# POKe MAGAZINE

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SUMMER 2017

## PEDIATRICIAN DR. HAQQ

Increasing her patients' quality of life by helping them during childhood

+

## Risks of Diabetes

What you need to know

## Leading Innovations

Life-saving practices; getting closer to a cure

Alberta Diabetes FOUNDATION

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# Risky Business

## The prevalence of both Type 1 and 2 diabetes is increasing in Alberta. Here's what you need to know about the risks facing children, pre- and post-diagnosis

BY CAITLIN CRAWSHAW ILLUSTRATION BY JULIA MINAMATA

**The incidence of diabetes in Alberta has nearly doubled in the last decade. Recent statistics show that one in 13 Albertans now live with either Type 1 or Type 2 diabetes, including many children (3,970 at last count), and one in four Albertans live with diabetes or prediabetes.**

At the Stollery Children's Hospital at the University of Alberta, pediatric endocrinologist Dr. Andrea Haqq diagnoses and treats many of these children. "We're a very busy clinic as we've been seeing more cases of both Type 1 and 2 diabetes over time," she says. Children with either form of diabetes exhibit many of the same symptoms, including weight loss, frequent urination and excessive thirst. Occasionally, parents report that their kids are suddenly wetting the bed at night after being potty trained.

Doctors don't know for sure which children will develop diabetes, or why. However, a number of risk factors are associated with both forms of the disease and can help predict which kids are more likely to get sick. In some cases, doctors and parents can take action to decrease a child's risk.

### TYPE 1 DIABETES

#### Environment

Children with Type 1 diabetes require frequent injections of insulin as their bodies don't produce enough of the hormone to process glucose (simple sugar) from food.

"It's an autoimmune disease, so immune cells in the body that normally fight harmful things, like bacteria and viruses, mistakenly destroy insulin-producing cells in the pancreas," says Haqq. Unfortunately, the origins of the disease continue to mystify researchers. "We know genetics may play a role in the process, and certain environmental factors like viruses may trigger the disease, but little is known about the exact causes."

Although family history is considered a risk factor, it increases a person's risk of developing the disease only slightly. Geography is another risk factor as certain communities have higher numbers of people with Type 1 diabetes (including Edmonton), but researchers don't yet know why certain environments create increased risks.

Haqq explains that most people with Type 1 diabetes are diagnosed as children, with the majority diagnosed between the ages of four and seven, and 10 and 14. "There are certain peaks to the disease," she says. Researchers don't know why this is, but speculate that it may have something to do with childhood diseases and hormones associated with puberty.

With so little known about the causes of Type 1 diabetes, doctors can't offer parents or caregivers any strategies for avoiding its onset. "When we see new children with Type 1 diabetes, it's always important to make sure the parents understand that they didn't do anything to bring on the disease," says Haqq. >

## RISK FACTORS FOR TYPE 2 DIABETES

### Genetics

Unlike Type 1, there's a very strong genetic component to Type 2 diabetes. Having a close relative with the disease or a mother who had gestational diabetes during pregnancy seem to raise a child's risk of becoming diabetic. A child's ancestry can also make him or her susceptible, as Type 2 diabetes tends to be more prevalent among certain ethnic groups (including people of First Nations and South Asian descent). There are also a number of rare genetic disorders that predispose children to obesity, such as Prader-Willi Syndrome (PWS) (Haqq's research on the disease is internationally known, see page 21 for more information).

### Obesity and Unhealthy Eating

Doctors know a little more about Type 2 diabetes, in which the body makes insulin but its cells can't use the hormone properly to break down glucose. Risk factors include poor eating habits and a sedentary lifestyle, but the biggest risk factor is childhood obesity, which has been greatly increasing in Alberta and throughout much of the world. Where a person gains weight raises his or her risk: "Certain fat distributions seem to be particularly bad, like fat in the abdominal region," says Haqq.

But genes aren't destiny. Haqq explains that even children with prediabetes who show signs of insulin resistance without having full-fledged diabetes can sometimes avoid the disease with lifestyle changes. Healthy eating, regular activity and maintaining a healthy weight can mitigate genetic risks of developing Type 2 diabetes. For children who are already overweight or obese, Haqq suggests weight maintenance, not weight loss. She also notes that Body Mass Index (BMI) isn't an absolute measure of health, as a growing body of research shows that active people in a higher BMI range can be healthy, too.

> "WE'RE A VERY BUSY CLINIC AS WE'VE BEEN SEEING MORE CASES OF BOTH TYPE 1 AND 2 DIABETES OVER TIME."

### Risks After Diagnosis

Whether children are diagnosed with Type 1 or 2 diabetes, they are at an increased risk of a host of health issues over time. Haqq explains that people with diabetes are prone to heart disease, cardiovascular problems, high blood pressure and damage to their nerves, kidneys and eyes.

Maintaining optimal blood sugar levels is critical to avoiding these medical complications over time. "We work hard to help people control their levels well in childhood because they have many decades of living with this disease ahead of them," Dr. Haqq says. At the same time, doctors need to be careful not to lower blood sugar levels too much as this can impede a child's cognitive development (growing brains need a certain amount of glucose to thrive).

Children with Type 2 diabetes may also face complications related to obesity, an even longer list of risks including cancer, sleep apnea, stroke, gallstones, osteoarthritis and infertility. "Obesity is a chronic disease, no different from hypertension," Haqq says. Even when people manage to lose large amounts of weight, our complex biology as human beings makes us prone to regaining the weight over time. "People generally have to do something to maintain their body weight," says Haqq. "Obesity requires lifelong treatment."

## Complications and Risks Associated with Diabetes

**30%**
of strokes

Leading cause of blindness

**40%**
of heart attacks

People of South Asian, Asian, African, Hispanic or Aboriginal descent are at a high risk

**50%**
of kidney failure requiring dialysis

**70%**
of all non-traumatic leg and foot amputations

+

**Genetics, age 40+, prediabetes, high blood pressure, high cholesterol, obesity, gestational diabetes, polycystic ovary syndrome, acanthosis nigricans, schizophrenia, depression, bipolar disorder, sleep apnea**

For more information, visit
**albertadiabeteslink.ca**

# Keeping an Eye … On the Eyes and Feet

## Blindness and amputation are two of the biggest risks for people with diabetes, but accessible innovations in medical technology are being used to prevent them

BY ELLIS CHOE PHOTOGRAPHY BY COLIN WAY

Rod Wajtula

**It started out as a small callus that had formed on the pad below the pinky toe of his right foot.**

But two years later, 69-year-old Rod Wojtula is now a candidate for amputation. The seemingly insignificant callus turned into a diabetic ulcer that morphed into a severe infection. It landed Wojtula in the hospital for several days, hooked up to an IV of antibiotics.

"It was a wonderful weight loss program," jokes Wojtula who lost 35 pounds on his six-foot, 200-pound frame.

Wojtula, a commercial real estate broker and resident of Banff, was diagnosed with Type 2 diabetes 15 years ago. That's when the former collegiate football player quit smoking, began to resist his sweet tooth, started exercising and introduced more fruit and vegetables into his diet. But the disease caused neuropathy/numbness in his legs — a condition that strikes about 70 per cent of diabetics.

Wojtula eventually had a bottle stopper-sized chunk of flesh carved out of his foot. After one year of daily visits from homecare to replenish wound dressings on his foot, Wojtula underwent an angioplasty in his right leg to increase blood circulation to his foot. Only then did the wound start to heal. He is now able to walk short distances but relies on his knee walker to get around. Careful foot cleansing and bandaging are still part of his regular routine.

Despite the surgical success, his foot is still not completely healed. His doctor's next recommendation is amputating the pinky toe. If that fails, his next option is to sever the top half of his foot.

"We are watching and waiting," says Wojtula. "Everyone's looking to find another option but the options seem to be limited."

He is one of a growing number of Albertans with diabetes who have foot ulcers that could lead to amputation.

In 2010-2011, 513 lower limb amputation procedures were performed in Alberta, according to Alberta Health Services. In 2014-2015, that number rose 45 per cent to 744 — the majority of those being a result of diabetic foot ulcers. It's a similar scene across Canada. According to the Canadian Institute of Health Information in 2011-2012, more than 60 per cent of all amputations performed in Canadian hospitals were associated with diabetes, with the vast majority stemming from diabetic foot ulcers.

> YOU LEARN TO LIVE WITH AND DEAL WITH IT. FORTUNATELY, I HAVE A WIFE WHO IS VERY PARTICIPATORY WHEN IT COMES TO MEDICAL STUFF."

"We're desperate to prevent this kind of situation," says Petra O'Connell, the senior provincial director of the Diabetes, Obesity and Nutrition Strategic Clinical Network under Alberta Health Services.

Currently, there are more than 303,000 Albertans with diabetes — that's more than double what it was back in 2005, when there were 130,000. The chronic disease has only been growing in prevalence across the country with rising obesity rates and sedentary lifestyles, bringing the number of Canadians with diabetes and prediabetes to 11 million and costing the healthcare system $3.4 billion in 2016.

O'Connell's own great aunt died shortly after her foot was amputated from Type 2 diabetes.

"That's the scary thing — the mortality rate," says O'Connell. "The five-year mortality rate is 74 per cent after amputation. That's pretty staggering. People don't connect the two."

O'Connell stresses that prevention is key.

"Up to 85 per cent of lower limb amputations can be prevented with early screening and treatment," she says. "We found that more than one third of patients who had foot ulcers or amputations had blood sugar levels in the normal range."

Hence, regular foot examinations are critical and it begins with the individual checking his or her own feet.

"Every day they should be looking for things that aren't normal — any signs of tingling, numbness, a change in the shape of their toes, nails or feet, any sores or feelings of pain or cramping in the lower legs," explains O'Connell. "Those potential signs are foot problems that need further examination by a healthcare provider."

But less than 50 per cent of people with diabetes have their feet routinely checked on an annual basis.

Alberta Health Services has made diabetic foot care a priority and has developed the country's first "diabetic foot care pathway," a map of sorts to help healthcare providers connect patients efficiently to appropriate resources and foot specialists.

"We're trying to improve foot care on a number of fronts including healthcare professionals' awareness; we've developed tools to help patients and healthcare providers do that assessment," says O'Connell. Alberta Diabetes Foundation saw this as a worthy investment and helped to develop such tools. "We're trying to establish high risk foot teams in each of our healthcare zones so primary care teams know where to refer these patients ... We're trying to change government policy so that there's additional foot care support to prevent the development of ulcers. Right now there are policies to support ulcers, but at that point it's too late. We want to focus on prevention."

Despite his situation, Wojtula maintains a positive attitude.

"I have to admit once you get this stuff happening to you, you have to be somewhat accepting," says Wojtula. "You learn to live with and deal with it. Fortunately, I have a wife who is very participatory when it comes to medical stuff."

But Wojtula turns serious when it comes to warning others about their foot health.

"If you need to scare people to take care of their feet, then scare them," says Wojtula. "Watch your feet like a hawk. If you get a sore, get your butt down to the doctor as quickly as you can. If I could go back in time, that would have been the thing I would have done."

******

With diabetes being the leading cause of blindness in Canada, constant vigilance also applies to eye care. Diabetic eye diseases include diabetic retinopathy, diabetic macular edema, glaucoma and cataracts. The latter tends to be the most common and develops at a faster rate in individuals with diabetes than those without.

Wojtula has regular eye checkups and so far, so good.

"With appropriate screening, testing and treatment, you can reduce the risk of blindness to less than one per cent," says Edmonton ophthalmologist Dr. Matthew Tennant, who specializes in diabetic retinopathy. "It's easier to prevent vision loss than return vision once it is lost."

Cynthia Langlow has been diligent about having regular eye examinations ever since she was diagnosed with Type 1 diabetes at the age of seven. Her attentiveness over the past 61 years has paid off.

"The biggest issue I have today is wearing reading glasses and night vision," says Langlow, who grew up in Edmonton and now lives in Calgary.

It would have been a different story had it not been for her consistent, comprehensive checkups. When she was 30, her doctor discovered both her eyes had diabetic retinopathy, a condition that develops in 25 per cent of Canadians diagnosed with diabetes. It occurs when the disease damages the tiny blood vessels >

in the tissue called the retina at the back of the eye. Immediate laser surgery involving the cauterizing of her blood vessels fixed the problem before it developed.

Screening involves a comprehensive dilated eye exam at least once a year but more frequent assessments are required if an individual is diagnosed with diabetic retinopathy because the condition doesn't present any symptoms.

"That's the big problem," says Tennant. "You don't notice symptoms until late in the eye disease. The trouble is you may not notice any trouble with your vision despite having significant retinopathy."

> "YOU DON'T NOTICE SYMPTOMS UNTIL LATE IN THE EYE DISEASE. THE TROUBLE IS YOU MAY NOT NOTICE ANY TROUBLE WITH YOUR VISION DESPITE HAVING SIGNIFICANT RETINOPATHY."
>
> – Dr. Matthew Tennant

In 2015, Langlow underwent emergency surgery after returning home to Calgary from a golf trip in the United States.

"I noticed all of a sudden that I couldn't see out of one eye when the plane landed," says Langlow. "It was a bit blurry. It was late Sunday night. By Monday morning, I couldn't see at all out of that one eye."

Cynthia Langlow holding her cat, Spartacus with husband Ron Langlow

But she was able to see a surgeon that afternoon and was on the operating table the next morning for a procedure called a vitrectomy to stop the bleeding in the back of her eye. After six weeks of recovery, she was back in the swing of things.

"It's again that early, consistent and regular screening and early intervention that will make the difference," says O'Connell. "In Alberta, eye exams for diabetics are covered by the government. I think a lot of people aren't aware of that fact."

But for thousands of people living in rural Alberta, access to screening was the bigger challenge until the tele-ophthalmology centre was established in 2003 at the Royal Alexandra Hospital in Edmonton. The distance-evaluation technology allows patients to have their eyes examined and photographed conveniently in their own local communities without having to take a day off from work to make a trip to the larger centres.

"It's made life easier for those living in rural areas," says ophthalmologist Dr. Chris Rudnisky, co-director of the Tele-Ophthalmology Centre. "Imagine the drive in a blizzard in January on Highway 16 versus walking across the street to the local hospital or health centre … On top of that, we're able to streamline an exam and have it done on one day."

The images taken in the remote areas are then transmitted virtually and securely to the team of eight ophthalmologists in Edmonton who analyze the data and return the assessments within 24 hours. As of 2014, the centre has screened nearly 15,000 patients across 15 community-hospital-based locations in northern Alberta, all 44 First Nations communities and five primary care practices.

"It saves a lot of hassle, time, and means less missed work [for patients]," says Tennant, who's also a co-director of the Tele-Ophthalmology Centre. "I'm proud of the program. I wish we could roll it out to more people in Alberta. It's something we'll continue to work on."

Tennant is also passionate about Anti-Vascular Endothelial Growth Factor (anti-VEGF) treatment, another technological advancement for diabetic retinopathy which he says is "the most amazing thing that has happened over the last 10 years."

Anti-VEGF treatment involves monthly injections of medication

into the eye for people who have an advanced stage of retinopathy called proliferative diabetic retinopathy. This is when new, abnormal blood vessels grow in the retina. If they leak blood, it can result in severe vision loss or blindness.

"[Anti-VEGF] injections can reverse that for one or two months but the problem tends to come back," explains Tennant. "In the meantime, people can work on their blood sugars and blood pressure and if they can control that, the problem can go away. We can reverse the changes over time."

In fact, good control and management of diabetes can reduce the risk of developing eye disease by 75 per cent. It can reduce the risk of worsening an existing condition by 50 per cent.

Optical Coherence Tomography (OCT) is another significant technological advancement that has improved eye assessments over the years. The non-invasive test uses light waves to take cross-section photos of the retina.

"OCT provides a way to examine the retina in 3D at very high resolution and to record the findings digitally," says Tennant. "This is particularly helpful for measuring leakage in the macula, the centre of the retina. We can then use this information to maximize treatment benefit."

"Technology is big. I never thought I'd live to age 70. I golfed 18 holes today. I enjoy that," says Langlow, who has been leading a support group for diabetics for the past 15 years.

But Rudnisky emphasizes that advancements in technology can only go so far. The medical system can't fix everything.

"It's a team effort," says Rudnisky. "Patients have a role to play. If they have good control of their blood sugar levels, they can be healthy and live a normal life. It comes down to controlling your sugar."

Langlow says it's something she worries about all the time.

"There's a bit of fear," she says. "You don't have a choice if you want to live a good life. I can't not check my blood sugar every few hours. If I don't take my insulin, I could end up in hospital. You can die quickly with Type 1 ... you have to be absolutely diligent every day. Check your blood sugar. I simply don't eat anything sweet. I was blessed that I don't like chocolate." To accurately and consistently monitor her blood sugar levels, Langlow uses an insulin pump and a continuous glucose monitor.

Rod Wojtula believes it's ultimately up to the patient.

"This is my sole responsibility," says Wojtula. "You make an effort to work with the doctors whether it's your diet, physical exercise or being attentive."

## INNOVATIONS IN FOOT CARE:

On the innovations front, the Diabetes, Obesity and Nutrition Strategic Clinical Network is testing two exciting new products (not on the market yet) with two Alberta-based companies:

**Orpyx** has developed a pressure mapping foot insole that can give real-time data to the person wearing a wireless smart watch. It measures whether the person has inappropriate pressure on his or her foot. This will help with ulcer prevention. It can also make sure patients are not experiencing inappropriate pressure on their feet if they already have ulcers.

**Exciton Technologies** is developing a silver salt wound dressing that is intended to help activate and speed up wound healing. It's testing the dressing on patients with 'stalled' wounds — that is, wounds that have stopped healing.

## FOOT CARE CHECK LIST:

| | |
|---|---|
| **SKIN** | check for calluses, corns, cracks, dryness (in between toes as well) |
| **NAILS** | check for missing, sharp, unkempt, thickened, long, ingrown or deformed nails |
| **STRUCTURE** | check for decreased range in motion, deformities, fallen arch, redness |
| **SENSATION** | check for pain, numbness, tingling, throbbing or burning sensation |
| **VASCULAR** | check for normal pulse, cool skin with changes in colour |
| **FOOTWEAR** | check for ill-fitting or inappropriate footwear causing pressure/skin breakdown |

# Resveratrol: the Superpower

## A powerful plant compound treats a range of diseases and drives one scientist to keep searching

**BY** ROBYN BRAUN, PHD

Dr. Jason Dyck didn't set out to study the compound resveratrol, but now he can't get away from it. "I started out as a cardiovascular researcher. But I can't get out of resveratrol because it is effective in the treatment of almost any disease. Whenever we test it, it has tremendous benefit. I can't walk away from something that could be so beneficial," he says.

The Alberta Diabetes Foundation recently funded Dyck's study of the effects of resveratrol on blood glucose levels and insulin levels in obese and insulin-resistant animals. The Alberta Diabetes Foundation funding will go a long way to support Dyck's research as he pursues the seemingly endless benefits of this organic compound for diabetes and other diseases. >

Resveratrol is a compound produced by some plants, including grapes, peanuts and Japanese knotweed, when they are suffering from some form of environmental stress. "When an environment is changing, plants are affected first," explains Dyck. "And under environmental stress they produce resveratrol. The thinking is that animals in the environment will consume the resveratrol in the plants, which effectively supplies them with the compound so that they can handle the environmental stress once it begins to affect them."

The discovery of a compound that would benefit a wide spectrum of diseases was surprising. "Researchers were making plant extracts and identifying the components of the extract that were effective and determining what the effects were," says Dyck. "They kept fractionating plant extracts and finally identified resveratrol." The extract was then purified and scientists began to experiment with its effects. The benefits were manifold.

## TOO MUCH BUZZ

Resveratrol research received a lot of attention when researchers found trace amounts of the beneficial substance in red wine. "People thought the presence of resveratrol in red wine addressed what's called the 'French paradox,'" explains Dyck. "The French eat a lot of fat but have low rates of cardiovascular disease. So it was proposed that this was because they also drink a lot of red wine and the resveratrol in the wine offsets the potential problems of a high fat diet."

Resveratrol is also an exercise mimetic. That is, as Dyck explains, it produces some of the same effects in animal bodies as exercise. His lab published a study where it exercised two groups of rats for 12 weeks. The only difference between the groups was that one was given resveratrol and the other was not. At the end of 12 weeks, the team gave the mice a run to exhaustion test. The animals who had taken the resveratrol performed 10 to 15 per cent better than the control animals. "To enhance a trained athlete's performance by 10 to 15 per cent for the same amount of work — that's a big deal," exclaims Dyck.

The paper received a lot of attention and again the link was made to red wine, with headlines claiming that a glass of wine could save you a trip to the gym. "But exercise is not one molecule," explains Dyck, "It's not just one pathway. Resveratrol causes subtle changes across a spectrum of pathways and effects."

Dyck acknowledges that there are minute quantities of resveratrol in red wine but he actively distances himself from the frenzied proclamations of news outlets and social media that a glass of red wine is the equivalent of one hour in the gym, or that drinking red wine regularly alleviates the need for a healthy diet. "It was funny for a while," he says of the excitement, "but it's not true and it's frustrating to see our research misused like that."

> "WHEN AN ENVIRONMENT IS CHANGING, PLANTS ARE AFFECTED FIRST, AND UNDER ENVIRONMENTAL STRESS THEY PRODUCE RESVERATROL."

Resveratrol in useful quantities is now available as a supplement in health food stores. One pill of 150 mg is the equivalent of 100 bottles of wine. "So it's a lot safer to take the supplements," laughs Dyck. Dyck himself takes the supplements right before his runs. While he hasn't noticed a difference with his overall health, he has noticed that the supplements make his runs harder. "I would think that if it was a placebo effect I'd have found the runs easier," he muses. "I don't know for sure but maybe it's like altitude training. It's harder to train on the resveratrol but you're in better shape as a result."

In the short term, there have been no toxicity effects reported from the supplements, says Dyck.

## DIABETES RESEARCH LOOKS TO RESVERATROL

Diabetes researchers began to experiment with resveratrol about 10 years ago and showed that, while taking resveratrol, obese animals had the glucose, blood fat and insulin levels of healthy animals even while they remained obese. "It's very clear from animal trials that resveratrol is very effective at lowering blood glucose levels," says Dyck. "But we didn't really know why." >

Around the same time, research emerged that showed that fecal transplants from lean animals to obese animals caused the obese mice to become lean. The results of these fecal transplants interested Dyck because he knew that, while resveratrol is effective in the treatment of many diseases, it's not found in the blood stream but passes undigested to the colon. Perhaps, he reasoned, the benefits of the fecal transplant could be enhanced with the addition of resveratrol. And they were.

"We don't know how it works exactly," says Dyck, "But the bacteria interact with the resveratrol and then secrete a new compound, which is even more effective than resveratrol on its own." The active compound created by the gut bacteria in the presence of resveratrol looks like a number of anti-diabetic compounds, Dyck says. It reduces hepatic glucose levels and increases insulin levels in the muscle. What's more, it works to regulate blood glucose faster and more profoundly than resveratrol.

Knowing that our gut bacteria make such a difference to the effect of resveratrol on blood glucose levels and insulin uptake could explain differences in results that researchers are seeing across different populations. "We are getting consistently good results in animal trials," explains Dyck. "But human trials show mixed results across population." For example, a study of obese, insulin-resistant men showed that resveratrol had a positive effect on their blood glucose and insulin levels, but in obese men who were not insulin-resistant, the resveratrol made no difference to their blood glucose levels.

It could be that some populations have the gut bacteria needed to use the resveratrol and some populations do not. "Your diet changes your microflora," says Dyck. "And we know that a high fat diet will change your intestinal profile, which can contribute to insulin resistance or even worsen the condition."

Dyck and his team are working to isolate the effective compound from the fecal material, so that it can be turned into a drug to treat everyone. But it is a slow search. "We're trying different fractions with different sizes or solubility. We're making the haystack smaller so that we can identify the needle."

> "WE DON'T KNOW HOW IT WORKS EXACTLY, BUT THE BACTERIA INTERACT WITH THE RESVERATROL AND THEN SECRETE A NEW COMPOUND, WHICH IS EVEN MORE EFFECTIVE THAN RESVERATROL ON ITS OWN."

## TIME FLIES

If the success of resveratrol research to date is anything to judge by, its future is very bright. "We've made tremendous progress in the past decade. We've gone from pipetting purified resveratrol onto cells grown in dishes through to animal trials and now we're looking at preventing damage from chemotherapy, improving the effects of chemotherapy, preventing hypertension, heart failure and diabetes," says Dyck, enumerating a few of resveratrol's benefits. Interest in resveratrol as a treatment for all kinds of disease has grown significantly, with more and more papers published every year.

"It's never fast enough for me, though," Dyck says. "I work because it could be a really great treatment. And patience was not a virtue that was bestowed upon me."

# History of Alberta Diabetes Foundation

**For over two decades, the Alberta Diabetes Foundation has provided support for important research and initiatives.**

ILLUSTRATION BY BREANNE KELSEY

## BEGINNINGS

One of the first projects funded by the Alberta Diabetes Foundation when it was founded in 1988 was the clinical research of Dr. Ray Rajotte, which it funded for 12 years. Dr. Rajotte pioneered the first-ever islet cell transplant, which was the biggest breakthrough in diabetes research since the discovery of insulin. That work, plus an expanded islet cell transplant team and the addition of anti-rejection protocol, ended up becoming the international standard of care for islet cell transplantation.

Since 2000, when the protocol was developed, Alberta Diabetes Foundation has invested in a capital campaign to build the world-class building that now houses the Alberta Diabetes Institute. Since then, the Foundation has endeavoured to continue to invest in world-class research for both Type 1 and Type 2 diabetes right here in Alberta.

Alberta Diabetes Foundation works in tandem with the best-in-class Alberta Diabetes Institute to allocate funding where and when it is needed most, ensuring that important diabetes research and projects do not become stalled. The Alberta Diabetes Foundation is able to fund projects, even at early stages, often filling in gaps left by traditional granting organizations. The researchers in Alberta are confident that a world without diabetes is possible and, today they are doing more than providing sustainable solutions to treating diabetes — our researchers are on their way to a cure.

## WHAT'S HAPPENING NOW?

The Alberta Diabetes Foundation has several current initiatives to educate the public about prevention methods, assist those with diabetes and fund experts and researchers. Alberta Diabetes Foundation continues to seek disruptive, innovative, and risky research in Alberta that will continue to redefine diabetes research.

### Alberta Food Fight

With one million people in Alberta with diabetes or prediabetes, and a lingering risk of Type 2 diabetes for all others, it is crucial to educate everyone in the province about easy ways to prevent and manage the disease. One of the easiest ways is adopting a healthy diet balanced with foods grown right here in Alberta that are easily obtainable and inexpensive, such as Alberta pork, chicken, beef, oats, legumes, potatoes and milk. A campaign is underway through November 2017 to provide Albertans with the tools they need for healthy eating including accessible research, recipes and product suggestions.

### Islet Research

With resources at the Alberta Diabetes Institute, Dr. Patrick MacDonald and his team at IsletCore recently solved a mystery 20 years in the making. They discovered that it is possible to fix a pathway in islet cells so that diabetic cells work the same as healthy cells and can control insulin production. The Alberta Diabetes Foundation invested $100,000 for seven years of research and is evaluating ongoing support for this one-of-a-kind piece of infrastructure — one that is unique to the world.


24 - 28
weeks

# Gestational Diabetes

## With a growing risk of gestational diabetes, learn how to stay healthy

BASED ON GUIDELINES FROM DIABETES CANADA ILLUSTRATION BY BREANNE KELSEY

**What is Gestational Diabetes?**
A type of diabetes that develops and occurs during pregnancy. Your body cannot produce enough insulin to handle the effects of a growing baby and changing hormone levels, and your blood glucose (sugar) levels rise.

**Who Develops Gestational Diabetes?**
Up to 20% of pregnant women develop gestational diabetes, however the women most at risk are those who:

- Are 35 years of age or older
- Are from a high-risk group (Indigenous, Hispanic, South Asian, Asian and African)
- Are obese (body mass index of 30kg/m2 or higher)
- Have prediabetes
- Had gestational diabetes in a previous pregnancy
- Have a parent, brother or sister with Type 2 diabetes
- Have polycystic ovary syndrome (PCOS) or acanthosis nigricans (darkened patches of skin)

**How is Gestational Diabetes Diagnosed?**
It is important to be tested for gestational diabetes when you are pregnant, between 24 and 28 weeks gestation, to avoid complications during delivery. Medical laboratories, including DynaLIFE Medical Labs and Calgary Laboratory Services, offer gestational diabetes screenings — you will be given a glucose drink and then a blood sample will be taken. Talk to your physician when you become pregnant to arrange this test and assess your risk.

**What Happens If I Am Diagnosed with Gestational Diabetes?**
Gestational diabetes is manageable. You will work with your physician to manage your blood glucose levels through diet, exercise and insulin to avoid complications in labour and delivery. Your blood glucose levels will return to normal after delivery, however there is an increased risk of developing Type 2 diabetes permanently and of developing gestational diabetes with future pregnancies. After your pregnancy, it is important to manage your diet and exercise to decrease these risks.

**Will My Baby Be Born with Diabetes If I Have Gestational Diabetes?**
No, but it does increase their risk of developing Type 2 diabetes and becoming overweight. It is important to provide your child with a healthy lifestyle and take preventative measures to decrease the risk of becoming overweight.

**How Can I Manage Gestational Diabetes?**
**Exercise** While you may have to adjust your usual fitness routine, exercise will have a positive impact on your body and can also prevent high blood pressure and chances of post-partum depression. Check with your fitness studio to see if it offers specialty prenatal classes or adjustments during regular classes, and work with an instructor who knows how to keep you safe and healthy. Some great options are prenatal classes at Blitz Conditioning in Edmonton, prenatal Pilates at Redefining Eve in Edmonton, prenatal yoga at Junction 9 in Calgary and barre classes at Barre Body Studio in Edmonton and Calgary (the instructors are pros at adjustments for pregnant women). Talk to your physician about exercise while pregnant to learn what is appropriate for you and your body.

**Eat Well** Eat smaller meals and snacks — try three larger meals and three snacks per day — with foods from all four food groups including produce such as fruits and vegetables, whole wheat products, low fat milk products and protein such as meat, fish and eggs.

**Take Insulin** Talk with your physician about insulin injections to manage your glucose levels.

**Can I Get Pregnant If I Have Type 1 or Type 2 Diabetes?**
Yes, but it is important to manage your glucose levels, especially during the first 5-11 weeks of pregnancy. This is when the baby's organs are beginning to develop and if blood sugar levels are irregular, the formation of the baby's spinal cord and heart could be affected.

# Shaping a Future Without Diabetes

A pediatrician with international training and experience is making a world of difference with practice and research in Edmonton

**BY** CAITLIN CRAWSHAW **PHOTOGRAPHY BY** COOPER & O'HARA

**Growing up in Vancouver, British Columbia, Dr. Andrea Haqq eagerly anticipated visits to her pediatrician — and not for the sticker at the end of the appointment. "I was always really interested in medicine," she explains. While her peers clambered off the examination table at the end of check-ups, Haqq lingered with questions about pediatric medicine and her doctor was more than happy to chat with his curious patient. By the time Haqq reached high school, her pediatrician was lending her medical texts on pediatrics and medical education, and had become a mentor as she considered her career path.**

Haqq's fascination with medicine didn't waver and she set out to become a pediatrician after high school. Knowing she needed to earn an undergraduate degree before entering medical school, the high-achieving student applied to several Ivy League schools in the United States and happily accepted an offer from the Massachusetts Institute of Technology (MIT). At 18, she left home for Boston where she would study biology for the next four years at one of the most prestigious research universities in the world. Haqq says the institution emphasized problem-solving over rote learning and fostered a deep appreciation for research that would serve her well in her career.


"YOU CAN CORRECT DEFICIENCIES IN HORMONES — LIKE INSULIN IN PATIENTS WITH DIABETES — VERY LOGICALLY."

Degree in hand, she returned to Canada to earn a medical degree at the University of Calgary before completing a pediatric residency at the Children's Hospital of Eastern Ontario (Ottawa). That's where she discovered endocrinology, a subspecialty of medicine that focuses on the complex interactions between hormones in the body and related health problems (including diabetes, thyroid disease and early and late-onset puberty). "I really liked endocrinology because it made sense. It had a logical pathway," says Haqq. "You can correct deficiencies in hormones — like insulin in patients with diabetes — very logically." On top of this, she was struck by how much the field helped sick children: "You can do a lot to impact a patient's quality of life and help them early on."

Haqq began her career as a clinician-researcher at Duke University in North Carolina before returning to Canada in 2009 to take a post as a clinician-researcher at the University of Alberta. In her role as a pediatric endocrinologist at the Stollery Children's Hospital, many of Haqq's patients have Type 1 or 2 diabetes. "We have a great multidisciplinary clinic here, so we have a team that includes social workers, nurses and dieticians," she says. Haqq also treats children with a wide range of other hormonal issues, as well as those with early-onset child obesity stemming from rare genetic disorders. She has a special interest in Prader-Willi Syndrome (PWS), a genetic condition that is the leading cause of childhood obesity. "These children [with PWS] have food-seeking behaviours and experience progressive obesity over time, as well as the complications of obesity, like insulin resistance, Type 2 diabetes and cardiovascular problems," says Haqq.

As an associate professor with the Department of Pediatrics, much of Haqq's research focuses on the genetics of childhood obesity and she is known internationally for her work on PWS. A few years ago, her team was one of the first in the world to identify high levels of ghrelin, a hormone that stimulates appetite, in children with PWS. "Parents of these children have to control their entire food environment. They lock cupboards and refrigerators because their kids are constantly hungry and seeking out food all of the time," she says.

Since then, Haqq has continued to study ghrelin, including how it functions in the bodies of kids with PWS and potential treatment options for suppressing it. "We're interested in novel therapies, be it dietary or pharmacological treatments, that might target ghrelin in children with PWS," she says.

This is an important undertaking as the disorder commonly leads to obesity, which is associated with a host of health problems. Curiously, insulin resistance and diabetes are often not an issue for children with PWS. "Despite their obesity, these kids seem to be metabolically protected from diabetes, compared with other children with obesity," she says. To understand why this is the case, Haqq is looking to an area of science called metabolomics, which examines the chemical "fingerprints" left behind by the body's processes (like digestion of food). These fingerprints may offer important insights about how certain gene mutations affect a person's metabolism.

"We want to identify critical, metabolic pathways that may be disrupted by certain gene mutations and predispose people to obesity or Type 2 diabetes," says Haqq, who is teaming up with University of Alberta metabolomics expert Dr. David Wishart. This information might one day allow doctors to treat patients more effectively with personalized interventions.

> "YOU CAN DO A LOT TO IMPACT A PATIENT'S QUALITY OF LIFE AND HELP THEM EARLY ON. "

Haqq also works with a number of other researchers at the Alberta Diabetes Institute (ADI) including Dr. Carla Prado, an expert in body composition and energy metabolism in adults. "We're looking at the unique body composition of children with PWS," she says. While obesity is usually associated with high amounts of "bad" or visceral fat (which the body stores around organs), children with the disorder have high amounts of subcutaneous or "good" fat (stored under the skin). Children with PWS also store fat in the fibres of their muscles.

With so many facets to Haqq's research program, she relies on a highly skilled research team and collaborates with experts in other institutions. She also requires funding from many different sources to make ongoing advancements in the field. Since setting up her lab in late 2009, Haqq has received consistent support from the Alberta Diabetes Foundation, which has funded numerous graduate students, summer students, pilot projects and more.

"Our current research environment makes funding more challenging," says Haqq. "It's amazing to have the support of the Alberta Diabetes Foundation."


# THE IMPORTANCE OF REGULAR LAB TESTING

A visit to the lab for testing isn't something that should just happen for a diagnosis. Two experts share why frequent testing is vital to healthy living.

COMPILED BY BREANNA MROCZEK
with Information from Dr. Mathew Estey, Clinical Chemist and Co-Director of Chemistry at DynaLIFE Medical Labs, and Dr. Christopher Naugler, Calgary Zone Clinical Department Head, Pathology and Laboratory Medicine, Medical Director

### Reliable Testing

Whether diagnosing or managing diabetes, clinicians at DynaLIFE Medical Labs (DML) in Northern Alberta and Calgary Laboratory Services (CLS) have turned to one very reliable — and convenient — test: the HbA1c blood test, also known as the haemoglobin A1c or glycated haemoglobin test.

Unlike its predecessor, the glucose test, HbA1c testing requires no fasting. Because it measures glucose control and tolerance over a period of time instead of at the precise moment of testing, it is a useful test for the initial diagnosis of diabetes as well as subsequent testing to manage diabetes over time.

### Diagnosis

Physicians will provide requisitions for the HbA1c test to patients with risk factors of diabetes. The test will provide results the physician can use to then diagnose the disease if applicable.

### Management

Patients with diabetes should have the HbA1c test administered every three months or 90 days. Dr. Christopher Naugler with CLS says that there is a problem with patients who over or under utilize HbA1c testing. "Many patients don't get tested at all after their initial diagnosis, which is problematic because then we can't see trends in blood sugar control and their physician can't adjust treatments, provide ongoing diet counselling, or check for side effects such as foot and eye diseases," Naugler says. "Lab testing is an ongoing part of having diabetes." That said, there is no benefit for patients who go for testing more than four times per year. "Testing more often than once every three months has no added value for the patient," Naugler says. The only exception is with pregnant women who have gestational diabetes, who may need more frequent testing during their pregnancy.

"Patients with diabetes should have their urine protein checked annually, but most don't," says Naugler. "If there is protein in the urine, sometimes treatment of the kidneys is required or the patient will be at risk of other diseases." Naugler advises those with diabetes to regularly follow up with their physician and get requisitions not only for routine HbA1c tests but for annual urine protein and kidney function tests as well.

### Exceptions

While the HbA1c blood test is very reliable for most patients, there are some subgroups and disorders for which the test will not be sufficient. "In any case where there's a disorder that affects the lifespan of red blood cells, which in turn affects the HbA1c in a way that's independent of glycemic control, a glucose test is a better option," says Dr. Mathew Estey with DML. In addition, Estey says that patients with cystic fibrosis, who are likely to develop cystic fibrosis-related diabetes (CFRD), require an oral glucose tolerance test instead. While this test is not as ideal, work is currently being done to find a new test that will work to help diagnose patients with CFRD.

### Provincial Utilization Office

Alberta Health Services is trying to increase awareness of the importance of lab testing, and addressing concerns of overuse and underuse, through the Provincial Utilization Office, which is housed in CLS. This office provides information and logistical support to physicians and administrators interested in improving when and why they refer their patients for lab testing. It is an excellent resource for health professionals.

## HBA1C BLOOD TEST FAST FACTS

- No fasting required
- Results can be determined the same day the lab receives the sample
- Very reliable
- Over one million tests are completed and reported by DML and CLS every year
- Can be used to diagnose Type 2 diabetes and manage Type 1 and 2 diabetes

### Lab Testing Checklist for Patients with Diabetes:

1. Four HbA1c tests per year (one every 90 days)
2. One urine protein test per year
3. One kidney function test per year

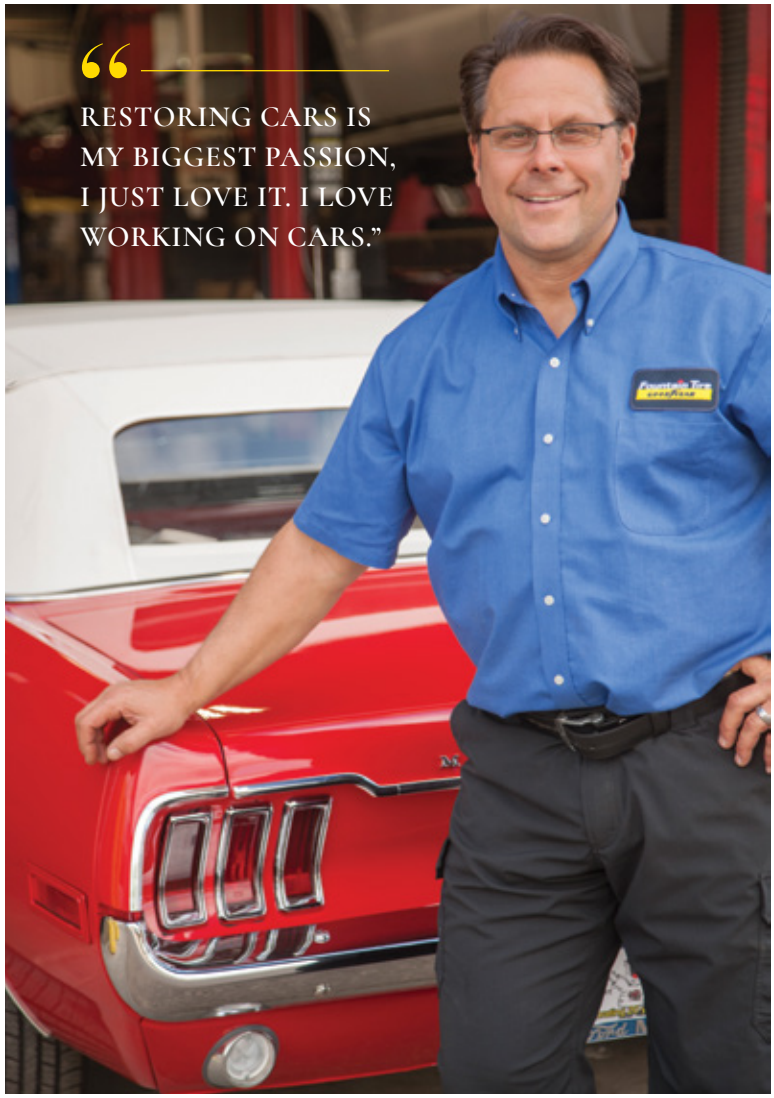
### Lab Testing Checklist for Diagnosis of Diabetes

1. Physicians will give patients a requisition for the HbA1c test, based on key risk factors, to screen for Type 2 diabetes


# CARS FOR A CAUSE

**BY** BREANNA MROCZEK **PHOTOGRAPHY BY** DARREN GREENWOOD PHOTOGRAPHY

An annual car show gets a new twist in 2017, as one lucky ticket-buyer can drive away in one of the show-stopping vehicles




Todd Lesenko, Owner of Fountain Tire, St. Albert and founder of St. Albert Cruisers Car Club

**Twenty-five years ago, Todd Lesenko visited Sandpoint, Idaho and was immediately taken with its "Lost in the '50s" classic car show. As a classic car enthusiast, he preferred the retro vibe of the music, entertainment and car displays to the typical rodeo theme found at summer festivals in Alberta, and decided something like that was needed here. So, he made it happen: in 1996, the first Rock'n August car show and festival took place in Edmonton and has be held annually in St. Albert ever since.**

Lesenko, who has owned Fountain Tire in St. Albert for 35 years, says that his love for cars started at the age of six when he would visit garages of friends and neighbours. When he was 13, he started restoring cars to make extra money — he would save up and spend his allowance on an old car and then borrow tools, equipment and space from friends and neighbours to work on the cars and eventually re-sell them for higher prices.

Since then, Lesenko estimates he's done hundreds of restorations throughout his life, and always tries to take on projects with a personal story. "I like building cars for a cause, like when it's someone's father's car or their grandfather's car." Lesenko says. "Restoring cars is my biggest passion, I just love it. I love working on cars."

Wanting to work and spend time with like-minded individuals, Lesenko started the St. Albert Cruisers Car Club 25 years ago to get car enthusiasts together to work on projects, share stories and drive around the cars in their collections. When Lesenko and the Cruisers decided to start Rock'n August, they partnered with the St. Albert Cosmopolitan Club, a men's service club and a big supporter of the Alberta Diabetes Foundation. "It was their mandate to focus on supporting the Alberta Diabetes Foundation, so it became Rock'n August's too," says Lesenko.

One day, a friend of Lesenko's, a member of the Draggins Rod and Custom Car Club in Saskatoon, Saskatchewan, told Lesenko the club was working on restoring a car for a raffle. "He loved this idea of adding a car raffle to Rock'n August," says Brent Brodeur, the current president of Rock'n August. "So, he bought a car and his team at Fountain Tire, along with Gary Poff and other members of the St. Albert Cruisers Car Club, did the restoration."

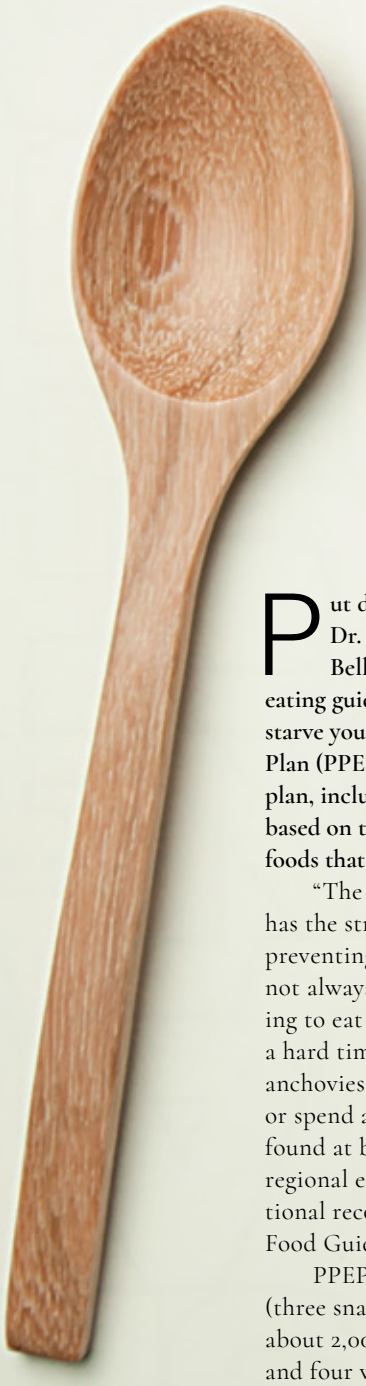
"The car — a 1968 Ford Mustang — had been stored for 20 years and was in pieces when I bought it," says Lesenko. "There were at least ten buckets of bolts and small parts. But everything was in great shape." His team of 12 spent over 800 hours throughout eight months working on the restoration. Lesenko donated the mechanical work at Fountain Tire, while members of the St. Albert Cruisers volunteered their time to work on the assembly at Lesenko's personal shop in Sturgeon County. The restored car, which has now been appraised at $55,000, is on display outside Fountain Tire in St. Albert and is the grand prize for Rock'n August's car raffle.

"I think it's a tremendous opportunity for people to own a beautiful car," says Lesenko. "And just as great, all of the proceeds from the tickets go to the Alberta Diabetes Foundation."

## 2017 ADF Classic Car for a Cure Tickets

**Cost:** $100 each
**Number available:** 2,000
**Where to purchase:** Alberta residents can purchase tickets anytime online at rocknaugust.com or during Rock'n August from August 8-12.

**The contest closes on August 18, or as soon as tickets are sold out.**



# A No-Gimmick Diet: Healthy Eating to Prevent and Manage Diabetes

## Two researchers from the University of Alberta have developed a simple, accessible meal plan to help Albertans eat well

BY BREANNA MROCZEK

**Put down that latest diet fad book — Dr. Catherine Chan and Dr. Rhonda Bell have developed a proven healthy eating guide, and it doesn't require you to starve yourself. The Pure Prairie Eating Plan (PPEP) is an easy-to-follow meal plan, including recipes and grocery lists based on the Mediterranean diet but using foods that are easily accessible in Alberta.**

"The Mediterranean dietary pattern has the strongest evidence for treating and preventing diabetes," Bell says. "But it's not always affordable, practical or appealing to eat that way in Alberta. You'd have a hard time convincing most people to eat anchovies as a meal and give up barbecue, or spend a fortune on exotic ingredients found at boutique shops." PPEP balances regional eating preferences with nutritional recommendations of the Canada Food Guide and the Mediterranean diet.

PPEP includes 28 days of menus (three snacks and three meals per day, about 2,000 calories per day in total) and four weekly shopping lists. The plan is available in full as a book, and an excerpt is available on the website, pureprairie.ca. It can be used by diabetics to manage their blood sugar levels, but is also perfect for anyone looking to eat well and prevent diabetes, heart disease and other unhealthy habits.

Dr. Chan and Dr. Bell spent five years with their research students developing the eating plan in order to address concerns about the rising rates of diabetes — they wanted to create accessible meal plans that were high in fibre, lean protein and mono-unsaturated fats that could help Albertans eat well in order to prevent or treat diabetes.

The shopping list includes ingredients that are grown and produced in Alberta, as well as foods that are easily available at grocery stores and affordable — think bananas, grapes and oranges, not guava and quince. It also makes use of healthy ingredients that are common in Alberta, such as Saskatoon berries and rhubarb, but not in the Mediterranean. The plan includes a hefty portion of beans, peas and lentils, as these are grown in Alberta and are a big part of the Mediterranean diet, yet they are not typically included in Albertan diets.

PPEP is one of the few "diet" plans that Dr. Timothy Caulfield, a Canadian research chair in Health Law and Policy, actually endorses — he's known for debunking dubious diets in his books *The Cure for Everything* and *Is Gwenyth Paltrow Wrong About Everything*. "[PPEP] is built around how we actually eat," Caulfield says. "It isn't a gimmick. It isn't a fad. It is real, science-informed diet advice that is both easy and fun to follow."

Sample Shopping List for 1 Week

Apples
Artichoke hearts, canned
Asparagus
Bananas
Basil, fresh
Berries, mixed, frozen
Cabbage
Carrots
Cilantro
Cucumber
Dill, fresh
Garlic
Grapes, red
Ginger root
Green beans
Green onions
Lemon
Lettuce
Lime
Mushrooms
Onions
Oranges
Parsley, fresh
Peas, frozen

Bagel, whole-wheat
Bread, raisin or pumpernickel
English muffin, whole-wheat
Pita bread, whole-wheat
Tortilla, whole-wheat

Butter
Cheddar cheese, low-fat
Cottage cheese, low-fat
Cream cheese, low-fat
Milk, skim or 1%
Mozzarella cheese, low-fat
Provolone cheese, low-fat
Swiss cheese, low-fat
Vanilla frozen yogurt

Back bacon
Basa (or other white fish)
Chicken breast, boneless, skinless
Turkey (deli, raw, or cooked)
Eggs
Ground beef, lean
Hummus
Pork tenderloin, lean
Shrimp, fresh or frozen
Sirloin beef steak
Stewing beef

# Black Bean Chèvre Quesadillas

**Adapted from Simply HeartSmart Cooking**

These are quick, easy and full of flavour. We almost always used chèvre but you could substitute whatever cheese you have on hand. Another option is to use the filling as a salad/side for almost anything (chicken breast, fish, mac and cheese, etc.). Whatever option you choose, it makes a great Friday (or any) night dinner. Barbecue them for extra flavour or make them open faced like a pizza. They can also be made ahead and reheated, and leftovers are great for lunches.

## Ingredients

1 cup (250 ml) black beans
1 tomato, chopped and drained
1 sweet red pepper, preferably roasted, peeled and chopped
1 jalapeño pepper, chopped
1 clove garlic, minced
1/2 cup (125 ml) cilantro
2 tbsp (30 ml) fresh chives or green onions
2 tbsp (30 ml) fresh basil
1 1/2 cups (375 ml) grated light Monterey Jack or cheddar cheese
1/2 cup (125 ml) chèvre (soft goat cheese) or feta cheese
6 10-inch (25 cm) flour tortillas

## Directions

1. Preheat barbecue or oven to 400°F (200°C).
2. Combine black beans, tomato, red pepper, jalapeño, garlic, cilantro, chives, basil, Monterey Jack and chèvre.
3. Place tortillas on counter in a single layer. Spread filling evenly over one half of each tortilla.
4. Fold unfilled half over filled side and press together gently.
5. Place in a single layer on heated grill on the barbecue or on a baking sheet or pizza stone in the oven. Bake for 7-10 minutes until the filling is heated and the cheese is melted.

## Nutritional Analysis (per serving)

340 calories, 11 g fat, 6 g saturated fat, 43 g carbohydrates, 4 g fibre, 18 g protein. >

# Rhubarb Muffins

**Adapted from Simply HeartSmart Cooking**

Rhubarb is hardy, full of flavour and it comes up at a time when everyone is longing for fresh garden produce. It used to be that every prairie garden had a rhubarb patch. As a result, it's been used in fruit compotes, baked in crisps, cobblers and cakes, made into jam, relish or chutney and served as a beverage. This recipe makes 16 muffins, so there's lots to share with family or friends or to freeze for a quick grab-and-go snack or lunch. The sweet topping contrasts really nicely with the tartness of the rhubarb.

## Ingredients

**Muffin Topping: Optional**

2 tbsp (30 ml ) all-purpose flour
3 tbsp (45 ml) brown sugar
1 tbsp (15 ml) oatmeal
1/2 tsp (2 ml) cinnamon
1 tbsp (15 ml) orange zest
1 tbsp (15 ml) butter

**Muffins**

1 cup (250 ml) all-purpose flour
1 cup (250 ml) whole-wheat flour
3/4 cup (175 ml) granulated sugar
2 tsp (10 ml) baking powder
3/4 tsp (3 ml) baking soda
1/4 tsp (1 ml) salt
1 large egg
1 1/4 cups (310 ml) raspberry yogurt
3 tbsp (45 ml) canola oil
1 tsp (5 ml) vanilla
1 tsp (5 ml) orange zest
1 cup (250 ml) fresh rhubarb, diced

## Directions

**Muffin topping**

1. In a small bowl, mix flour, sugar, oatmeal, cinnamon, lemon zest together. Add butter or margarine and blend with a fork until mixture resembles coarse crumbs. Set aside.

**Muffins**

1. Preheat oven to 375°F (190°C). Line 16 muffin cups with paper or silicone liners.
2. In a large bowl, mix together all-purpose flour, whole-wheat flour, sugar, baking powder, baking soda and salt.
3. In a small bowl, whisk together the egg, yogurt, canola oil, vanilla and lemon zest.
4. Stir the egg mixture into the flour until combined. The batter will appear thick, but resist over-mixing.
5. Gently fold the fresh rhubarb into the batter.
6. Spoon the muffin batter into prepared muffin cups, filling the paper cup. Sprinkle the tops with equal amounts of muffin topping.
7. Bake in the centre of the oven for 18-20 minutes or until lightly browned and a toothpick placed in the centre of the muffin comes out clean.

## Nutritional Analysis (per serving)

165 calories, 4.5 g fat, 1 g saturated fat, 28 g carbohydrate, 1.2 g fibre, 3.6 g protein, 138 mg sodium.

## Canada's Food Guide Servings

0.1 vegetables and fruit, 0.7 grain products, 0.1 milk and alternatives.

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## PURE PRAIRIE EATING PLAN 2.0

Dr. Chan and Dr. Bell have been hard at work preparing new recipes and shopping lists for an updated version of their project. This new version will contain more ethnic foods and eating habits (such as eating from a communal pot) that are typical of Asian communities.

## BUY THE BOOK

Pick up a print copy of *Pure Prairie Eating Plan* at Chapters, Indigo and independent bookstores across Alberta, through most online retailers and at the Alberta Diabetes Foundation office at the Li Ka Shing Centre for Health Research Innovation at the University of Alberta, 8602 - 112 St in Edmonton.