# Thin Film Encapsulation Devices for Human Stem Cell derived Insulin Producing Cells

## Grant Award Details

Thin Film Encapsulation Devices for Human Stem Cell derived Insulin Producing Cells

**Grant Type:** Quest - Discovery Stage Research Projects

**Grant Number:** DISC2-09559

**Project Objective:** *The awardee proposes to develop a macroencapsulation device based on flexible nanoporous thin films to support the long term viability and function of allogeneic human embryonic stem cell (hESC)-derived insulin producing cells (SCIPCs) for the treatment of Type I Diabetes. The device will be optimized in vitro for beta cell survival and immunoprotection and be evaluated in vivo for foreign body response and vascularization and function. The final device candidate will enable hESC-derived beta cells survival and function allowing for normalization of blood glucose levels and c-peptide production in in vivo immunocompetent animal models of diabetes.*

**Investigator:**

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| **Name:** | Tejal Desai |
| **Institution:** | University of California, San Francisco |
| **Type:** | PI |

**Disease Focus:** Diabetes, Metabolic Disorders, Type 1 diabetes

**Human Stem Cell Use:** Embryonic Stem Cell

**Award Value:** $1,092,063

**Status:** Closed

## Progress Reports

**Reporting Period:** Year 2

**View Report**

## Grant Application Details

**Application Title:** Thin Film Encapsulation Devices for Human Stem Cell derived Insulin Producing Cells

**Public Abstract:**

**Research Objective**

We propose to develop a macroencapsulation technology, based on flexible nanoporous thin films, to support the long term viability and function of human stem cell derived insulin producing cells.

**Impact**

Encapsulation devices that maintain function of stem cell derived islets can address challenges with current cell therapy for Type I Diabetics, including islet shortage and life-long immunosuppression

**Major Proposed Activities**

- Enhance beta cell survival by incorporating cell survival factors (e.g. amino acids) into the internal compartment of macroencapsulation device.
- Enhance immunomodulatory effects of the macroencapsulation device by incorporating controlled release of soluble anti-TNFa and IL-1Ra from the device.
- Determine differentiation and function of macroencapslated hESC-derived beta cells in vivo over 3 months.
- Evaluate biocompatibility of our immunomodulatory thin film macroencapsulation device by monitoring extent of fibrosis and vascularization in vivo.
- Examine immune activation by macroencapsulated hESC-derived beta cells in mice with normal immune system.
- Test in vivo functionality of devices with hESC-derived beta cells (Graft survival, blood glucose, and c-peptide production over 3-6 months).

**Statement of Benefit to California:**

Diabetes affects 2.3 million Californians with annual healthcare costs of more than $12 billion. An unlimited supply of insulin-producing cells may be produced from stem cells for treating diabetes, but the need for immunosuppression limits the use of this therapy. We will develop a macroencapsulation device that protects these cells from the immune system and enhances long term cell function. Success in this effort may alleviate diabetes-associated disease and financial burden in California.

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