Exploring the Relationship between the PITX3 Gene and Pituitary as a Site for Neural Regeneration through Blastocyst Complementation of Knockout Brains for the Treatment of Neural Degenerative Diseases

Binoy, Gauri

Neurodegenerative diseases are the deadliest in the world. Neurodegeneration is the progressive loss of the function of neurons. This study analyzes the relationship between the PITX3 gene and the pituitary, and then explores the potential of neural regeneration through blastocyst complementation as a treatment for degenerative diseases. The PITX3 gene is important in the development of the lens, dopamine neurons of the substantia nigra, and pituitary. However, the extent of its role in the pituitary has not been fully explored. Using the method of blastocyst complementation, a process in which stem cells are injected into blastocysts and are genetically engineered to disrupt the function of a unique gene for organ regeneration, the goal of this project is to direct blastocyst complementation to regenerate the human pituitary neurons. At the outset of the project, blastocyst pituitary tissue that both had and did not have the PITX3 gene was examined. Two types of human stem cells were then injected into PITX3 disrupted blastocysts and were allowed to develop 62 days. Following this, the pituitaries were slice and tissue was stained using fluorescent antibodies. Sections were imaged using a fluorescent microscope to identify growth of pituitary neurons and to observe if human stem cells were able to develop into appropriate cell types. If the PITX3 gene does indeed play a large part in the pituitary development and human cells are found in abundance within complimented animals, the conclusion is made that this is viable option to treat and cure degenerative diseases afflicting the pituitary.

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