



## STEM CELLS AND REGENERATIVE BIOLOGY OF THE ADULT BRAIN

Organized by

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI, TAMIL NADU, INDIA

7<sup>th</sup> Sep, 2020 to 12<sup>th</sup> Sep, 2020

### Bharathidasan University

Bharathidasan University was established in February 1982 and was named after the great revolutionary Tamil Poet, Bharathidasan (1891-1964). The motto of the University, "We will create a brave new world" has been framed from Bharathidasan's poetic words "புதியதோர் உலகம் செய்வோம்". The University endeavours to be true to such a vision by creating in the region a brave new world of academic innovation for social change. The University area lies in the strategic central part of Tamil Nadu, covering the Cauvery delta, traditionally known as intellectual capital of the state. The University has totally 4 Faculties, 16 Schools, 37 Departments and 29 Specialized Research Centres.

### Abstract

Neural stem cell derived adult neurogenesis is an integral cellular process responsible for structural integrity, neurophysiology and regulation of neural plasticity of the hippocampus, olfactory bulb, striatum, cortex, amygdala and hypothalamus of the brain. Adult neurogenesis is indispensable for learning and memory, motor functions, behaviour, sex and mood. Notably, adult neurogenesis has been a subject of regulation by various intrinsic and extrinsic factors. Notably, dietary antioxidants, exercise, enriched environment, growth factors, hormones, pharmacological agents including antidepressants have been shown to boost and improve cognitive functions through adult neurogenesis. In contrast, memory loss along with impaired neurogenesis has been a salient feature of ageing, chronic stress and neurodegenerative disorders. Thus, understanding stem cell biology of the adult brain is one of the important steps in day-to-day life and to develop disease-modifying therapies for neurological diseases that exhibit dementia. The objectives of the course are as follows: i) To raise awareness among participants about adult onset mental health conditions, ii) To expose the participants to the basics of stem cell biology, neurobiology of diseases and regenerative aspects of the adult brain, iii) To impart knowledge among participants in boosting cognitive function through regulation of adult neurogenesis using non-invasive methods.

### The Foreign Faculty Member

#### Prof Ludwig Aigner, Paracelsus Medical University, Salzburg, Austria



Professor Ludwig Aigner is the Director of the Institute of Molecular Regenerative Medicine at the Paracelsus Medical University in Salzburg, Austria. He served as President of the Austrian Neuroscience Association and scientific board member of the Wings For Life spinal cord injury foundation. He has published 200 articles in peer-reviewed journals including Cell, Nature, Nature Neuroscience and Alzheimer's and Dementia. He received his Ph.D. at the University of Basel, Switzerland, where he was the first to demonstrate that nerve fibre growth can be re-induced in the adult central nervous system through the expression of a certain protein. He underwent his postdoctoral stint at Montreal, Canada. After that, he moved to the University of Regensburg, Germany, exploring the fascinating issue of adult neural stem cells with the possibility to generate new neurons in the adult, aged and diseased brain with special reference to the role of microglia in Alzheimer's disease and Vascular Dementia.

### The Host Faculty Members

#### Dr. M. Anusuyadevi Jayachandran., Department of Biochemistry, Bharathidasan University

Dr. M. Anusuyadevi Jayachandran completed her doctoral studies from the Department of Biochemistry, University of Madras and acquired post-doctoral experience in the field of neurodegeneration from the Department of Neuroscience, The Medical University of South Carolina, USA. Later in the year 2008, she got appointed as Assistant professor in Department of Biochemistry, Bharathidasan University and established her laboratory in the field of Neurogerontology. Her present research involves physiological, biochemical and molecular aspects of Alzheimer's disease. She is a recipient of Young Investigator Awards from DBT and DST. Her research group is involved in creating awareness about Alzheimer's disease.



#### Dr. Mahesh Kandasamy, Department of Animal Science, Bharathidasan University

He obtained doctorate in Natural Sciences from Department of Neurology at University of Regensburg, Germany under the guidance of Prof Ludwig Aigner. His first postdoctoral stint was at the Institute of Molecular Regenerative Medicine, Paracelsus Medical University, Salzburg, Austria. Further, he worked as Postdoctoral Associate at the Molecular Psychiatry unit, Charité- University of Medicine, Berlin, Germany. He later served as a Research Scientist at NIMHANS, Bangalore. Presently, he works as Assistant Professor under UGC-FRP in the Department of Animal Science, Bharathidasan University. His laboratory is interested in understanding the regulation and functional implications of stem cell-mediated adult neurogenesis in ageing and dementia related neuropsychiatric conditions and behavioural aspect of learning and memory.



# Course Module

Schedule	Lectures/Tutorials	Hours
Day 1	Inauguration Lecture 1: History, scientific background, introduction to concepts in stem cell biology. Stem cells properties, classification and sources. Embryonic Stem cells (ESCs), Adult Stem Cells (ASCs)	1
	Lecture 2: Reprogramming of somatic cells-induced pluripotent stem cells (iPSCs) and Yamanaka factors. Modelling of neurodegenerative disorders using iPSCs and Implications of stem cells in neurodegenerative disorders Ethical issues in stem cell research.	1
	Tutorial 1: Demonstration of neuroanatomy, stem cell niches of the brain (rat, mice), human (Chart)	2
Day 2	Lecture 3: Introduction and overviews of gerontology, hypotheses of ageing, stress, neurodegenerative disorders and dementia.	1
	Lecture 4: Neurobiology of Alzheimer's disease (AD), Parkinson's disease(PD), Huntington's disease (HD), Amyotrophic Lateral Sclerosis (ALS). Therapeutic targets for neurodegenerative disorders.	1
	Tutorial 2: Measures of cognitive functions, intelligence quotient(IQ) and emotional intelligence (EQ) tests	2
Day 3	Lecture 5: Neural stem cells and stem cell niches of the adult brain. Functional significance of adult neurogenesis and cognitive functions	1
	Lecture 6: Regulation of Adult Neurogenesis in health and disease. (Ageing, Stress AD, PD, HD and stroke)	1
	Tutorial 3: Toxin induced, transgenic models to study neurodegenerative disorders	2
Day 4	Lecture 7: Cell and Molecular signalling aspects of neural stem cell niches of the adult brain (TGF-beta, Wnt, NOTCH and Hedgehog signalling pathways)	1
	Lecture 8: In vivo manipulation and monitoring of adult neurogenesis in live organisms.	1
	Tutorial 4: Strategies to analyze neurogenesis in the adult brain Neuroimaging studies of the adult neurogenesis	2
Day 5	Lecture 9: The significance and challenges of neural stem cell transplantations, antisense technologies in the treatment of neurodegenerative disorders.	1
	Lecture 10: Non-invasive strategies to boost cognitive functions through adult neurogenesis (Nutrition, enriched environment, drugs and physical exercise)	1
	Tutorial 5: Implications of Cre-LoxP and CRISPR CAS9 genetic systems in regenerative biology of the adult brain.	2
Day 6	Discussion, Examination, Assessment and Felicitation	

## Course Registration Fee

**Participants from India: Students MSc=Rs. 1000, MBBS and PhD =Rs 2,000, Postdocs: Rs.2,500  
Faculties/Scientists=Rs.3500, Industry= Rs. 5,000/- For foreign nationals: USD 200**

**Registration fee includes course materials and lunch only. Accommodation based on payment basis in the BDU guest house and hostels (based on the availability)**

**The deadline for application: 15.08.2020**

**For Further details, Please contact Course Coordinator**

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