Scientists successfully use human induced pluripotent stem cells to treat Parkinson's in rodents

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Researchers at the Buck Institute for Age Research have successfully used human induced pluripotent stem cells (iPSCs) to treat rodents afflicted with Parkinson's Disease (PD). The research, which validates a scalable protocol that the same group had previously developed, can be used to manufacture the type of neurons needed to treat the disease and paves the way for the use of iPSC's in various biomedical applications. Results of the research, from the laboratory of Buck faculty Xianmin Zeng, Ph.D., are published August 16, 2010 in the on-line edition of the journal *Stem Cells*.

Human iPSC's are a "hot" topic among scientists focused on regenerative medicine. "These cells are reprogrammed from existing cells and represent a promising unlimited source for generating patient-specific cells for biomedical research and personalized medicine," said Zeng, who is lead author of the study. "Human iPSCs may provide an end-run around immuno-rejection issues surrounding the use of human embryonic stem cells (hESCs) to treat disease," said Zeng. "They may also solve bioethical issues surrounding hESCs."

Researchers in the Zeng lab used human iPSCs that were derived from skin and blood cells and coaxed them to become dopamine-producing neurons. Dopamine is a neurotransmitter produced in the mid-brain which facilitates many critical functions, including motor skills. Patients with PD lack sufficient dopamine; the disease is

a progressive, incurable neurodegenerative disorder that affects 1.5 million Americans and results in tremor, slowness of movement and rigidity.

Researchers transplanted the iPSC-derived neurons into rats that had mid-brain injury similar to that found in human PD. The cells became functional and the rats showed improvement in their motor skills. Zeng said this is the first time iPSC-derived cells have been shown to engraft and ameliorate behavioral deficits in animals with PD. Dopamine-producing neurons derived from hESCs have been demonstrated to survive and correct behavioral deficits in PD in the past. "Both our functional studies and genomic analyses suggest that overall iPSCs are largely similar to hESCs," said Zeng.

The research also addresses the current lack of a robust system for the efficient production of functional dopamine-producing neurons from human iPSCs, Zeng said. The protocol used to differentiate the iPSCs was similar to one developed by Zeng and colleagues for hESCs. "Our approach will facilitate the adoption of protocols to good manufacturing practice standards, which is a pre-requisite if we are to move iPSC's into clinical trials in humans," said Zeng.

"The studies are very encouraging for potential cell therapies for Parkinson's disease," said Alan Trounson, Ph.D., the President of the California Institute for Regenerative Medicine. "The researchers showed they could produce quantities of dopaminergic neurons necessary to improve the behavior of a rodent model of PD. We look forward to further work that could bring closer a new treatment for such a debilitating disease," Trounson said.

Provided by Buck Institute for Age Research