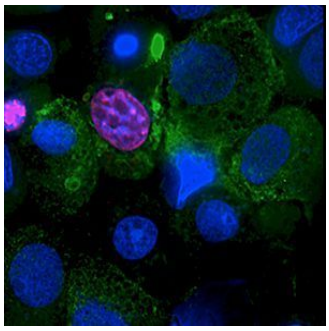
ICU
MANAGEMENT & PRACTICE

Major Hurdle Cleared to Diabetes Transplants



Scientists have found a way to make insulin-producing cells multiply in the laboratory. Pictured in blue are the cells, while the insulin is green. Increased availability of these cells may facilitate treatment of patients with type 1 diabetes.

Researchers at Washington University School of Medicine in St. Louis have identified a way to trigger reproduction in the laboratory of clusters of human cells that make insulin, potentially removing a significant obstacle to transplanting the cells as a treatment for patients with type 1 diabetes.

Efforts to make this treatment possible have been limited by a dearth of insulin-producing beta cells that can be removed from donors after death, and by the stubborn refusal of human beta cells to proliferate in the laboratory after harvesting.

The new technique uses a cell conditioning solution originally developed to trigger reproduction of cells from the lining of the intestine.

“Until now, there didn’t seem to be a way to reliably make the limited supply of human beta cells proliferate in the laboratory and remain functional,” said Michael McDaniel, PhD, professor of pathology and immunology. “We have not only found a technique to make the cells willing to multiply, we’ve done it in a way that preserves their ability to make insulin.”

The findings are now available online in PLOS ONE.

The current method for harvesting human islets, which are comprised primarily of the insulin-producing beta cells, makes it necessary to find two or three donors to extract enough cells to produce an adequate supply of insulin to treat a single patient with diabetes.

The idea for the new technique came from an on-campus gathering to share research results. Lead author Haytham Aly, PhD, a postdoctoral research scholar, reported on his work with beta cells and was approached by Thaddeus Stappenbeck, MD, PhD, associate professor of pathology and immunology, who studies autoimmune problems in the gut. Stappenbeck had developed a medium that causes cells from the intestine’s lining to proliferate in test tubes.

“He said, why don’t you try it, and he gave us some samples,” Aly said. “We put the solution in our freezer for a month or so, and when we finally gave it a try, we were amazed at the results: human beta cells in Dr. Stappenbeck’s solution reproduced at a rate that was 20 times higher than beta cells in a solution that contained the sugar glucose.”

The ability to produce large quantities of human beta cells in the laboratory gives the researchers hope that they could one day be transplanted into patients with type 1 diabetes.

The advantage of Stappenbeck’s solution may be that it is designed to activate multiple growth signaling pathways in cells, according to the researchers. Earlier attempts to make beta cells proliferate focused on one or two growth pathways. The solution also activates genes that help prevent beta cells from dying.

Because pancreatic cancers are among the most deadly tumors, the scientists checked to make sure the proliferating beta cells weren’t becoming more like cancer cells. They found that none of the factors known to contribute to pancreatic cancer were active in the laboratory-grown beta cells.

“This is an important concern to keep in mind if we are to expand human beta cells in culture with this medium and subsequently transplant them into patients,” said Aly.

If the new availability of laboratory-grown beta cells makes it possible to treat patients with transplants from one donor instead of multiple donors, McDaniel noted, that might reduce the risk of immune system rejection of the transplants.

“Another benefit in using this novel growth medium to expand isolated human beta cells is that the cells remain healthier and have reduced levels of cell damage or death,” Aly said. “That may also reduce the chances of immune system rejection.”

Source: Washington University School of Medicine

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