

YORK U

FALL 2012

Fighting Diabetes

How exercise can
lead to longer lives

PLUS


York launches its
new refreshed brand



Exercise leads to longer, healthier lives for diabetics. That's why York kinesiologists are doing the research, starting sports camps and designing community programs.

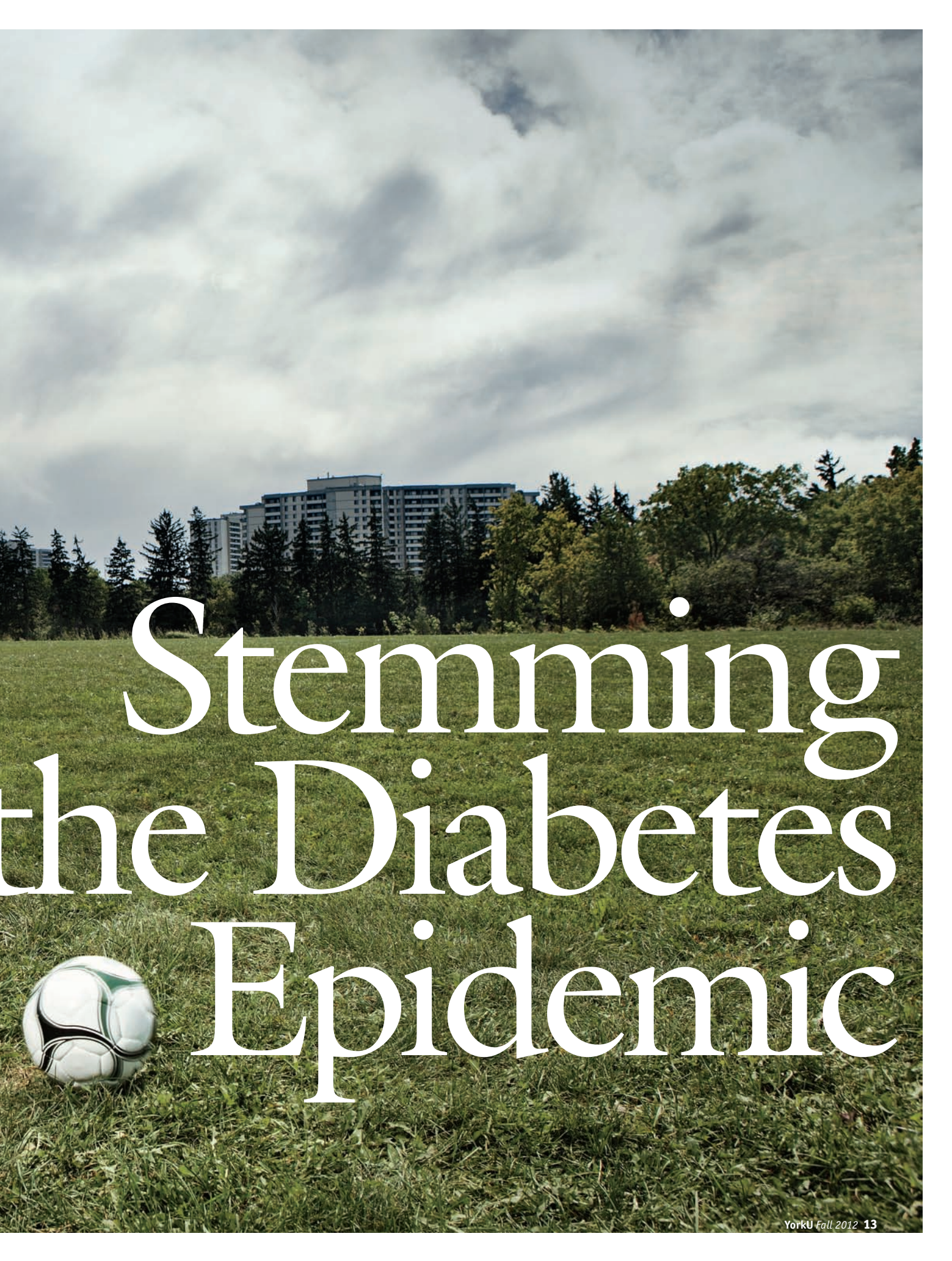
BY MARTHA TANCOCK

PHOTOGRAPHY BY KC ARMSTRONG



O N A FAMILY HOLIDAY in Florida four years ago, Yasmine developed an unquenchable thirst and was urinating frequently. Her mother, pharmacist Preet Dhatt, recognized the symptoms and as soon as they returned to Canada whisked her four-year-old daughter to the pediatrician. She was diagnosed with Type 1 diabetes and sent to hospital. That was Nov. 28, 2008. "I'll never forget that day. It is emblazoned in my memory forever," says Dhatt. "It's the day my life changed forever."

Now eight, Yas was too young to remember what life was like before the insulin pump. The rhythm of her days – and nights – is measured in two-hour intervals. During the day, from wherever she is – school included – she phones her mom every two hours to report her blood sugar count. Throughout the night, Dhatt tiptoes into Yasmine's bedroom to check her sleeping child's blood sugar

A photograph of a soccer ball on a grassy field. In the background, there are trees and a large, multi-story building. The sky is overcast with grey clouds. The title 'Stemming the Diabetes Epidemic' is overlaid in large white serif font.

Stemming the Diabetes Epidemic

count. It's Yasmine's "normal". She is the only one of 2,000 pupils at her school with diabetes – as far as she knows – but leads a life as active as her two brothers and any other child. She plays soccer and hockey, skates, skis, swims and even runs 5K road races with Dhatt. She is reluctant to talk about diabetes or to lift her shirt to reveal the site where a tiny plastic insulin-delivering straw is implanted under her skin every three days – and will be for as long as she wears an insulin pump. Yasmine was surprised when someone referred to diabetes as a disease. That's not how she thinks of it.

For the second year in a row, Yasmine has attended an unusual and increasingly popular two-week summer sports camp at York University for children with Type 1 diabetes. Unusual because physical activity for diabetics used to be strictly avoided – it could send blood sugar levels way out of whack. But York researchers are proving over and over that exercise – even as little as a brisk walk once a week – only bene-

“No, my daughter didn't develop diabetes because I fed her too much sugar and let her watch too much TV...”

fits those with diabetes. As the condition surges to epidemic proportions in Western countries, their findings couldn't be timelier. About 2.7 million Canadians have diabetes, according to 2010 statistics. Yasmine is among the 10 per cent with Type 1. Another one million Canadians have diabetes but do not know it. Some 4.2 million will have it by 2020. There are two types. Type 1, called juvenile diabetes because it often besets people under 30, must be treated with insulin. Type 2, once called adult-onset diabetes until increasing – and alarming – numbers of children and youth began to develop it, can be treated initially without insulin; it affects 90 per cent of those with diabetes. An increasingly overweight and sedentary population is driving up the numbers with Type 2 diabetes. “Canada is at the tipping point concerning diabetes,” warns a report, *Diabetes: Canada at the Tipping Point – Charting a New Path*, published last year by the Canadian Diabetes Association with Diabète

What is the difference between Type 1 and Type 2 diabetes?

DIABETES IS A CHRONIC, often debilitating and sometimes fatal disease in which the body either cannot produce insulin (Type 1) or cannot properly use the insulin it produces (Type 2). Insulin is a hormone that turns glucose – from foods like bread, potatoes, rice, pasta, milk and fruit – into energy. Without insulin, glucose levels rise to dangerous levels in the blood and can damage organs, blood vessels and nerves.

Type 1 and Type 2 diabetes are very different diseases. This is a little known fact and can be a source of frustration for diabetics and their families. “I wish they had different names,” says Preet Dhatt, mother of an eight-year-old with Type 1

diabetes. It's a common refrain. She often finds herself on the defensive, explaining that, “No, my daughter didn't develop diabetes because I fed her too much sugar and let her watch too much TV. Yes, she can eat cake and anything else she wants – within reason – because we closely monitor and control her insulin levels.”

Type 1

TYPE 1 IS THE RARER, and more dangerous, condition of the two. Ten per cent of diabetics have Type 1. It is an autoimmune disease that destroys the ability of the pancreas to produce insulin. It happens suddenly, without warning, for no known

reason. It can only be treated by taking insulin – by syringe, pen or insulin pump under the skin.

Type 2

IN TYPE 2 DIABETES, the pancreas does not produce enough insulin, or the body does not properly use the insulin it makes. Obesity and sedentary lifestyle, as well as a genetic predisposition, can lead to this more common form of diabetes, which affects 90 per cent of diabetics. It used to be called adult-onset diabetes until it began appearing in increasingly younger populations. It is treated with medication. ■

Québec. “Unless action is taken, diabetes will threaten the lives of millions more Canadians and the future sustainability of the Canadian health-care system and our economy.”

Researchers in York’s School of Kinesiology & Health Science, Faculty of Health, are taking action – together in labs, at community centres, with adults, with children – to stem the tide of this epidemic. There is no cure for diabetes, and children like Yasmine – and growing legions of young people and adults – must manage this relentless disease their entire lives. But through the pioneering work of York researchers like the three profiled here, they could live longer and more active lives.

Michael Riddell: First sports camp for kids with Type 1 diabetes

AT 14, AN ATHLETIC MICHAEL RIDDELL developed Type 1 diabetes. It flattened him, and in his trial-and-error struggle to manage his

blood sugar levels with insulin injections – and get back on the basketball and tennis courts – he discovered his life’s mission. Nowhere could he find information about managing blood sugar levels and exercise performance in Type 1 diabetes. “That motivated me to study kinesiology,” says the 45-year-old York researcher, now the world expert on exercise and pediatric diabetes. He soon realized the vast potential of this untapped field. As a PhD student in medical science at McMaster University, he developed guidelines for ingesting carbohydrates to prevent low blood sugar in children playing sports – and broke new ground. Later, he wrote the handbook for patients and the guidelines for doctors about exercise and diabetes, both widely used in North America. Frequently in demand as a speaker locally and around the world – diabetes is a hot topic these days – Riddell keeps busy in his York lab, investigating how exercise and stress affect blood glucose levels and metabolism of those with diabetes.

Four years ago, Riddell also launched a summer sports camp

Preventing Type 2 diabetes

THE NUMBERS ARE ALARMING. In 2004, the Public Health Agency of Canada estimated that five million people – about 15 per cent of Canada’s adult population – had prediabetes. More than half those with prediabetes, characterized by a slight elevation in blood glucose levels in the fasting state or after a meal, develop Type 2 diabetes in two to five years unless dramatic lifestyle changes are made. By 2016, the agency predicts that seven million – 20 per cent of Canada’s adult population – will have prediabetes or Type 2 diabetes. It’s an epidemic that York researchers Chip Rowan, Michael Riddell and Roni Jamnik are attempting to learn more about, and reverse, through prediabetes

screening and exercise programs.

Screening and customized physical activity

IN 2009, they launched prediabetes screening and customized physical activity programs to help prevent Type 2 diabetes in high-risk communities. The Prediabetes Detection and Physical Activity Intervention Delivery (PRE-PAID) program targets ethnic groups at high risk – South Asian, African, African-Caribbean and Chinese – and uses a community-based approach to engage them in the physical activities they enjoy. Certified exercise physiologists have been offering bad-

minton, basketball and soccer, tai chi and Bollywood dance classes to 300 participants in Toronto’s Jane-Finch and Agincourt North communities. Two are working with Aboriginal participants in northern Ontario.

“Now that we have the tools that are sensitive enough to detect prediabetes, we are able to screen for the condition and then put measures into action to help prevent diabetes,” says Riddell.

Exercise works better than drugs

RIDDELL IS A TIRELESS ADVOCATE of the benefits of healthy eating and more exercise to prevent Type 2 diabetes. Diet decreases weight, and exercise reduces body fat, increases lean

mass and results in higher resting metabolic rate, enhanced insulin sensitivity and improved cardiovascular risk profile. Lifestyle improvements that include increased physical activity are much more effective than drug treatment in preventing Type 2 diabetes, he says.

At least 150 minutes of brisk walking or more strenuous aerobic activities per week, without more than two days off in a row, reduces Type 2 diabetes risk by 60 per cent. And resistance exercises, such as weightlifting, three times a week increases muscle mass, elevates resting metabolic rate, enhances muscular endurance, increases insulin sensitivity and attenuates muscle mass loss during caloric restriction and aging. ■

at York for children eight to 16 with Type 1 diabetes. Sponsored by the Diabetes Hope Foundation with support from Medtronic of Canada, the camp creates a safe, fun place where kids can play sports without fear that their blood sugar levels will fluctuate wildly or that they will be ridiculed. “There is a stigma to having diabetes,” says Riddell. “People often think Type 1 diabetes is somehow your fault – you did not eat properly, you liked sweets. They drop you from sports teams or other school activities because they think you’re weak, fragile, sick, can’t have a family. Sometimes they even think they can ‘catch it’.”

To overcome the stigma, Riddell integrates kids with and without diabetes at the camp. “The integrative aspect is invaluable,” says Dhatt. Those with diabetes also get one-to-one coaching on how to manage their erratic blood sugar levels independently. They learn to monitor their levels without their parents’ help, take pre-dosed, fast-acting glucose pills, and program their insulin pumps – small infusion sets fitted just under the skin. Sometimes it’s a small miracle.

Last year, one boy refused to test his blood sugar. He didn’t like the finger prick and fought with his parents before every meal. “By the last day, he was checking his blood without being asked and phoned me after camp to say he’d had a normal test at 4pm,” says Riddell. “The whole social environment is one of acceptance. He knew it was good for him. We taught that kid that he is responsible and we celebrated his successes.”

Every year, Riddell invites Canadian athletes with diabetes, like Olympic rower Chris Jarvis and Tampa Bay Lightning hockey player Cory Conacher, to meet the campers. There’s nothing more inspiring than a good role model.

For Riddell, the camp has also become a living lab where he is working with graduate students like Dessi Zaharieva and Theresa Beesley. “We’ve learned a lot about preventing and sta-

bilizing low blood sugar in really active kids wearing glucose sensors and insulin pumps,” he says.

Above all, Riddell hopes the camp drives home the benefits of exercise. “Now we know that those with Type 1 diabetes can live 10 years longer if they exercise,” says the squash player and mountain biker. “Now we know that exercise can lower your risk of developing Type 2 diabetes by 60 per cent. Now we know that exercise prevents inflammation, cardiovascular disease and reduces risk of other complications of diabetes, such as kidney failure and nerve damage.” Who can argue with that?

Jennifer Kuk: A little exercise, a longer life

WITH DIABETES ON BOTH SIDES of her family, obesity researcher Jennifer Kuk has a personal stake in working to improve the health of Canadians. Obesity and Type 2 diabetes go hand in hand, she says. As both reach epidemic proportions in the Western world, it is not surprising that her findings make international headlines.

Kuk analyzes epidemiological survey data and conducts clinical studies.

Her most recent discovery is that for diabetics, moderate physical activity can improve longevity. Walking, jogging, biking, dancing and even gardening just once a week – as long as it makes you breathe a little harder and your heart beat a little faster – can mean a longer life. “Being physically active is protective,” says Kuk. Published in the journal *Diabetologia* in February, the study was based on an analysis of data from more than 10,000 adults who participated in an American health and nutrition survey. Kuk and co-authors, grad student Jacinta

Discovery could prevent amputations

DIABETICS OFTEN SUFFER from poor circulation caused by peripheral artery disease, which impairs blood flow to muscles. It can be so painful that patients can’t do normal daily activities and, in the worst scenario, have to have a foot or lower leg amputated. In healthy individuals, the lack of blood flow to muscle would stimulate compensatory blood vessel growth,

but such a response is lacking in those with Type 2 diabetes.

In 2011, muscle health researchers Tara Haas, Olivier Birot and their team identified a cell-signalling process that interferes with blood vessel growth in muscle. They are investigating how blocking this negative signal might stimulate blood vessel growth and make it

easier for diabetics with circulation problems to keep active. “Our research furthers our understanding of how we can jumpstart the growth of new vessels,” says Haas, a professor in York’s School of Kinesiology & Health Science, Faculty of Health. “And it may lead to drug treatment regimens that will help patients get back on their feet.” ■

Reddigan and kinesiologist Michael Riddell, compared the physical activity levels of diabetics with those who died prematurely from general causes and cardiovascular disease. Health professionals tend to stress glycemic control as the key to a longer and healthier life, but now it is evident that physical activity also has a beneficial effect.

Weight loss is a key treatment for diabetes and, in another study, Kuk argues for publicly funded medical clinics and a team approach to obesity management. Fifty-nine per cent of Canadians are overweight and 23 per cent are obese. The usual approach – doctors telling patients to eat less and exercise more – isn't solving this epidemic. Obesity, like diabetes, is a complex chronic disease that needs constant monitoring, says Kuk. She paired up with Dr. Sean Wharton, director of one of Canada's publicly funded clinics offering multi-disciplinary support to obese patients from physicians, behavioural therapists, exercise specialists and nutritionists. They analyzed data from more than 2,700 Wharton Medical Clinic patients and found that in three to six months, one-third lost five to 10 per cent of their weight – a clinically significant loss that results in health benefits such as reduced knee and back pain, and a reduction in sleep apnea, lipids and blood pressure. Publicly funded clinics would also benefit the poor, who have higher rates of obesity and can't afford commercial weight loss programs.

In Project RADICAL, Kuk is investigating how at-risk ethnic populations estimate food serving sizes, exercise intensity and overweight status based on Canada's lifestyle and obesity guidelines. So far, one finding is that subjects often overestimate servings of milk, meat, cheese, bread and pasta, vegetables and fruit as prescribed in the *Canada Food Guide*. She plans to recommend clearer guidelines based on her findings to the Ministry of Health, food guide publisher.

Kuk has also examined the effects of aerobic and resistance exercise on adolescent boys and found that resistance exercises – not aerobic exercises, as expected – reduced insulin resistance (more glucose was getting to muscles and not staying in the blood). Kuk attributes the results to pubertal boys' sex hormones, which stimulate the creation of more muscle at a faster rate. So, go lift weights young men. In similar tests of adolescent girls with diabetes, Kuk expects aerobic exercise will reduce insulin resistance.

Paul Ritvo: Using smartphones to control blood sugar levels

PAUL RITVO IS PIONEERING the use of smartphones and custom software to help those with Type 2 diabetes lead healthier lives. For the clinical health psychologist and director of York's Health Behaviour Change Lab, electronic communications technology is a low-cost, effective tool for health promotion.

Ritvo is conducting a trial in Africa to assess the effectiveness of text-messaging and cell phones to help HIV-positive Kenyans comply with antiretroviral treatment. He's conducting a similar experiment in Ontario using smartphones and health coaching to help people with diabetes control their blood glucose levels.

In a pilot project started last year, he and his doctoral student Noah Wayne have equipped diabetic adults with BlackBerry smartphones to monitor glucose levels, exercise, diet and mood – and trained health coaches at York to counsel them on healthy change. "It's an entirely new platform for changing lifestyle," says Ritvo. "It's a comprehensive tool that allows clients and coaches to track health and behaviour hour-by-

hour, seven days a week." It sure beats waiting for test results in a doctor's office.

Based at Black Creek Community Health Centre, the HealthCoach project involves new immigrants, visible minorities and people of modest means. "It's important to test programming in a multi-ethnic population so our software can eliminate or prevent a digital divide (haves versus have-nots)," says Ritvo, also a senior scientist in cancer prevention and treatment with Cancer Care Ontario and the Ontario Cancer Institute.

Because physical activity plays a major role in reducing blood sugar levels, Ritvo and Wayne also created an exercise room at the centre filled with stationary bikes and a treadmill, staffed with York kinesiology students who tailor programs to suit individual needs. "It's a catalyst, a step towards teaching people to exercise at home."

So far, the use of smartphones has led to significantly lower blood sugar levels in participants, he says. "There's still much testing left to do, but we're getting objective results that are hard to argue with." ■

**"Now we know
that those with
Type 1 diabetes
can live 10 years
longer if they
exercise..."**