Stem Cell Transplants for Brain Repair In Epilepsy and Neurodegenerative Diseases

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ABSTRACT OF THE TALK

Epilepsy afflicts over 60 million people worldwide, putting it among the most prevalent of neurological disorders. The highest incidence occurs in children under the age of five and in the elderly. A relatively large proportion of epilepsy patients develop seizures in the temporal lobe epilepsy (TLE) following head trauma. Many are resistant to antiepileptic drugs or experience debilitating side effects such as cognitive impairment, depression or dementia. Surgery to remove the epileptic tissue may offer relief from seizures, but it is only an option for patients with focal and unilateral seizures. Additionally deep brain stimulation is now used to control seizures, however some patients with severe, multifocal TLE do not respond to this approach. Gene and stem cell therapy offer the potential for curing epilepsy, rather than treating the symptoms. Coupled with a better understanding of neurological changes caused by seizures, the goals of this emerging area of research are to modify the progression of epilepsy and cure the underlying defects. This seminar focuses on stem cell based therapies for treating refractory temporal lobe epilepsy and highlights some of the important scientific and ethical roadblocks that must be overcome before cell based therapies can be used successfully to treat neurodegenerative conditions. Our current research focus is to develop strategies for generating inhibitory GABAergic neurons from mouse and human embryonic stem cell lines. We are comparing the properties of ES-derived cells to the brain's endogenous GABAergic interneurons and evaluating their ability to integrate into the adult hippocampus after

transplantation into mice with recurrent seizures. Intrahippocampal grafts of neural stem cells survive for extensive periods and integrate into the dentate gyrus of adult mice. Neurophysiological studies suggest that the transplanted cells became functional neurons and incorporate into the host brain hippocampus. On-going studies are evaluating functional recovery of the mice by long-term video electroencephalogram (EEG) recordings.