

# Transplant Cures Rats With Type 2 Diabetes

The treatment approach transplants precursors of the pancreas without immune suppression drugs.

REVIEWED BY MARC R. HAMMERMAN, MD

**A**n approach proven to cure a rat model of type 1 diabetes also works in a rat model of type 2 diabetes, according to a report from researchers at Washington University School of Medicine, St. Louis. The treatment approach transplants precursors of the pancreas from embryonic pigs. The study appears in the journal *Transplant Immunology*.

“Finding that we can cure type 2 diabetes in the same way is very significant because in humans, type 2 is almost 20 times more prevalent than type 1 diabetes,” said senior author Marc R. Hammerman, MD, Chromalloy Professor of Renal Diseases in Medicine, in a news release. “There are about 200 million people with type two diabetes worldwide, and the incidence is rapidly increasing.”

In a previous study, Dr. Hammerman and codeveloper Sharon A. Rogers, research instructor in medicine, showed that they could transplant the cells in a way that lets them grow into insulin producers without triggering attacks by the rats’ immune systems. This cured diabetes in the rats, without the use of immune suppression drugs required to prevent rejection in other transplant-based treatments.

## GROWING ORGANS FROM STEM CELLS

Dr. Hammerman and Ms. Rogers are leaders in the emerging field of organogenesis, which focuses on growing organs from stem cells and other embryonic cell clusters known as organ primordial. Unlike embryonic stem cells, which can become virtually any cell type, primordial are locked into become cells of a specific organ. The researchers approach for diabetes treatment uses pig pancreatic primordial. In previous research, they found that obtaining primordial early in the pigs’ development rendered them invisible to the rats’ immune system, eliminating the need for antirejection drugs.

In the most recent study, researchers transplanted the pig primordial into a strain of rat with a disorder that

closely resembles human type 2 diabetes. The result was the same: The transplants cured diabetes without immune suppression.

Dr. Hammerman noted that the study showed the lack of immune rejection was not just an artifact from the strain of rats used for the first experiments. “In addition, now we also know that this approach works for the much more common type 2 diabetes, something we couldn’t predict based on our earlier research,” Dr. Hammerman said. One distinction between the two types of diabetes that made such a prediction difficult is insulin resistance.

## RATS ARE CURED BY PIG INSULIN

“The transplanted primordial not only appropriately regulated blood sugar in the type 2 diabetic rats, they also reduced insulin resistance,” Dr. Hammerman said. “The rats are cured by pig insulin, which comes from the transplants and can be measured in their circulation. The rats’ own insulin producing cells in the pancreas are atrophied.”

Dr. Hammerman and Ms. Rogers showed that engrafted embryonic pig pancreatic tissue removed from rats and placed in a test tube releases pig insulin with a minute of being exposed to high glucose levels.

“The link between the glucose sensing and insulin releasing machinery of the pig cells is established normally after transplantation of primordial, and they work just like a normal pancreas,” said Ms. Rogers in a news release.

With support from the Juvenile Diabetes Research Foundation, the researchers along with scientists at the University of Alabama-Birmingham have transplanted pig pancreatic primordial into diabetic nonhuman primates. Results so far are preliminary but encouraging. If the pig-to-primate work proves successful, they hope to move on to human trials. ■

Rogers SA, Chen F, Talcott, M, Laipis H, Hammerman MR. Glucose intolerance normalizing following transplantation of pig pancreatic primordial into non-immunosuppressed diabetic ZDF rats. *Transplant Immunology*; 2006; Accessed on Sept. 27, 2006. Available at: doi:10.1016/j.trim.2006.08.007.