Neuroscience is a multidisciplinary science that involves the study of the structure and function of the nervous system for understanding the behavioral, cognitive, and development aspects of the nervous system at cellular and molecular levels. During 2006–2007, the Department of Biotechnology launched a program on “Neuroscience” with an aim to support the R&D activities for understanding the brain function, its disorders, and pathogenesis at cellular and molecular levels as well as for developing neurological tools, techniques, and procedures for major neurological disorders, pathological conditions and building the technology platforms. The chronological development of the program by the Department is mentioned in Table 1.

Understanding the neurological processes and diseases and finding their treatment through biotechnological interventions are challenging. Therefore, the Department established a dedicated institution namely “National Brain Research Centre (NBRC)” in Manesar, Haryana, India. In 2000, the institution became operational as an interim facility as part of “International Center for Genetic Engineering and Biotechnology, New Delhi.” The institute was established under the auspices of Professor P.N. Tandon, the founder chairperson of the NBRC society, and Professor Vijayalakshmi Ravindranath, the founder Director of the Institute. The institute was established with an aim to understand brain functions in health and diseases, to generate trained human resources and conduct interdisciplinary research in neuroscience. The institute successfully generated a pool of eminent neuroscientists in India and trained human resources alone or in collaboration with other institutions, such as All Indian Institute of Medical Sciences (AIIMS), New Delhi, and the National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, India. The institute developed several neurotools having clinical relevance, such as DALI, KALPANA, NINS-STAT, BRAMHA, PRATEEK, GAURI, ANSH, and SWADESH.

Parallel to the development of the institution, the Department also promoted neuroscience in Indian universities by supporting the “MSc Neuroscience” program at two locations, i.e., Jiwaji University, Gwalior, Madhya Pradesh, and NBRC, Manesar, Haryana during 2005-06. These programs train around 35 students each year selected through the entrance examination. Each student was provided a stipend by the Department. These programs have done well in terms of capacity building; however, severely hit by the brain drain phenomena as majority of students joined PhD abroad. As a result, the MSc program at NBRC was discontinued, though it has been recently restarted. The students also observed that major career avenues are in academia and the scarcity of the available faculties possibly further leads to a reduction in the popularity of the program.

For decades, the neurology projects were supported as part of Chronic Disease Biology Task Force of the Department. Under the able leadership of Late Dr M.K. Bhan, former Secretary, Department of Biotechnology, it was recognized that the country needs to strengthen its capacity in the neuroscience area, especially in the clinical community. As a result, the Department constituted an expert group of neurobiology under Chronic Disease Biology Task Force with a handful of people engaged in neurological research. From 2010, the efforts geared up to augment capacity building, generate skilled manpower, and establish centers of excellence. Several centers of excellence in areas of schizophrenia, stroke biology, epilepsy, neuroimmunopathy, and neurological disorders were established. To enhance the capacity of clinicians, two fellowship programs, namely Initiative on Neuro-Clinical Research Education (INCRE) and Initiative on Neuroinformatics and Computational Neuroscience Education (INCNE), were initiated. The INCRE fellowship was aimed to facilitate hypothesis-driven research by clinicians. The INCNE was to inspire young scientists and engineers from various disciplines to work in neuroinformatics and computational neuroscience. Unfortunately, these fellowships did not continue for a long time.

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The Neuroscience program got impetus from 2010 onward when it was strengthened through a call for proposals such as National Glial Initiative (NGI) and Hypoxia-Ischemic Brain Injury (HIBI). In Table 2, the skewed data infer that after an initial lag period, the program acknowledged although the grant distribution is not proportionate (Table 2). It seems that a majority of grants have been taken up by premium institutions and the program did not spread its wings to remote institutions. The peaks of funding support in past years draws that call for proposals invited in a particular year was supported in a subsequent financial year and the absence of any special effort in inviting the proposals led to a dip in grant release. Furthermore, the grant pattern indicates that the area is highly specialized and requires close interaction with research-oriented neuroclinicians to test and validate the hypothesis. The manpower trained in the supported projects is considerable and will certainly lead to an impact in the area. The fact that the number of research publications came out is moderate in this niche area and more or less commensurate with the number of projects sanctioned. This indicates that the quality of proposals needs to be significantly improved and sustained efforts are needed through the involvement of various stakeholders to boost the prospects in the future.

The epidemiological data about neurological diseases are still a major problem in India. As a result, the Department unfolded two major population-based studies, namely Dementia Science program and Stroke and Cognitive Decline program. Dementia Science program is ongoing network program among seven Indian institutions for studying the estimate of the prevalence and incidence of dementia in the country. The Stroke and Cognitive Decline Cohort Study was supported under the Indo-Netherlands joint collaboration to study the known and novel determinants of stroke and cognitive function among the Indian population. The results obtained so far suggest that the prevalence of stroke is 1.5%. The causative factors for stroke are hypertension, diabetes, obesity, smoking, and chewing tobacco. Hypertension is the most prevalent risk factor for stroke occurrences.

In addition, the Center of Excellence (CoE) in AIIMS, New Delhi, on the neuroengineering platform development resulted in the development of tools for neuroendoscopy, training software, and eye gear. Recently, the Department has

### Table 1. Chronology of Major Milestones/Initiatives/Programs in Neuroscience Supported by the Department of Biotechnology.

| Year     | Milestones/Initiatives/Programs |
|----------|---------------------------------|
| 2000     | National Centre for Brain Research (NBRC), Manesar, Haryana (dedicated to the Nation in 2003) |
| 2005–2006| Launch of MSc (Neuroscience) |
| 2006–2007| Neuroscience program launched |
| 2010–2011| First call for proposal |
| 2011–2012| – Expert Group on Neurobiology under Chronic Disease Biology Task Force (EGN-CDB) |
|          | – Dedicated website for neuroscience “dbt-neuro.ncbs.res.in” was hosted by NCBS, Bengaluru |
|          | – Program support on Cellular Models and Networks in Neuropsychiatric Disorders, NIMHANS, Bengaluru |
| 2012–2013| Program support for Translational Research on Neuroimmunopathology of Schizophrenia, NIMHANS, Bengaluru |
| 2013–2014| – Glial Biology program launched |
|          | – Initiative on Neuro-Clinical Research Education (INCRE)–fellowship support |
|          | – Cohort Study on Stroke & Cognitive Decline |
|          | – Centre of Excellence on Calcium Signaling and Lipid Metabolism, NCBS, Bengaluru |
| 2014–2015| – Initiative on Neuroinformatics and Computational Neuroscience Education (INCNE), a fellowship support |
|          | – Hypoxia-Ischemic Brain Injury (HIBI) program support |
|          | – Program support on Translational Research for Cerebral Stroke Biology, AIIMS, New Delhi |
| 2016–2017| Centre of Excellence for Epilepsy (CoE), a collaborative project between National Brain Research Centre (NBRC), Manesar and All India Institute of Medical Sciences (AIIMS), New Delhi |
| 2017–2018| – Dementia Science program support, NBRC, Manesar |
|          | – Centre of Excellence for Epilepsy (CoE), Phase II |
|          | – National Initiative on Glial Cell Research, Phase II |
|          | – Translational Stroke Facility at AIIMS, New Delhi |
|          | – Centre of Excellence to study the impact of RAG in Brain development, IISc and IBAB, Bengaluru |
|          | – Centre of Excellence in Neuroengineering Platform for innovation in Excellence Research and Translational Research, AIIMS, New Delhi |
| 2018–2019| – Centre for Neurodevelopmental Synaptopathies, inStem, Bengaluru |
| 2019–2020| KALPANA: Advanced Spectroscopic Signal Processing Platform for Improved Accuracy to Aid in Early Diagnosis of Brain Disorders in Clinical Setting, a tool developed in NBRC, Manesar |
| 2020–2021| Call for Proposal for “Developing neurotools, techniques and protocols for brain disorders and pathological conditions” |
launched a call for proposal on the development of neurotools for brain disorders and pathological conditions for the direct benefit of the Indian patient community, and the proposals are selected for support.

Considering India’s high load of neurological diseases, the interministerial and intercontinental efforts are required to boost the research capability and the team efforts of India’s young neurobiologists and neurologists, especially the neuroclinicians and neurosurgeons. Bringing the latest technology in this area needs the development of tools and equipment showing precision, committed to simplify the complexities of the neuroproblems, ease of access, and cost-effectiveness. To achieve such targeted goals, tremendous efforts are required to develop the skilled and quality manpower, infrastructure, and translational capability in India.

In summary, at present in India, the basic and translational component of neuroscience needs equal and parallel attention for better management of neurological diseases as well as to capture the innovative potential existing in this area. It is observed that the neuroscience area is highly interdisciplinary science and needs massive involvement of clinicians, engineers, epidemiologists, and basic neurobiologists to achieve the fundamental goals and to provide the solutions to the smallest psychiatric disorders/problems so that society can benefit immensely with the cohesive and integrated efforts of stakeholders.

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