

New islet cell transplant procedure offers improved outcomes for patients with type 1 diabetes

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The latest approach to islet transplantation, in which clusters of insulin-producing cells known as islets are transplanted from a donor pancreas into another person's liver, has produced substantially improved results for patients with type 1 diabetes, and may offer a more durable alternative to a whole pancreas transplant. Participants in the new study received islet cells isolated from the pancreas of organ donors to help their bodies produce insulin, the life-sustaining hormone responsible for absorbing glucose from the blood. The new approach, which allowed the harvested cells a short period of rest prior to transplant, resulted in increased levels of insulin production to the degree that patients were able to discontinue daily insulin injections. Results of the study, conducted by researchers at the Perelman School of Medicine at the University of Pennsylvania, appeared recently in the journal *Diabetes*.

In the study, investigators used an advanced technique to isolate and harvest [islet cells](#) from donor pancreases. Unlike prior methods in which isolated islet cells were immediately transferred to the recipient, the new technique allowed the extracted cells to rest in a controlled environment for three days prior to transplant. Inflammation that occurs when the cells are harvested can often predispose the recipient to rejection after transplantation. However, by allowing the cells to rest, the inflammation – and possibility of rejection – is reduced. Ultimately, the resting period also resulted in a more efficient process by allowing investigators to use fewer islet cells than previous methods which required cells from two or

more donor pancreases achieve similar results. Despite fewer islet cells being transplanted, the new approach resulted in significantly improved islet cell function.

"These results show that islet transplantation has become a more promising method for replacing the islet cells in type 1 diabetes patients experiencing severe problems with [low blood sugar](#)," said lead author Michael R. Rickels, MD, MS, medical director for the Pancreatic Islet Cell Transplantation Program and associate professor of Medicine in Endocrinology, Diabetes and Metabolism at Penn Medicine. "We've seen positive long-term results with this technique, and are excited to be able to offer the option to our patients, where currently a whole [pancreas transplant](#) requiring major surgery is the only available alternative."

The new approach, known as the CIT07 protocol, was developed by the National Institutes of Health and sponsored by the Clinical Islet Transplantation (CIT) Consortium, in which Penn has served as a member since 2004. Under the new protocol, which measures islet cell mass, all patients involved in the study were able to come off [insulin](#) therapy and remained so after at least one year with no loss of the transplanted cell mass.

Typically, patients with [type 1 diabetes](#) must self-administer multiple injections of insulin per day, or receive it by a continuous infusion from a wearable pump. However, insulin therapy is difficult to calibrate to the body's changing energy needs, and patients are required to frequently check their blood sugar levels and adjust their insulin dosage. Varying levels of insulin in the body often results in low blood sugar (hypoglycemia), which can induce a coma or other medical emergency. Conversely, islet transplantation, when effective, results in natural, internal self-monitoring and adjustment of insulin levels to keep blood sugar levels in a normal range (homeostasis).

"The fact that significantly more transplanted islet cells in the new protocol are able to successfully integrate and continue producing insulin at least one year later compared to prior studies, gives us hope that more type 1 [diabetes patients](#) will be able to live full and healthy lives free from the dangers of hypoglycemia and the burden of administering insulin," said senior author and principal investigator Ali Naji, MD, PhD, surgical director of the Kidney and Pancreas Transplant Program at Penn Medicine.

Roughly five to ten percent of all people with diabetes have Type 1 diabetes. Previously known as juvenile-onset diabetes, Type 1 diabetes is typically first diagnosed in children and young adults and persists throughout life. Patients with the disease do not produce insulin because of autoimmune destruction of the insulin producing cells in the [pancreas](#). Without insulin, patients cannot convert sugar, starches, and other food into energy needed for survival. When left untreated, Type 1 diabetes is a potentially fatal disease.

Provided by University of Pennsylvania School of Medicine

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