Neurosciences-2013

43rd Annual meeting of the Society for Neurosciences (SfN), San Diego

"Neurosciences-2013" 43rd Annual meeting of the Society for Neurosciences (SfN) was organized in the convention center at San Diego, USA between 9-13th November, 2013, to foster creativity and collaboration among emerging neuroscientists. According to the president of SfN the meeting was attended by more than 30,000 attendees. More than 15,000 scientific presentations showing innovative advances in techniques and valuable new research about brain structure, health, diseases, and treatments, were brought into life. In addition to the posters and scientific lectures, the meeting featured 34 professional development workshops and networking functions. There were around 80 sessions each day spread through 40 conference halls and around 2500 posters presented each day. Around 1400 exhibits were present from many international companies displaying their new technologies and product ranges giving us enormous information regarding the latest facilities and cutting edge research tools in the world of neuroscience.

Students of Neuroscience Research Lab, Department of Neurology, Postgraduate Institute of Medical Education and Research, Chandigarh, INDIA presented six posters in different sessions and one student gave an oral presentation in the minisymposium. Nanosymposiums were conducted with different themes under the headings, Neural Excitability, Synapses and Glia: Cellular Mechanism, Disorders of the nervous system, Sensory and the motor systems, Integrative systems, cognition and behaviours, Novel method and technology development and History teaching public awareness and Social Impacts in Neuroscience.

First day started with the special lecture of Dr. Ed Catmull, president, Pixar and Walt Disney Animation Studio on the "creative culture". He described creativity as a complex phenomenon and not a result of individual geniuses. According to him, barriers to creativity can be removed if mentored in a right direction. Committing mistakes is essential part of creativity thus zero error is not desirable in creative environment. He emphasised on increasing the independence to fix the problem without permission and require-

ment of honest assessment of the work. On a question that "his creativity leads the people from real to unreal world and creativity in research is to know the reality" he answered that his reality is at the technical level which is their reality.

Fred Kavli Public Symposium on creativity was an attraction of the day. He described creativity as one of the defining traits of humanity which is manifested itself in the organization of social systems (e.g., moral, political, and economic), in the arts (from music, painting, and theater to literature and film), and in all manner of inventions (from scientific explanations and technical instruments to complex engineered systems). Neuroscientists, a composer (and a piano), a visual artist, joined the symposium for a real time discussion on the neuroscience of creativity. At the same time yet another nanosymposium on the topic "The Choroid Plexus (CP) and Cerebrospinal Fluid (CSF): Emerging Roles in Development, Disease, and Therapy" was illustrative on the role of CSF and CP in the therapeutics and development of biomarkers and how understudied CP cells can be generated and used for CSF-based therapies.

Under the theme of learning and memory K. O'LEARY et al's minisymposium entitled "Impairment of neuronal insulin signalling and GluT4 translocation by oligomeric beta-amyloid: Importance of tertiary amyloid structure and impact on metabolism" showed a connection between AD and insulin resistance with beneficial impacts of monomeric amyloid. Minisymposium entitled "How Do Cellular-Stress Response Pathways Control Brain Resistance During Aging and Neurodegenerative Disease?" illuminated the mind by elaborating the cell-stress response pathways regulating the response to chronic or acute stress by understanding diseased neuron resistance.

Special lecture on the topic entitled "Interacting Influence of Sleep and Circadian Clocks on Human Physiology and Cognitive Performance" by Dr. Charles A. Czeisler illustrated the role of mammalian circadian clocks which in humans interact with sleep to affect many aspects of both physiology (including endocrine, metabolic, cardiovascular, immune and respiratory physiology) and behaviour (including

activity, alertness, performance, mood, vigilance, attention and eating).

"Altered glucocorticoid signalling mediates the impact of recurrent hypoglycemia on hippocampal cognitive and neural function" entitled talk illustrated through *in vitro* and *in vivo* approaches confirmed that recurrent hypoglycaemia (RH) markedly alters cognitive function, and have characterized the importance of glucocorticoids in mediating some of the compensatory effects observed in the hippocampus following RH. Yet another talk entitled "Impairment of neuronal insulin signalling and GluT4 translocation by oligomeric beta-amyloid: Importance of tertiary amyloid structure and impact on metabolism" reported the results of *in vitro* studies, using hippocampal neuronal culture to more fully characterise the impact of the distinct tertiary forms of beta-amyloid (monomeric, oligomeric, and fibrillar) on glucose metabolism, insulin signalling and other downstream effectors.

Under the theme learning and memory physiology "Caffeine treatment interacts with insulin to downregulate mTORC1 in hippocampal neuronal culture" entitled talk by Dr. Fitzgerald indicated that caffeine may be a novel regulator of mTORC1 activity in the brain, which may mediate some of acute and/or chronic neuronal effects of caffeine consumption. mTORC1 dysregulation has been implicated in the formation and progression of intracellular neurofibrillary tangles and the occurrence of Alzheimer's disease. "Insulin and thyroid hormone interact in the hippocampus to regulate spatial working memory" entitled talk reported that co-administration of T3 and insulin not only reversed enhancement of performance by insulin but impaired spatial working memory compared to control animals. Dr. J. Yuan, Department of Cell Biology, Harvard Medical School, Boston discussed regarding regulation of neuronal cell death: from apoptosis to necroptosis. Poster presentations were also carried out related to the themes of "Visual System Development, Developmental Cell Death, Activity-Dependent Changes in Connectivity, Synapse Formation: CNS I, Patterning of Midbrain and Diencephalons" under the theme development.

Second day was initiated with the special lecture by Dr. Caroni on the topic entitled "Adjusting Brain Circuits for Learning and Memory" illustrated the role of system plasticity in adjusting flexibly to specific behavioural demands and prioritization & retention of memories as a function of circumstances. In yet another special lecture on the topic "When Good Neurons Go Bad: Dopamine Neuron Regulation and its Disruption in Psychiatric Disorders" Dr. Grace discussed the role of midbrain dopamine neurons with implication in a broad variety of psychiatric disorders, ranging from schizophrenia to drug abuse and depression.

Symposium on neuropeptide signalling in cellular interactions illustrated the stem cell interaction, cell migration, signalling system biology, drug design and development in relation to neuropeptides. Yet another symposium chaired by Dr. Reilly discussed the role of transposable elements in health and diseases of central nervous system. Under the theme of Innovative AD Therapeutics scientific sessions involved several aspects of Alzheimer's disease and dementia including genetic and environmental factors in pathophysiology of disease, several aspects of APP and Tau pathology, Imaging & Biomarkers in AD diagnostics and innovative approaches in AD therapeutics. Banik et al's presentation on "Effect of intra-hippocampal transplantation of hUCB derived lin-ve stem cells in amyloid- β peptide induced mouse model of memory loss" illustrated the efficacy of intra-hippocampal transplanted lineage negative (lin-ve) stem cells isolated from human umbilical cord blood (hUCB) in mice model of AD and concluded that lin-ve stem cells from hUCB have potential to alleviate A β induced memory loss in mice model of AD. Dr. Farahany presented special lecture under the theme of David Kopf Lecture on Neuroethics on Blaming the Brain: Behavioural Sciences in the Courtroom and discussed comprehensive empirical study on the use of biosciences in the United States and other legal systems. Posters were presented for different themes.

Several new molecules and techniques were introduced in the meeting to facilitate and foster the scientific community. Two photon microscopy and several bioinformatics tools were explored to compare the lower vertebrate genome with human genome that can drive the research in translation. Prospective role of transposon (Tn) in age related macular degenera-

tion have been hypothesized which has already been reported in several neurodegenerative pathologies. Nanosymposium on the topic "Endosomes in Neuronal Trafficking and Neurodegenerative Diseases" included various paradigm of endosomal processes in neurodegenerative disorder. Under this theme Dr. Paolo's talk under the heading "PI3P is selectively deficient in Alzheimer's disease and regulates endosomal sorting and processing of the amyloid precursor protein" discussed the mechanisms of APP trafficking through the endosomal system in normal and pathological states.

Post traumatic stress disorder (PTSD) was highlighted in the meeting by correlating the genotype with the phenotype affected from traumatic brain injury. It was reported that AA genotype in the gene which encodes for FK506 binding protein, partially protects from developing PTSD symptoms following TBI. Other SNPs like ApoE, 5HTTLPR, BDNF, Neuroglobin were also evaluated for understanding the pathophysiology of PTSD. "The relationship of amyloid burden and memory retrieval across the Lifespan" entitled talk of G. N. BISCHOF discussed about range of AB deposition in younger adults has important implication in explaining episodic memory differences. This group examined the effect of mean cortical AB deposition on these two memory retrieval types i.e recall memory and episodic memory in a large sample of healthy adults aged 30–89 (N = 147, Mean Age = 63.37, Range = 30–89, Mean MMSE = 29.27). Standardized memory constructs for three tests of recall and recognition memory taken from the Hopkins Verbal Learning Task and from a Verbal Recognition Memory task, were computed. Dr. SHAH's Talk on the presentation entitled "A combination of physical exercise and computerized cognitive training improves verbal memory and increases cerebral glucose metabolism in the elderly" described that specific lifestyle combination of physical and mental exercises for 16 weeks improves cognition and increases brain glucose metabolism in cognitively healthy older adults. 223 participants (60–85 years) were assigned to 16 weeks home based physical activity (PA group, n = 64) or computerized cognitive training (CT group, n = 62) or a combination of both (combined group, n = 51) along with a control group (n = 46) were undertaken for this study.

Gillispie Minhas, Neuroscience Research Lab (NRL), PGIMER, INDIA presented

poster on the topic entitled "Establishment of pterygopalatine artery (PPA) ligation murine model of retinal ischemia to test efficacy of stem cells".

Third day initiated with Dr. Stephen H. Scott's special lecture on the topic entitled Putting Sensory Back into Voluntary Control". Dr. Akshay Anand's talk on the role of CCL2 and CCR2 mediated clearance of A β rich drusen in Age Related Macular Degeneration: Implications for Alzheimer's disease illustrated the effect of common SNPs, in developing AD & AMD. Dr. Eric Richard Kandel's (recipient of the 2000 Nobel Prize in Physiology or Medicine) talk was inspiring enough to seniors as well as young neuroscientists. Neeru Jindal, NRL, PGIMER, INDIA presented her research work as a poster on the topic entitled Role of bone marrow derived Lin-ve stem cell in NMDA induced retinal degeneration mouse model. Kaushal Sharma from the same lab presented poster on the topic of TLR3 polymorphism and age related macular degeneration: A pilot study in North India.

Dr. Orly Lazarov chaired the CME entitled "genes, environment, and cognitive function" which elaborated the role of environment, traumatic brain injury, stroke as a risk factor for developing cognitive impairment and AD. Role of environmental enrichment and exercise in enhancing brain plasticity was also discussed in the CME.

Neuro-Epigenetics in neural development, plasticity, and brain disorders chaired by: Hongjun Song, PhD, had been a illustrative symposium on epigenetics. Epigenetic mechanisms play critical roles in tissue-specific gene expression, X chromosome inactivation, gene imprinting, and reprogramming. Discussion on recent advances in the understanding of epigenetic mechanisms, including DNA modifications, miRNA and piRNA in the wider context of neurogenesis, neuronal development, synaptic plasticity, learning and memory, and brain disorders, were carried out in this symposium. Dr. A. Ferguson-Smith Physiology, Development and Neuroscience, University of Cambridge, UNITED KINGDOM, discussed the Regulation of postnatal neurogenesis through modulation of genomic imprinting. Dr. J. Sweatt elaborated the epigenetic mechanisms in memory formation.

Planery talk on Transgenerational epigenetics by Dr. T. L. BALE of Univ. of Pennsylvania was focused on epigenetic mechanisms and transgenerational

outcomes associated with reprogramming of the brain and behaviours, thus promoting disease risk or resiliency. This lecture discussed about epigenetic changes before maturation of sperm, are inherited to the offspring and these methylation and acetylation patterns results in different diseases.

The talk was on BACE1 trafficking in cultured hippocampal neurons. Live-cell imaging was used as a tool to study the endocytotic process. It was reported that motile carriers containing internalized BACE1 in dendrites undergo exclusive retrograde transport toward the soma, whereas they undergo bidirectional transport in axons. Unidirectional dendritic transport of BACE1 in endosomes requires Eps15 homology domain-containing (EHD) proteins 1 and 3. Moreover, sorting and bidirectional axonal BACE1 transport require Rab11 GTPase activity in addition to EHD1/3 function. Finally, EHD1/3 co-localizes with BACE1 and APP in hippocampal mossy fiber axons *in vivo* and modulates BACE1 cleavage of APP *in vitro*. It was suggested that EHD proteins and Rab11 coordinate BACE1 trafficking in neuronal recycling endosomes, a process that is likely relevant for presynaptic A β production and Alzheimer's disease pathogenesis.

Sorting of neurodegeneration causative metal transporters at endosomes: group tested the hypothesis that endosome vesicle formation mechanisms regulate ATP7A traffic. SILAC proteome profiling of biogenesis of lysosomes complex 1 (BLOC-1)-deficient neuronal cells revealed presence of ATP7A, suggesting that BLOC-1 and associated factors would regulate ATP7A traffic. Down-regulation of components belonging to the BLOC-1 and the BLOC-1-associated inositol lipid kinase (PI4KII α) interactomes perturbed ATP7A content and/or subcellular localization in cells. Thus, BLOC-1 mechanisms necessary for endosomal vesicle formation regulate metal transporters associated with neuro-

degeneration and BLOC-1-allelic variants may confer susceptibility or resistance to metals insults.

Role of exosomes in the release and the transcellular spread of amyloids in Alzheimer's disease: It was found that these amyloidogenic cleavages occur in early endosomes followed by the routing of the cleaved product to multivesicular bodies. Subsequently, A β peptides are released from the cells via the novel exosomal pathway. This group showed that these peptides aid in the transport of amyloids and in plaque formation. Exosomal proteins were found to be accumulated in the plaques of AD patient brains suggesting a role in the pathogenesis of AD. Moreover, targeting a transient state analog, β -secretase inhibitor to endosomes inhibited the secretase more efficiently than its soluble counterpart suggesting a novel therapeutic strategy for inhibiting the formation and release of amyloids in AD.

Rahul Tyagi, NRL, PGIMER, INDIA, presented poster on the topic of Neuropsychological assessment of dystrophin isoform induced progression of cognitive impairment in DMD/BMD patients in North West Indian Population.

Various emerging and crucial aspects such as neuroendocrinology, neuroimmunology, neural encoding of fear, cognitive regulation of food stimuli: implications for obesity and its experiential, hormonal, and neural Antecedents, Estrogen Action in the Brain, Sensory Deprivation and Brain Plasticity in deaf and blind individuals, were discussed in the meeting.

Sridhar B of NRL, PGIMER, INDIA, presented his poster on the topic Edge of Ciliary Epithelium Cells over the Umbilical Cord Blood derived blood cells in rescue of retinal degeneration. Shweta from the same group presented on the topic entitled Role of early life exposure of lead in Alzheimer's disease: A systematic review of LEARN model.

Other academic highlights were the workshops and meetings entitled: Research careers in industry and the private sector, challenges in neuroscience training, a guide to journal publishing, transitioning beyond the postdoc: early-career investigators, neurobiology of disease, sleep and circadian clocks on human physiology and cognitive performance, age-dependent responses of synapse structure to hippocampal plasticity, blood-brain barrier and neurodegeneration, plasticity in the adult brain: neurogenesis and neuroepigenetics, understanding cortical hierarchies, neurocircuitry of addiction, epigenetics in epilepsy, adjusting brain circuits for learning and memory, progress in single cell neurobiology.

In our academic schedule we met different people of neuroscience community including the legend Dr. Eric, Nobel laureate. We attended a meeting organised by Dr. Lahiri, and were introduced to the community of American scientists of Indian origin. We visited exhibits and got the knowledge of new cutting edge technologies and products of our field. Diversity of neuroscience domain has made this meeting another success, as organizers could bound the audience who were seeking a drop from the ocean of knowledge. Poster sessions were most dynamic as whole of the neuroscience could be covered in the hall full of neuroscientists. Meeting was well organized though more than 30000 peoples had to be accommodated making this one of the grand gathering in the world of neurosciences. Next meeting is scheduled to be held at Washington thus planning for yet another event might be started to make it yet another grand success.

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Rahul Tyagi
Neuroscience Research Lab
Department of Neurology
PGIMER, Chandigarh