Novel neural pathways and neurogenic potential of the cerebral ventricles in adult mammalian brain

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Objective: Cerebral ventricle enjoys a unique environment in the mammalian brain. The surface of the third, fourth and lateral cerebral ventricles is covered by supraepndymal cells and an immense net-work of nerve fibers. Recent studies indicate that the ventricular surface is another neurogenic niche in the vertebrate brain. This study is focused on characterization neuronal elements and the neurogenic potential of the ventricular surface in adult rats.

Methods: Identification and characterization of the intraventricular cell clusters and nerve fibers in adult rats were carried out using correlative transmission and scanning electron microscopy. Characterization of supraependymal nerve fibers were carried out by immunohistochemical analysis as well as by the intraventricular administration of selective neurotoxins. Further studies were carried out to understand axotomy induced axonal regeneration and the neurogenic potential of the ventricular surface.

Results: Electron microscopic studies have shown the presence of catecholaminergic, cholinergic or peptidergic nerve fibers on the ependymal surface. Studies following the injection of selective neurotoxins into the cerebral ventricles have confirmed the serotonergic, adrenergic and/or dopaminergic nature of these fibers. Immunohistochemical studies revealed the presence of tyrosine hydroxylase positive fibers on the ependymal surface. Retrograde labeling studies have suggested that some of these fibers may have originated from the superior cervical ganglia. Profound axonal regeneration of the fibers and neurogenesis were observed following axotomy.

Conclusion: The data presented in this study shows the existence of clusters of supraependymal cells and an extensive, novel, intraventricular neural pathway in the vertebrate brain. These fibers are of varied nature and origin. Preliminary studies indicate that some of the ependymal or supraependymal cells may represent another group of neural stem cells of the mammalian brain.

Speaker Biography

Thazhumpal Chacko Mathew completed his PhD from the University of Alberta, Canada in 1992 and obtained FRCPath (UK) in 2003. In 1983, he had undergone a research training at the University of Lund, Sweden. After his postdoctoral studies at the University of Alberta, he worked as Assistant Scientist at NYU, USA. In 1993 he joined the Faculty of Allied Health Sciences (FAHS) of Kuwait University. Also, he had a joint appointment in the Department of Anatomy of the of the Faculty of Medicine (FOM), Kuwait University. Currently he is Professor and Chairman of the Graduate Program at the FAHS. He was also Vice Dean for Research at the FAHS and the Director of the Electron Microscope Unit in the FOM. His research is in molecular neurobiology. He is one of the members of the international advisory board of the Netter's Atlas of Human Anatomy. Prof. Mathew received several awards and published more than 75 papers and attended over 100 conferences.

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