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Stem Cell Therapy Controls Diabetes in Mice

By ANDREW POLLACK

Scientists reported on Wednesday that they were able to control diabetes in mice by harnessing human embryonic stem cells. The work raised the prospect that the embryonic cells might one day be used to provide insulin-producing replacement cells to treat the disease in people.

The scientists, at the biotechnology company Novocell, turned the stem cells into cells that produced insulin in the mice. Those cells kept blood sugar in check after the mice's own insulin-producing cells were destroyed.

"For those who say there is not much evidence that embryonic stem cells can cure diabetes, there you go," said Dr. Camillo Ricordi, director of the Diabetes Research Institute at the University of Miami, who was not involved in the research.

Still, a small number of the mice developed tumors, and some experts said the cells might not be well-characterized enough for use in people. In any event, Novocell said it would be several years before any human tests could begin.

Doctors are already experimenting with transplants of insulin-producing islet cells from cadavers for patients with Type 1 diabetes, a disease that destroys a person's own islet cells. In some cases, the transplant recipients have not needed daily injections of insulin, at least for a while.

But there are too few donors to provide cell replacement to more than a small percentage of diabetics. Embryonic stem cells, which can potentially be turned into any type of cell in the body, could be a source of islet cells.

Novocell, which is based in San Diego, reported in 2006 that its researchers had turned human embryonic stem cells into insulin-producing cells in culture dishes, something others have also reported doing. But Novocell's cells did not vary insulin production in response to glucose, a crucial requirement for implantation.

In the latest work, published online Wednesday by Nature Biotechnology, the researchers got assistance from the mice themselves. Instead of implanting the insulin-producing cells into mice, they implanted precursor cells that were a step short of developing into insulin-producing cells.

The mice's bodies apparently provided the proper signals to turn the implanted cells into functioning insulin-producing cells in about 90 days.

When the scientists used a toxin to destroy the mice's own islet cells, the animals that had received the human cells continued to produce insulin and control their blood sugar while mice without the implants quickly became diabetic. After about 100 days, the scientists removed the implanted cells from the mice, and blood sugar levels shot up.

"This for the first time validates that you can use human embryonic stem cells to produce fully functional human islets," said Emmanuel E. Baetge, the chief scientific officer of Novocell and senior author of the report.

But Dr. Mark A Magnuson, a professor at Vanderbilt University and director of its stem cell biology center, said the Food and Drug Administration might not allow the transplant into people of cellular material that would have to "mature" in the body.

"Would this happen reproducibly in different people, and would it be the same in all transplant sites?" Dr. Magnuson said in an e-mail message. "If it wasn't totally predictable, could there be adverse effects, such as tumors?"

Indeed, in the Novocell experiment, 7 of the 105 mice with the implants developed a sort of tumor called teratomas. Dr. Baetge said Novocell could probably have reduced or eliminated the teratomas if it had purified the cells before implanting them.