

Bankhead-Coley Cancer Research Program

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*Pathology, Immunology, and Laboratory Medicine
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Florida Research Challenge
(2-year project)*

Project Title: Generation of Pancreatic Islet Beta-Cells from Patient-Specific, Viral-Free, iPS Cells

Project Summary: Diabetes and its complications are a major healthcare burden affecting 200 million people worldwide. Since a common feature is diminished numbers of insulin-producing cells (IPCs), islet cell replacement has been studied as a potential curative therapy. However, pancreatic islet cells are not readily available, and immunosuppressive therapy increases susceptibility to infections and cancer. These two obstacles hinder the clinical use of islet cell transplantation. Recent progress in human-induced pluripotent stem cells (iPSCs) provides the promise of generating patient-specific IPCs for cell therapy. Generation of iPSCs involves reprogramming somatic cells to become embryonic stem cells. The common method employs viral vectors to introduce transcription factors. However, this strategy introduces viral genes into the iPSCs, which could increase cancer risk. In this project, we use a novel strategy to induce iPSCs from blood cells of diabetics by delivering reprogramming factors with protein transduction technology. This new technology enables one to add a “signal” to an engineered protein, allowing it to freely enter cells without the help of viral vectors. Our objectives are to produce iPSCs from diabetics using non-viral reprogramming methods based on four engineered reprogramming factor proteins, and to develop highly effective methods to differentiate iPSCs towards IPCs, and to test their insulin-secreting ability following a glucose challenge.