SUGAR FIX

Dr. James Shapiro wants to eradicate diabetes

by Eliza Barlow * photography Bluefish Studios

Dr. James Shapiro in his lab at the University of Alberta

Shapiro and his team are now researching how to make stem cells from a patient's own blood and turn those cells into insulin-producing islet cells that could then be transplanted back into the patient.

Dr. James Shapiro's quest to cure diabetes began nearly 40 years ago, when, as a medical student at Newcastle University in England, he started a research project on islet cell transplants in rats.

"When I first started, I knew nothing about diabetes, and certainly nothing about transplant. I'd never seen a rat before," he recalls. He soon got up close and personal with them.

To get a drop of rat blood for his experiments, the young Shapiro had to venture in the middle of the night to the university's animal house, located amid billowing steam behind a hospital laundry, and steel himself to snip off the end of a rat's tail.

"It was quite scary for me — go down this pathway, go down to the animal house, and there were the rats in these cages. I was terrified to touch them, and one of the rats sloughed its tail when I touched it and — I can still feel it now," he says. Rats can deglove the skin from their tails as a defense mechanism.

"My heart was in my mouth. I was petrified."

Still, Shapiro worked "day and night" on the research for a year, sometimes even sleeping in the animal house, so he could measure the rodents' blood sugar around the clock.

"It was tantalizing research," he says — though most of those early experiments didn't work. "I felt very cheated, in some ways. I'd worked so hard at it and most of it was a failure. But I got the opportunity to pick up the pieces when I came to Canada [in 1993]."

He spent the next several years training in liver transplant surgery and continuing to research diabetes treatments at the University of Alberta. Today, Shapiro is a professor of surgery, medicine and surgical oncology, and holds a Canada Research Chair in regenerative medicine and transplant surgery at the University of Alberta.

In the late 1990s, he led the clinical team that made a major breakthrough in treating diabetes — now known as the Edmonton Protocol — which transplants insulin-producing donor islet cells into patients, reducing their dependence on insulin injections.

The procedure is a treatment for Type I diabetes, in which the immune system attacks the cells that make insulin inside the pancreas. In Type II diabetes, those same cells burn out over time.

Over the last 20 years, his team has done more than 700 islet infusions in Edmonton. Several thousand have been performed around the world.

But the procedure is a stopgap. It requires an average of two donor pancreases per patient, in a world where only 28,000 organ donors are available annually. There are 460 million people living with diabetes around the world. These numbers don't add up. A lifetime regimen of anti-rejection drugs for transplant recipients also has side effects.

Shapiro and his team are now focused on finding a cure.

Diabetes carries the Greek meaning "to siphon." Shapiro has seen it steal the quality of life from so many patients. "Sometimes it's a miserable existence," he concedes, adding insulin injections don't address the underlying condition.

"It's a chemical treatment for a biological disease. It's a dismaying problem, but one for which — with some very hard work and dedication and focus — there's a solution out there," he adds.

Shapiro and his team are now researching how to make stem cells from a patient's own blood and turn those cells into insulin-producing islet cells that could then be transplanted back into the patient.

"At first it seemed such an impossible idea that you'd be able to make islet cells that make insulin just from a tube of a patient's blood. Well, this absolutely can be done now. The recipes are like a cookbook. They're quite complicated… but at the end [of the process] we've got tubes of cells that are the patient's own. So you could put them back in with no anti-rejection drugs and anticipate those will work very well," he says, adding he believes it could work for both Type I and II diabetes.

"We're focusing now on trying as fast as we can with an ever-expanding team to try and take that forward for a first in-human trial. If that worked, that would be the holy grail of transplantation. It would be amazing. So that's what really drives me and drives our team and we're really excited about those next steps."

Shapiro's new stem-cell treatment is currently being tested on immunodeficient rats and mice. He hopes human trials will start in the next year or two, after the researchers ensure that the cells do exactly what they're supposed to do.

What's needed now is funding to keep the research going — an estimated $10 million over the next three to five years, for which fundraising is ongoing. It's pocket change compared to what diabetes costs health-care systems — a worldwide economic burden of more than $1.3 trillion, according to a study from international researchers including Harvard University's T.H. Chan School of Public Health.

But the heaviest toll of the disease isn't financial. Children afflicted with diabetes are among the patients who wrench Shapiro the most.

"It's heartbreaking to see a two- or three-year-old, or younger sometimes, being given injections and pricking their finger and monitoring and knowing that this could be for the rest of their life, if we don't do something to turn this around," he says. "Every patient I talk to has a different story. I see there's a solution ahead; we've just got to keep going on that journey, and we'll get there." **ED.**

549 NEW CASES OF DIABETES ARE DIAGNOSED EACH DAY IN CANADA

Stats from the Government of Canada health-infobase.canada.ca/diabetes/