

BETA CELL REPLACEMENT THERAPY

A philanthropic investment opportunity for FRIENDS UNITED at The University of Chicago Kovler Diabetes Center

A new frontier in diabetes research...

The University of Chicago Kovler Diabetes Center, a national leader in comprehensive diabetes care and research, is committed to finding new therapies for diabetes that may someday even lead to a cure for the disease. We are currently developing a promising new approach with the goal of discovering how skin cells grown from adults can be taught to make insulin and used to better understand how to treat diabetes. The technical term for these cells is induced pluripotent stem cells (iPSCs), and there is no doubt they can help teach us how the beta cells that secrete insulin in the body work. These adult stem cells are made from skin biopsies of adults or children (not human embryos). With our current knowledge of genetic engineering, these skin cells can be turned into the iPSC stem cells that are capable of becoming almost any function-specific cell in the body. **Our challenge** is discovering how to do it efficiently, get the process scaled up, and deal with potential downsides including rejection by the body's immune system.

Several labs, including our group of collaborators at the University of Chicago Kovler Diabetes Center and the University of Cincinnati, have been able to generate such stem cells and to transform them into beta cells. Our expertise in the genetics of diabetes has also illuminated the next steps that will turn them into functional and useful insulin-secreting cells. **This innovative approach** to stem cell research brings together research groups at the University of Chicago with other collaborators to apply the complementary expertise in stem cell and developmental biology, genetics and genomics and beta-cell physiology required to forge groundbreaking new therapies for treating patients with type 1 diabetes (T1D).

Beta cell replacement therapy is a game-changing goal for the next generation of treatments for type 1 diabetes. The University of Chicago is well positioned as an innovator in the field. We have worked extensively over the last several decades in the biology, genetics and physiology of insulin secreting cells. These studies have helped us to understand key genetic pathways that allow beta cells to become and remain beta cells. In collaboration with an outstanding developmental biologist, James Wells at the University of Cincinnati, we have developed a project to leverage our knowledge of beta cell biology and genetics to define the steps necessary for creating new beta cells that could be redelivered to the donor individual either by encapsulation or following immunomodulation of their underlying diabetes. The basic idea is to biopsy skin cells from patients with various kinds of diabetes and, following culture in dishes, add genes and small molecules that lead them to the beta cell pathway. By including both subjects with rare forms of diabetes and obesity without diabetes, we will analyze the key genes that make robust beta cells. We will also test the key steps of very recently published methods that were able to turn skin fibroblast cells into functional liver cells. The preliminary data from this project will be critical in developing a strong application for further funding from the National Institutes of Health. While other groups are certainly pursuing their own strategies in both the public and private sectors, we believe that our special approach and insight into beta cell function positions us to make the greatest impact, by adding key pieces to the puzzle that will benefit others taking related approaches in beta cell replacement research.