**Abstract**

Parkinson's disease is a neurodegenerative disease involving the malfunctioning and death of dopaminergic (DA) neurons. Due to the depletion of the neurons producing dopamine, there is a lack of the neurotransmitters responsible for communicating the signals necessary for movement and coordination. We found that differentiating induced pluripotent stem cells (iPSC) to DA neuron progenitors followed by transplantation into the rat brain may enable differentiation into DA neurons. After 3-4 months, we will extract the brain, mount it on a sequence of slides, and observe their differentiation. We have yet to produce consistent results. However, we will continue to repeat experimentation and review mechanisms of the protocol.

**Background Information**

- Ensure survival of human iPS-derived neurons in rat brain
- Construct a more efficient differentiation method
- Decrease the symptoms of Parkinson’s disease with the availability of human midbrain DA neurons
- Translate this research to clinical studies

**Project Goals**

- 1 million Americans diagnosed with Parkinson’s disease – 60,000 new patients annually
- Currently no Diagnostic Test available
- Problem: Loss of Dopamine Neurons
  - Tremors
  - REM Sleep Disorder
  - Cognitive Impairment

**Figure 1**: The Human Brain. A patient with Parkinson’s disease experiences loss of dopaminergic neurons in the substantia nigra.

**Figure 2**: Creating iPS Cells. Usage of iPS cells generates patient-specific human midbrain dopaminergic neurons to study Parkinson’s disease.

**Figure 3**: Surgical insertion is made into the striatum of a rat brain.

**Figure 4**: Floorplate Neuroepithelial Cell Formation. Arrests Cell cycle, p53 knockdown, and extracellular environment to influence neural maturation

**Figure 5**: DA Differentiation. Facilitates attachment, cell growth, promotion of neural morphology, motility of cells

**Figure 6**: Neural Differentiation. After 3-4 months, staining provides a visual of the differentiation that had occurred at the injection site.

**The Houbo Method**

- Pumorphamine: Influences growth & development of iPS cells in vitro
- Accutase: Detaches the iPS cells from the bottom of the well
- Ascorbic Acid: Provides acidic environment
- Heparin: Inhibits degradation of growth factors

- Correct Cell Form
- dcAMP: Prevents inactivation of second messengers
- Is permeable
- Assists in neurite growth
- Can produce more physiological responses than cAMP

**Introduction**

**Results**

**Experimental Methods**

- Differentiation of iPS cells into dopaminergic neurons
- Transplantation into the Rat Brain on Day 20
- Inject Immunosupressor, Cyclosporin A
- Euthanization
- Slicing of Serial Coronal Sections
- DAB Staining
- DA Neurons

**Part 1: Transplantation into Brain**

- Culture of induced pluripotent stem cells
- Differentiation into dopaminergic neurons
- Ready for Insertion

**Conclusion**

- • Utilize The Houbo Method
- • Select high purity of midbrain floorplate progenitors

**Discussion**

- • Houbo Jiang, Ph.D., Research Mentor
- • Jian Feng, Ph.D., Principal Investigator
- • Michael J. Fox Foundation
- • The Collegiate Science and Technology Entry Program

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**References**


**Contact Information**

Christina Aponte, CSTEP Research Intern
Email: caponte@buffalo.edu
www.linkedin.com/christinaaponte