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Device Protects Transplanted Pancreatic Cells from the Immune System

Immunoprotection is important step toward future treatment of Type 1 diabetes

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Scientists at the University of California San Diego (UC San Diego) School of Medicine and the Burnham Institute for Medical Research (Burnham) have demonstrated in mice that transplanted pancreatic beta cells are protected from the immune system when encapsulated in a synthetic material called polytetrafluorethylene (PTFE). They also showed that using precursor cells, instead of fully formed beta cells, enhanced the rate of transplantation success. The study, which suggests a new approach to treating Type 1 diabetes, was published online on April 8 in the journal *Transplantation.*

The scientists thought that, even if T-cells - white blood cells in the immune system which act like soldiers to search out and destroy targeted invaders - weren't able to penetrate the device to reach the encapsulated cells, they would cluster around it.

"The results exceeded our expectations," said Pamela Itkin-Ansari, PhD, assistant adjunct professor at the UC San Diego School of Medicine and Burnham. "We found no evidence of an active immune response, suggesting that the cells in the device were invisible to the immune system."

Type 1 diabetes results from an autoimmune response wherein the body attacks and kills insulin-producing beta cells in the pancreas. One of the challenges of cell transplantation therapy to treat diabetes is the need for long-term immunosuppression, which carries health risks. Transplanting beta cells in a protective device could alleviate the need to use immunosuppressive drugs.

The investigators used two different mouse models in the study. The team first transplanted mouse islet cells - clumps of cells in the pancreas that house beta cells- into other mice, in order to demonstrate that the cells were protected from the immune system when encapsulated in PTFE. Human cells encased in PTFE were then transplanted into immunodeficient mice to study the viability and function of both mature beta cells and precursor cells inside the device.

Itkin-Ansari's team found that by using precursor cells that had not completely differentiated, the transplanted cells could regenerate into fully functional beta cells. According to the researchers, this has important implications for how stem cell-derived tissue should be transplanted in the future.

"After transplantation, the precursor cells mature into functional beta cells that are glucose-responsive and control blood sugar levels," said Itkin-Ansari. "Additionally, we demonstrated that using precursor cells, instead of more committed beta cells, enhanced the cell transplant's chances of success."

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