-US& NH RO1-DR. PANKAJ
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(6,31,828.42)	**Opening Balance**	(6,31,828.42)		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
-		-		**Revenue Expenditure**	
			-	Facilites and admin cost	-
				Material & Supplies	
			-	Personnel/Manpower expenses	-
			-	Travel	-
	Closing Balance*		(6,31,828.42)	**Closing Balance**	(6,31,828.42)
(6,31,828.42)	TOTAL	(6,31,828.42)	(6,31,828.42)	TOTAL	(6,31,828.42)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122051
हरियाणा

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

FRN-006740C NEW DELHI

Annexure-61

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
NATIONAL INITIATIVE ON GLIA CELL RESEARCH PROJECT -Dr. PANKAJ SETH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
92,588.71	Opening Balance	92,588.71		**Capital Expenditure**	
	Grant-in-Aid			Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Overhead	
	Closing Balance*		92,588.71	**Closing Balance**	92,588.71
92,588.71	TOTAL	92,588.71	92,588.71	TOTAL	92,588.71

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/16/2023
Place: New Delhi

Annexure- 62

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
PDF-SERB (AMIT NASKAR)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(1,28,935.00)	**Opening Balance**	(1,28,935.00)		**Capital Expenditure**	
	Grant-in-Aid		-	Lab Equipment	-
	Interest Income			**Revenue Expenditure**	
			-	Consumables (Lab)	-
			-	Manpower	-
			-	Travel	-
				Research Grant/Contingency	
				Overhead	
				Fellowship	
	Closing Balance*		(1,28,935.00)	**Closing Balance**	(1,28,935.00)
(1,28,935.00)	**TOTAL**	(1,28,935.00)	(1,28,935.00)	**TOTAL**	(1,28,935.00)

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 540026
Date: 11/10/2023
Place: New Delhi

Annexure- 63

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
PDF-SERB (Ashok Datusalia)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
45,920.00	**Opening Balance**	45,920.00		**Capital Expenditure**	
	Grant-in-Aid	-		Lab Equipment	
-	Interest Income	-		**Revenue Expenditure**	
				Consumables (Lab)	
				Manpower	
				Travel	
				Research Grant/Contingency	
				Overhead	
				Fellowship	
	Closing Balance*		45,920.00	**Closing Balance**	45,920.00
45,920.00	TOTAL	45,920.00	45,920.00	TOTAL	45,920.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 64

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DBT TATA INNOVATION FELLOWSHIP -Dr. P.K.ROY
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(2,07,575.40)	**Opening Balance**	6,67,424.60		**Capital Expenditure**	
8,75,000.00	Grant-in-Aid			Lab Equipment	
-		-		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
			-	Travel	
				Fellowship	
	Closing Balance*		6,67,424.60	**Closing Balance**	6,67,424.60
6,67,424.60	TOTAL	6,67,424.60	6,67,424.60	TOTAL	6,67,424.60

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 541026
Date: 11/10/2023
Place: New Delhi

Annexure- 65

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Study of Neuronal Regeneration after Injury using Caenorhabditis Elegans-Dr. Anindya Ghosh Roy
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
11,46,191.81	**Opening Balance**	96,567.21		**Capital Expenditure**	
	Grant-in-Aid	10,00,000.00	4,42,743.60	Lab Equipment	
8,410.00	Interest Income	9,529.00		**Revenue Expenditure**	
			2,28,321.00	Consumables (Lab)	4,18,091.00
			3,65,800.00	Manpower	3,07,933.00
				Travel	15,144.00
			21,170.00	Contingency	12,264.00
				Overhead	1,666.00
			-	Fellowship	-
				Returned to AIIMS	
	Closing Balance*		96,567.21	**Closing Balance**	3,50,998.21
11,54,601.81	TOTAL	11,06,096.21	11,54,601.81	TOTAL	11,06,096.21

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 66

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
International Centre for Gentic Engineering and Biotechnology(ICGEB)- Dr BHAVANI SHANKAR SAHU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
11,79,370.58	**Opening Balance**	95,477.29		**Capital Expenditure**	
	Grant-in-Aid	12,18,470.48	7,51,800.00	Lab Equipment	-
	Interest Income				
				Revenue Expenditure	
			3,32,093.29	Consumables(Lab)	10,67,755.57
				Manpower	
				Contingency	
				Travel	
				Fellowship	
				Overhead	
	Closing Balance*		95,477.29	**Closing Balance**	2,46,192.20
11,79,370.58	TOTAL	13,13,947.77	11,79,370.58	TOTAL	13,13,947.77

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 67

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
Austin Spectrum Disorders, Genes and the Gut Microbiome: Utilizing Song Birds(Zebra Finches) as a Model System- DR SOUMYA IYENGAR
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
12,50,120.00	**Opening Balance**	6,45,349.72		**Capital Expenditure**	
-	Grant-in-Aid		-	Lab Equipment	-
18,163.00	Interest Income	-			
		-		**Revenue Expenditure**	
			4,97,855.28	Consumables(Lab)	6,95,466.00
			1,22,133.00	Manpower	1,39,000.00
			1,400.00	Contingency	
			1,545.00	Travel	5,440.00
				Fellowship	
				Overhead	
				Int. refund to DST	18,163.00
			-	Refund of Unspent Grant	2,03,280.72
	Closing Balance*		6,45,349.72	**Closing Balance**	**(4,16,000.00)**
12,68,283.00	**TOTAL**	6,45,349.72	12,68,283.00	**TOTAL**	6,45,349.72

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 68

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA

Exploring Auditory Perception in House Crows using functional Magnetic Resonance Imaging and Neuroanatomical Techniques- DR SOUMYA IYENGAR

RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
5,91,592.56	**Opening Balance**	8,63,895.56		**Capital Expenditure**	
8,00,000.00	Grant-in-Aid		24,675.00	Lab Equipment	9,010.00
8,702.00	Interest Income	9,483.00			
				Revenue Expenditure	
			1,90,247.00	Consumables(Lab)	2,19,612.00
			2,65,567.00	Manpower	3,72,000.00
				Contingency	13,098.00
			5,910.00	Travel	26,320.00
				Fellowship	
			50,000.00	Overhead	
	Closing Balance		8,63,895.56	**Closing Balance**	2,33,338.56
14,00,294.56	TOTAL	8,73,378.56	14,00,294.56	TOTAL	8,73,378.56

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 516026
Date: 11/10/2023
Place: New Delhi

Annexure- 69

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
DST INSPIRE FACULTY AWARD - Dr. XYZ(2020-21)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
15,24,000.00	**Opening Balance**	15,24,000.00		**Capital Expenditure**	
-	Grant-in-Aid/Adjusted from other project	-		Lab Equipment	
-	Interest Income	61,570.00		**Revenue Expenditure**	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Overhead	
	Closing Balance		15,24,000.00	**Closing Balance**	15,85,570.00
15,24,000.00	**TOTAL**	15,85,570.00	15,24,000.00	**TOTAL**	15,85,570.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122051

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 70

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
NPDF-DR. SUMAN SAHA
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
9,60,000.00	**Opening Balance**	9,60,000.00		**Capital Expenditure**	
	Grant-in-Aid/Adjusted from other project			Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	6,44,032.00
				Fellowship	
				Contingency	
				Travel	1,00,000.00
				Overhead	2,15,968.00
			9,60,000.00	**Closing Balance**	
	Closing Balance				
9,60,000.00	**TOTAL**	9,60,000.00	9,60,000.00	**TOTAL**	9,60,000.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

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Prof. Krishanu Ray
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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा / Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No.: 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 71

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
LABORATORY ANIMALS LTD (DR. INDERJEET)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
4,37,866.88	**Opening Balance**	4,37,866.88		**Capital Expenditure**	
	Grant-in-Aid SERB	4,00,000.00		Lab Equipment	1,82,834.00
	Registration Fee	4,57,560.00		**Revenue Expenditure**	
	Spnsorship Fee	4,14,900.00		Workshop Expenses	10,88,880.00
				Manpower	
				Contingency	
				Travel	4,13,518.00
				Overhead	
	Closing Balance		4,37,866.88	**Closing Balance**	25,094.88
4,37,866.88	TOTAL	17,10,326.88	4,37,866.88	TOTAL	17,10,326.88

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122051
हरियाणा/Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 516026
Date: 11/10/2023
Place: New Delhi

Annexure- 72

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
ICMR-DEEPALI SINGH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
(3,14,900.00)	**Opening Balance**	95,801.00		**Capital Expenditure**	
10,70,667.00	Grant-in-Aid	97,333.00		Lab Equipment	
-	**Travel Grant-CSIR**	73,793.00		**Revenue Expenditure**	
				Consumables(Lab)	
			6,54,867.00	Manpower	1,39,939.00
			5,099.00	Contingency	16,504.00
				Travel	73,793.00
				Overhead	
	Closing Balance		95,801.00	**Closing Balance**	36,691.00
7,55,767.00	**TOTAL**	2,66,927.00	7,55,767.00	**TOTAL**	2,66,927.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

PROF. KRISHANU RAY
DIRECTOR

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-122051
हरियाणा/Haryana

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-000740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 73

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
ICMR-NEW PROJEC(2021-22)
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
6,24,644.00	**Opening Balance**	6,24,644.00		**Capital Expenditure**	
-	Grant-in-Aid	-		Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Tfr to Dr Soumya -neuroanatomical study	6,24,644.00
	Closing Balance		6,24,644.00	**Closing Balance**	-
6,24,644.00	**TOTAL**	6,24,644.00	6,24,644.00	**TOTAL**	6,24,644.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

T. BHATTACHARYYA
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हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु रॉय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 74

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
COLLABORATIVE RESEARCH AND EXPERIMENTATION (KCL)-DR. ARPAN BANERJEE
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance			**Capital Expenditure**	
	Grant-in-Aid	23,07,885.00		Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	
				Manpower	
				Contingency	
				Travel	
				Overhead	
	Closing Balance		-	**Closing Balance**	23,07,885.00
-	**TOTAL**	23,07,885.00	-	**TOTAL**	23,07,885.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
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Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
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हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co.
Chartered Accountants
FRN-00674C

FRN-00674C
NEW DELHI

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 75

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
STUDY OF NEURONAL REGENERATION AFTER INJURY-DR. BHAVANI SHANKAR SAHU
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance			**Capital Expenditure**	
	Grant-in-Aid	19,26,500.00		Lab Equipment	
-	**Interest received**	18,279.00		**Revenue Expenditure**	
				Consumables(Lab)	4,16,496.00
				Manpower	
				Contingency	59,000.00
				Travel	
				Overhead	1,16,400.00
	Closing Balance		-	**Closing Balance**	**13,52,883.00**
-	**TOTAL**	**19,44,779.00**	-	**TOTAL**	**19,44,779.00**

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
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Chief Administrative Officer
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National Brain Research Centre
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हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान
National Brain Research Cen
मानेसर/Manesar-122
हरियाणा/Harya

For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546826
Date: 11/10/2023
Place: New Delhi

Annexure- 76

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
SARS COV2 DBT PANKAJ SETH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance			**Capital Expenditure**	
	Grant-in-Aid	9,60,000.00		Lab Equipment	
-	**Interest received**			**Revenue Expenditure**	
				Consumables(Lab)	7,25,825.00
				Manpower	
				Contingency	
				Travel	
				Overhead	
	Closing Balance		-	**Closing Balance**	2,34,175.00
-	**TOTAL**	9,60,000.00	-	**TOTAL**	9,60,000.00

TANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
T. BHATTACHARYYA
मुख्य प्रशासनिक अधिकारी
Chief Administrative Officer
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
National Brain Research Centre
मानेसर-122051 / Manesar-12...
हरियाणा / Haryana

PROF. KRISHANU RAY
DIRECTOR

प्रो. कृशानु राय
Prof. Krishanu Ray
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केंद्र
National Brain Research Centre
मानेसर/Manesar-122052
हरियाणा/Haryana

For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

FRN-006740C
NEW DELHI

Sunil Kumar
Partner
Membership No: 546026
Date: 11/10/2023
Place: New Delhi

Annexure- 77

NATIONAL BRAIN RESEARCH CENTRE, MANESAR, HARYANA
ICMR-TIPU KHAN
RECEIPTS AND PAYMENTS ACCOUNT FOR THE PERIOD ENDED March 31,2023

PREVIOUS YEAR AMOUNT (in Rs.)	RECEIPTS	CURRENT YEAR AMOUNT (in Rs.)	PREVIOUS YEAR AMOUNT (in Rs.)	PAYMENTS	CURRENT YEAR AMOUNT (in Rs.)
	Opening Balance	-		**Capital Expenditure**	
-	Grant-in-Aid	7,82,077.00		Lab Equipment	
				Revenue Expenditure	
				Consumables(Lab)	
				Fellowship	4,89,904.00
				Contingency	15,000.00
				Travel	
				Overhead	
	Closing Balance			**Closing Balance**	2,77,173.00
-	**TOTAL**	7,82,077.00	-	**TOTAL**	7,82,077.00

PANMOY BHATTACHARYYA
CHIEF ADMINISTRATIVE OFFICER

टी. भट्टाचार्य
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National Brain Research Centre
मानेसर/Manesar-122052
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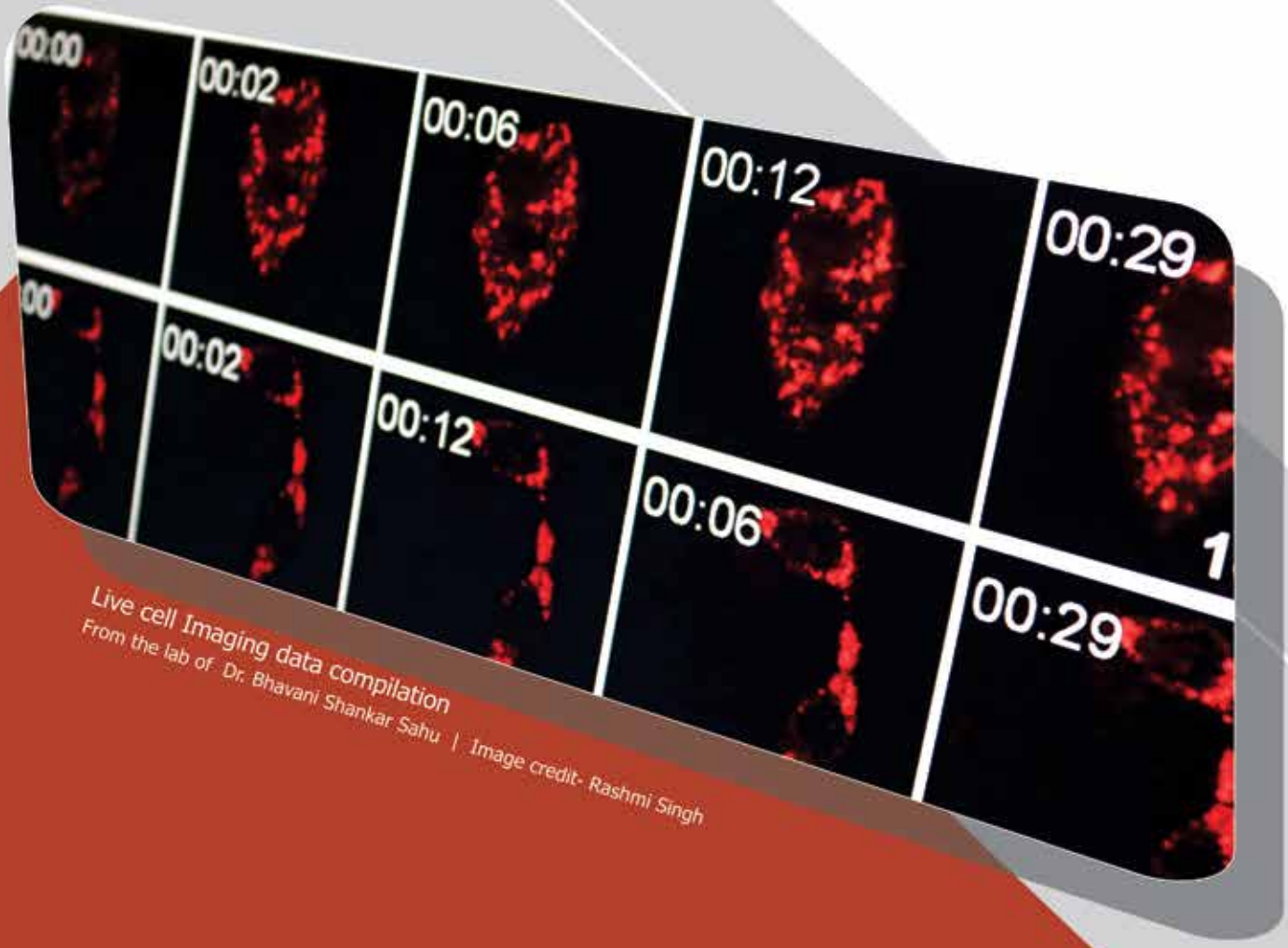
As per our separate report of even date attached
For Kumar Khare & Co.
Chartered Accountants
FRN-006740C

Sunil Kumar
Partner
Membership No. 546026
Date: 11/10/2023
Place: New Delhi

Compiled & Edited by: Ms. Rashmi Singh, Science Communicator, NBRC.
Lab-based images & others: Ms. Rashmi Singh
Images (NBRC campus & building): Mr. Sibaram Behera, Ph.D. student, Prof. Anindya Ghosh Roy lab



Live cell Imaging data compilation
From the lab of Dr. Bhavani Shankar Sahu | Image credit- Rashmi Singh

National Brain Research Centre
NBRC

National Brain Research Centre

Nainwal Road, Manesar, Haryana, 122 052, India