

# DIABETES TREATMENTS

## ADULT STEM CELLS VS. EMBRYONIC STEM CELLS

### **ADULT CELLS successfully TREAT HUMANS with diabetes:**

- 2005** Islet cells can be donated from live donors for patients, opening up many more transplant possibilities. Using this technique, a mother donated cells for her diabetic daughter, alleviating the diabetic symptoms. Matsumota S et al., "Insulin independence after living-donor distal pancreatectomy and islet allotransplantation," *The Lancet*, 365, 1642-1644, 7 May 2005.
- 2001** The Edmonton protocol was used to isolate cadaveric islet cells to treat 12 people with juvenile diabetes. Ryan A. et al., "Glycemic Outcome Post Islet Transplantation," Annual Meeting of the American Diabetes Association, June 22-26, 2001. Since 2001, over 200 diabetic patients have been treated with this protocol.

### **ADULT STEM CELLS successfully TREAT diabetes in MICE:**

- 2006** Three independent studies confirmed earlier findings by Harvard researchers that blocking autoimmune attack on the diabetic pancreas leads to regeneration of insulin-secreting cells in diabetic mice. Chong AS *et al.*, Reversal of diabetes in non-obese diabetic mice without spleen cell-derived  $\beta$  cell regeneration, *Science* 311, 1774-1775, March 24, 2006; Nishio J *et al.*, Islet recovery and reversal of murine type 1 diabetes in the absence of any infused spleen cell contribution, *Science* 311, 1775-1778, March 24, 2006; Suri A *et al.*, Immunological reversal of autoimmune diabetes without hematopoietic replacement of  $\beta$  cells, *Science* 311, 1778-1780, March 24, 2006.
- 2006** California researchers showed that insulin-secreting cells could be produced from other cells within the human pancreas. Hao E *et al.*, Beta-cell differentiation from nonendocrine epithelial cells of the adult human pancreas, *Nature Medicine* 12, 310-316, March 2006.
- 2006** NIH scientists showed that they could grow pancreatic cells for long periods and turn them into insulin-secreting cells. Ta M *et al.*, The defined combination of growth factors controls generation of long-term replicating islet progenitor-like cells from cultures of adult mouse pancreas, *Stem Cells* doi:10.1634/stemcells.2005-0367, published online March 23, 2006.
- 2006** A Japanese team demonstrated that human umbilical cord blood stem cells could form insulin-secreting cells. Yoshida S *et al.*, Human cord blood-derived cells generate insulin-producing cells *in vivo*, *Stem Cells* 23, 1409-1416, October 2005.
- 2005** Israeli scientists have found that patients could serve as their own donors, converting their liver cells to insulin-secreting cells. Sapir *et al.*, "Cell-replacement therapy for diabetes: generating functional insulin-producing tissue from adult human liver cells," *PNAS* 102, 7964-7969, 17 May 2005.

- 2004** University of Florida researchers restored normal blood sugar levels in diabetic mice for three months by transforming bone marrow stem cells into islet-like cells that produced normal insulin levels. Oh SH, et al., Adult bone marrow-derived cells trans-differentiating into insulin-producing cells for the treatment of type I diabetes, *Lab Invest* 84, 607-617, May 2004.
- 2003** Researchers used spleen cells to help regenerate pancreatic islet cells that produced insulin and permanently reversed diabetes in mice. The lead researcher stated that using this procedure “patients with fully established diabetes possibly could have their diabetes reversed” (BBC News Online, 14 November 2003), and is ready to test the approach in clinical trials. Kodama S, et al., Islet regeneration during the reversal of autoimmune diabetes in NOD mice, *Science* 302, 1223-1227, Nov 14, 2003.
- 2002** University of Florida researchers turned liver stem cells into pancreatic cells. When implanted into mice, these transformed cells reversed hyperglycemia in 10 days. Yang L. et al., In vitro trans-differentiation of adult hepatic stem cells into pancreatic endocrine hormone producing cells, *Proc Natl Acad Sci USA*, 99, 8078-8083, 11 June 2002.

### **Touted ESCR Diabetes Studies—NO CURES:**

- 2005** Failure of insulin production from embryonic stem cells that resembled pancreatic islets. Paek HJ et al., Origin of insulin secreted from islet-like cell clusters derived from murine embryonic stem cells, *Cloning and Stem Cells* 7, 226-231, December 2005.
- 2005** Embryonic stem cells briefly reversed hyperglycemia in mice, but caused tumors. Fujikawa T et al., Teratoma formation leads to failure of treatment for type I diabetes using embryonic stem cell-derived insulin-producing cells, *American Journal of Pathology* 166, 1781-1791, June 2005.
- 2004** Embryonic stem cells thought to make insulin did not actually produce new insulin. Hansson M et al., “Artifactual insulin release from differentiated embryonic stem cells”, *Diabetes* 53, 2603-2609, October 2004.
- 2004** Scientists found that what appeared to be insulin-producing cells differentiated from embryonic stem cells did not actually make insulin, and formed tumors. Sipione S et al., “Insulin expressing cells from differentiated embryonic stem cells are not beta cells”, *Diabetologia* 47, 499-508, 2004.
- 2004** Scientists in Israel produced clusters with some insulin-secreting cells from embryonic stem cells. Segev H et al., “Differentiation of human embryonic stem cells into insulin-producing clusters,” *Stem Cells* 22, 265-274, 2004.
- 2003** Repeat of previous studies showed that embryonic stem cells did not make insulin. Rajagopal J et al.; “Insulin staining of ES cell progeny from insulin uptake”; *Science* 299, 363; 17 Jan 2003.
- 2002** A study showed embryonic stem cells turned into a kind of insulin-producing cell, not beta cells, that produced 13% of the normal insulin levels. When injected, the mice were kept alive but not enough to cure the diabetes. Hori Y, et al., “Growth inhibitors promote differentiation of insulin-producing tissue from embryonic stem cells.” *Proc Natl Acad Sci USA* 99, 16105-16110, Dec 10, 2002.
- 2001** Media heralded study showed that embryonic stem cells turned into pancreatic cells. In fact, they only produced 1/50 the normal amount of insulin and mice died. Lumelsky N, et al., “Differentiation of embryonic stem cells to insulin-secreting structures similar to pancreatic islets,” *Science* 292, 1389-1394; May 18, 2001.