NIXING the insulin needle:

Diabetes research is opening doors to more treatment options

by **ELLEN ASHTON-HAISTE**

Stem cells, eyelet transplants, targeted tissue regeneration – these were concepts beyond comprehension for Frederick Banting, when he discovered insulin as a diabetes treatment early in the 20th century. Certainly he would have been incredulous at the thought that within a hundred years, his breakthrough could lead to the myriad options diabetics will face in the dawning years of the 21st century.

"There are all sorts of strategies emerging and I think in the future people will be able to choose the approach that's right for them and for the type of diabetes they have," says Dr. David Hill, scientific director at Lawson Research Institute in London, Ont., and chair of the research committee for the Canadian Diabetes Association. "It's very promising and people with diabetes deserve it."

One of the breakthroughs in modern research came out of an Edmonton laboratory in the late nineties, when scientists pioneered the transplantation of the insulin-producing eyelet cells in the pancreas. Some of those Edmonton patients are into their third year off-insulin, but others have been forced to return to at least partial insulin support. Thus, Hill cautions, the procedure should not be considered a "one-time fix." As a long-term strategy it would require subsequent transplants or top-ups.

But at a number of mirror sites in Canada and the United States, reproducing the Edmonton transplant protocol, attempts have been made to build on that breakthrough. For example B.C. researchers have been looking at immunosuppressing patients to increase the quality of life of the transplant and, in Pittsburgh, there has been some success in reducing the number of donor pancreases required for a transplant – currently two to one.

There are no mirror sites in Ontario but London is hoping to become the first in the near future with Toronto likely to follow soon after.

"We are a very strong centre for looking at the biology of insulin-producing cells in terms of where do they come from, what are the precursor cells or stem cells," Hill says. These, he adds, are not the controversial embryonic stem cells but adult cells resident in the pancreas.

In fact, London researchers achieved a breakthrough of their own in this area. Working with the cells from pancreatic tissue, they isolated a population of stem cells, which by nature replicate themselves rapidly, and then manipulated them in a tissue culture. "We now have proof, in animal models, that if we do that in a controlled way, we can cause these stem cells to cluster together in balls and reform as things that look just like pancreatic eyelets and have within them functioning insulin-producing cells."

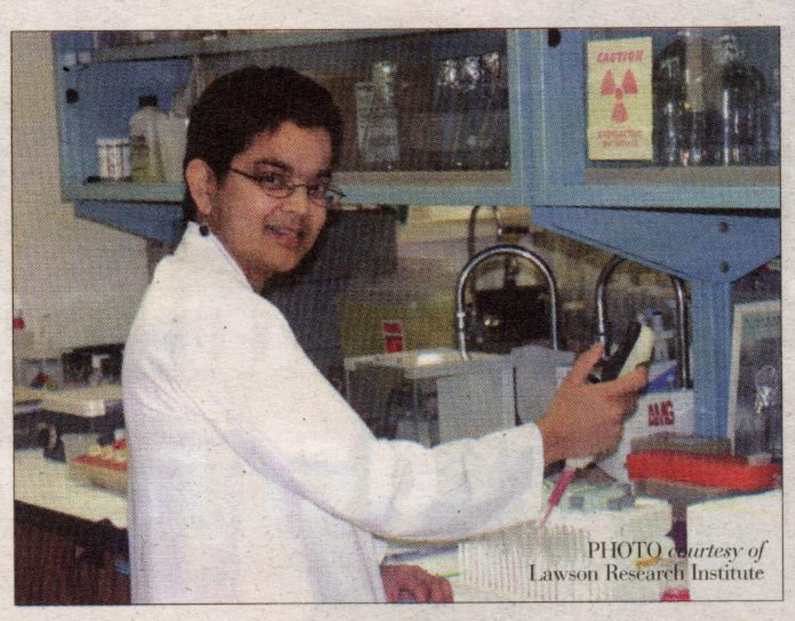

PHOTO *courtesy of* Lawson Research Institute

Savita Dhanvantari, a researcher at Lawson Health Research Institute in London, Ont., works in the lab where some breakthroughs have been made in the treatment of diabetes.

Other sites, including one in Montreal, have been moving this research from the animal to the human level with similar success. Ultimately, if such success continues, Hill explains, these "artificial" eyelets could supplement the donor eyelets in transplants, greatly increasing the availability of transplant material and possibly, someday, replacing donor eyelets completely.

Other London research, earlier this summer, took bone marrow stem cells, which reproduce blood cells, and reinjected them into diabetic mice. The surprising result was that the cells found their way to the damaged pancreas and induced natural regeneration, growing back insulin-producing cells and suggesting a real possibility of tissue regeneration.

"That's a very promising line where, in the long term, we see targeted tissue regeneration being the really perfect answer for reversing diabetes."

The downside of these advances is that, in patients where the immune system ran amok and destroyed the pancreatic cells, any treatment that regrows or transplants them would be accompanied by a lifetime of immune suppressive drug treatment.

But for many diabetics, such drastic techniques are not needed. Other options coming down the pipe for blood glucose control, include a glucose meter with an implanted needle attached to an insulin pump – something already being used for some patients – that would constantly sample the blood glucose levels and send the information to the pump which would supply the needed insulin.

"Effectively you have an artificial pancreas, miniaturized to the size of a walkman, which is what an insulin pump size is now that you strap to a belt," Hill says. "I think that will be the next major advance and a very big improvement in control of blood glucose."

Some of these technologies may be possible within the next five years. Others will take longer to perfect but every advance is welcome in the fight against a disease which Hill says has become a "frightening" burden in this province.

In the Greater Toronto Area, he says the incidence of diabetes is eight to 10 per cent and growing rapidly, particularly in ethnic populations which have large communities there. "The GTA is potentially facing an epidemic of diabetes and all of the complications. The long-term result from that will be a huge burden on the health care system if nothing is done to stop it."