

'Grow your own transplant' may be possible for men with type 1 diabetes

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Men with type 1 diabetes may be able to grow their own insulin-producing cells from their testicular tissue, say Georgetown University Medical Center (GUMC) researchers who presented their findings today at the American Society of Cell Biology 50th annual meeting in Philadelphia.

Their laboratory and animal study is a proof of principle that human spermatogonial stem cells (SSCs) extracted from testicular tissue can morph into insulin-secreting beta islet cells normally found in the pancreas. And the researchers say they accomplished this feat without use of any of the extra genes now employed in most labs to turn adult stem cells into a tissue of choice.

"No stem cells, adult or embryonic, have been induced to secrete enough insulin yet to cure diabetes in humans, but we know SSCs have the potential to do what we want them to do, and we know how to improve their yield," says the study's lead investigator, G. Ian Gallicano, Ph.D., an associate professor in the Department of Cell Biology and Director of the Transgenic Core Facility at GUMC.

Given continuing progress, Gallicano says his strategy could provide a unique solution to treatment of individuals with type 1 diabetes (juvenile onset diabetes). Several novel therapies have been tried for these patients, but each has drawbacks. Transplanting islet cells from deceased donors can result in rejection, plus few such donations are available. Researchers have also cured diabetes in mice using induced pluripotent

stem (IPS) cells – adult stem cells that have been reprogrammed with other genes to behave like embryonic stem cells – but this technique can produce teratomas, or tumors, in transfected tissue, as well as problems stemming from the external genes used to create IPS cells, Gallicano says.

Instead of using IPS cells, the researchers turned to a readily available source of stem cells, the SSCs that are the early precursors to sperm cells. They retrieved these cells from deceased human organ donors.

Because SSCs already have the genes necessary to become embryonic stem cells, it is not necessary to add any new genes to coax them to morph into these progenitor cells, Gallicano says. "These are male germ cells as well as adult stem cells."

"We found that once you take these cells out of the testes niche, they get confused, and will form all three germ layers within several weeks," he says. "These are true, pluripotent stem cells."

The research team took 1 gram of tissue from human testes and produced about 1 million stem cells in the laboratory. These cells showed many of the biological markers that characterize normal beta islet cells.

They then transplanted those cells into the back of immune deficient diabetic mice, and were able to decrease glucose levels in the mice for about a week – demonstrating the cells were producing enough insulin to reduce hyperglycemia.

While the effect lasted only week, Gallicano says newer research has shown the yield can be substantially increased.

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Provided by Georgetown University Medical Center

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