Diabetes Research in Québec
Funded by the Canadian Diabetes Association

About the Canadian Diabetes Association

Founded in 1953, the Canadian Diabetes Association is a member-based, independently governed charitable organization. It is one of the largest health charities in Canada and lends support to the more than 11 million Canadians currently living with diabetes or prediabetes.

The Canadian Diabetes Association is proud to be a leading supporter of diabetes research in Canada and, since the establishment of the Charles H. Best Research Fund in 1975, has supported more than $130 million in research grants, awards and partnerships to scientists who have dedicated their careers to the fight against diabetes. Since Banting and Best’s discovery of insulin in Toronto in 1922, Canadian researchers have made huge strides and key advances in understanding how and why diabetes happens, how to make the lives of people living with diabetes better and how diabetes may be better treated or prevented. Although the research we fund is diverse in its scope, covering a broad range of specialties/topics, the key goal of every study remain the same: to improve the quality of life of people living with diabetes and to find a cure.

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Diabetes Research in Québec

The following list describes the 19 research projects being conducted this year in Québec through funding commitments by the Canadian Diabetes Association.

Dr. Paul Brassard (Operating Grant 2016-2017)
McGill University Health Centre, Montréal, QC
Project title: Type 2 diabetes, its treatment with metformin and the incidence of viral-induced cancers
Summary of research: Dr. Brassard wants to further explore the links between type 2 diabetes, medications used to treat the disease and cancers that are triggered by certain viruses. His team is assessing patient information from a large database to see if people with diabetes are more likely to develop certain cancers and if their diabetes medications seem to have an impact on the relationship. Findings from this research will help inform knowledge on cancer risk in people with type 2 diabetes and may provide recommendations for medical management of these patients.

Dr. André C. Carpentier (Operating Grant 2014-2017)
Universite de Sherbrooke (Sherbrooke, QC)
Project title: Postprandial metabolism after bariatric surgery in type 2 diabetes

Last updated: April 15 2016
**Summary of research:** Dr. Carpentier is using a new imaging technology to find out if bariatric surgery, a treatment for obesity, results in better fat metabolism in patients. This study will help researchers understand how type 2 diabetes may be prevented, treated and, even, reversed.

**Dr. John S. D. Chan (Operating Grant 2014-2017)**
Centre de Research-CHUM (Montréal, QC)

**Project title:** Insulin and molecular regulation of heterogeneous nuclear ribonucleoprotein F and K gene expression in diabetic mice

**Summary of research:** Diabetes and high blood pressure are two major risk factors for developing cardiovascular (heart and blood vessel) disease, stroke, heart attacks and kidney failure. Keeping blood glucose at normal levels using insulin (a medication mimicking the glucose-lowering hormone) is the best way to prevent diabetes-related complications in people with type 1 diabetes. Dr. Chan is examining two proteins that can be found in the nucleus (the "brain centre" of cells) to find out how these proteins are involved with the ability of insulin to prevent high blood pressure and kidney damage in diabetes. Dr. Chan's studies will help understand how insulin prevents the complications of diabetes.

**Ms. Shiaoying Chang (Doctoral Student Research Award 2013-2016)**
Université de Montréal (Montréal, QC)

**Supervisor:** Dr. Shao-Ling Zhang

**Project title:** Maternal diabetes and perinatal programming of hypertension: roles of angiotensin converting enzyme-2 (ACE2)

**Summary of research:** When a mother has gestational diabetes, her baby has a higher-than-normal risk of birth defects, and a higher risk of developing metabolic syndrome, high blood pressure, obesity and chronic kidney disease later in life. This is called "perinatal programming", but it is unclear how it happens. Ms. Chang is examining an enzyme called ACE2, which seems to have a protective effect on the kidneys. Ms. Chang is studying if, and how, ACE2 protects against perinatal programming for high blood pressure and kidney disease.

**Dr. Kaberi Dasgupta (Targeted Research Grant 2016)**
The Research Institute of McGill University Health Centre (Montréal, QC)

**Project title:** Stigma and its impact on glucose control among youth with diabetes, a Canada-wide study (STIGMA trial)

**Summary of research:** Dr. Dasgupta, along with her post-doctoral student and co-investigator, Dr. Anne-Sophie Brazeau, are leading a national team of physicians, researchers and patient representatives in conducting a large online survey to learn more about stigma from adolescents and emerging adults with type 1 diabetes. The results will help determine the prevalence of stigma in this population, gain insight into the patient perspective of it, and gather their recommended solutions to this challenge. These responses will be compared against mailed-in blood samples that will be used to determine blood glucose controls. Using these two methods together will help the researchers evaluate the associations between stigma and health outcomes. This study will be one of the largest studies on stigma and
adolescents with diabetes internationally. Results are anticipated to be available in 2017 and the content will be leveraged to impact government policy and improve the quality of life for those affected by type 1 diabetes.

**Dr. Alexandre Fisette (Post-Doctoral Fellowship 2013-2016)**

CHUM Research Centre (Québec, QC)

*Supervisor: Dr. Stephanie Fulton*

**Project title:** Central role of GPR120 in energy balance and food reward

**Summary of research:** Research has shown that omega-3 fatty acids affect the way nerves communicate, but little is known about the role of a specific omega-3 receptor regarding how food makes us feel, how much we eat and how much energy we use. Dr. Fisette aims to understand the central role of this receptor in the relationship between obesity and type 2 diabetes.

**Dr. Claudia Gagnon (Operating Grant 2012-2016)**

Laval University –CRCHUL, Québec, QC

**Project title:** Role of vitamin D in the prevention and treatment of diseases associated with insulin resistance.

**Summary of research:** Dr. Gagnon’s team conducted a clinical trial to determine whether vitamin D supplements can help improve insulin resistance, cholesterol levels, blood pressure or body weight. The results of this research project will help illustrate if taking vitamin D supplements can provide a cost-effective and safe strategy for preventing or treating diseases associated with insulin resistance.

**Dr. Pedro M. Geraldes (Scholar Award 2011-2016)**

University of Sherbrooke (Sherbrooke, QC)

**Project title:** Role of PKC delta and SHP-1 on poor collateral vessel formation in diabetes

**Summary of research:** In diabetes, blood vessels can become damaged and don't properly heal, which can lead to complications of diabetes. It has been suggested that high blood glucose levels prevent blood vessels from forming properly. Dr. Geraldes is studying the role of two enzymes (protein kinase C and SHP-1) that are activated when blood glucose levels are high, to determine if they inhibit blood vessel formation when blood flow is decreased (i.e. when blood vessels are blocked or damaged). This research will help better understand the underlying blood vessel complications related to high glucose levels in people with diabetes. It may also help in the development of new treatments to promote new blood vessels during reduced blood flow, preventing amputations in people with type 1 and 2 diabetes.

**Dr. Marie-France Hivert (Clinician Scientist Award 2011-2016)**

University of Sherbrooke (Sherbrooke, QC)

**Project title:** Evaluation of contributing heritable and environmental factors to adipokine and glycemic regulation variability during pregnancy and fetal development

**Summary of research:** Having gestational diabetes (diabetes during pregnancy) increases the risk of short-term and long-term complications in both mother and child. Dr. Hivert wants to know how genes...
and the cellular environment affect the ways that blood glucose (sugar) levels are regulated during pregnancy, and may be related to the risk of obesity and conditions related to metabolism later in life.

**Dr. Gabriel Lachance (Post-Doctoral Fellowship 2015-2018)**

Université Laval (Québec, QC)

*Supervisor:* Dr. André Marette

**Project title:** Role of iNOS in the pathogenesis of insulin resistance

**Summary of research:** Dr. Lachance is studying a molecule that could provide clues to the early detection of diabetes. Approximately 80% of obese people will develop diabetes as a result of their body’s inability to sense the effect of insulin. This condition is called insulin resistance and it is reversible, especially if treated in the early stages. However, scientists are still searching to understand the initial link between obesity and diabetes, which could help with early detection. Researchers have recently determined that, in obesity, a molecule called nitric oxide (NO) reduces the effect of insulin. The impaired insulin production then leads to higher blood glucose levels and results in type 2 diabetes. Dr. Lachance is examining how NO is produced to better understand the early signs of diabetes. Results from this study could provide new knowledge on how to more effectively identify diabetes and prevent its progression.

**Dr. Sylvie Lesage (Operating Grant 2013-2016)**

Hôpital Maisonneuve-Rosemont (Montréal, QC)

**Project title:** Immunogenetic regulation of DN T cells in the context of autoimmune diabetes

**Summary of research:** Dr. Lesage and her team recently showed that a rare cell type, namely DN T cells, play an important role in the prevention of autoimmune diabetes. Specifically, they showed that mice who spontaneously develop diabetes have fewer DN T cells than mice who never develop the disease. Also, the injection of DN T cells into mice is sufficient to prevent the onset of diabetes. The key advantage of DN T cells over other types of therapies aimed at inhibiting autoimmune responses lies in their specificity. DN T cells appear to specifically impede the production of antibodies associated with the autoimmune pathology. During this study, Dr. Lesage hopes to identify the genes which determine the proportion of DN T cells. The outcomes of this project could result in the development of new and novel therapies for the treatment of type 1 diabetes.

**Dr. André Marette (Operating Grant 2014-2017)**

Laval University (Montréal, QC)

**Project title:** Glucoregulatory action and therapeutic potential of omega-3 derived protectin DX

**Summary of research:** It has been suggested that eating a type of fats called long chain omega-3 polyunsaturated fatty acids (commonly called omega-3) reduces the risk of developing diabetes, but why this happens is not well understood. It was recently discovered that omega-3s are used by the body to make molecules called resolvins, protectins and maresins. Dr. Marette is studying how resolvins, protectins and maresins influence insulin sensitivity (how well insulin works in the body to lower blood
glucose) and glucose metabolism (how glucose is used by the body for fuel). This research could lead to the discovery of new therapies for prediabetes and type 2 diabetes.

**Dr. Meranda M. Nakhla (Operating Grant 2014-2017)**
The Research Institute of McGill Univ. Health Ctr (Montréal, QC)
**Project title:** Improving the transition from pediatric to adult care for emerging adults with diabetes

**Summary of research:** Emerging adulthood is the transition period between childhood and adulthood, when the young adult becomes independent, establishes their identity and makes career and educational choices. This is a challenging time, and is especially so for young adults who are managing a chronic illness, like diabetes, as they take more responsibility for their own health. At this time, many emerging adults fail to move from a pediatric diabetes clinic to an adult clinic and only to come back to the medical system once they have diabetes-related complications. Dr. Nakhla is examining provincial databanks in Québec that contain all visits to doctors and hospitals for emerging adults with diabetes to find out why emerging adults don't enter an adult clinic, what happens to them when they leave pediatric care and what factors improve their health. This research will allow Dr. Nakhla to advise the government and healthcare providers on how to provide the care emerging adults need.

**Dr. Shirin Panahi (Post-Doctoral Fellowship 2014-2016)**
PEPS- Universite Laval (Québec, QC)
**Supervisor:** Dr. Angelo Tremblay
**Project title:** Milk supplementation, physical activity, glucose homeostasis and appetite control: towards a new paradigm of obesity management and diabetes prevention

**Summary of research:** Dr. Panahi is examining the impact of consuming dairy foods with and without an exercise routine for weight loss, weight maintenance and better control of blood glucose. She wants to know how dairy foods, such as yogurt, contribute to appetite control, amount eaten, blood glucose, body weight and fat. Findings for this study will help guide dietary guidelines for people with obesity and type 2 diabetes.

**Dr. Rémi Rabasa-Lhoret (Operating Grant 2014-2017)**
Clinical Research Institute of Montreal (IRCM) (Montréal, QC)
**Project title:** Closed-loop control in type 1 diabetes: moving to automation with outpatient pediatric studies

**Summary of research:** In healthy people, blood glucose levels are tightly controlled by two hormones: insulin lowers blood glucose and glucagon raises blood glucose. In type 1 diabetes, the body does not produce insulin, and insulin must be taken by injection or by insulin pump. Dr. Rabasa-Lhoret and his team have developed a wearable artificial pancreas for people with type 1 diabetes. It is made of: a sensor to continuously read blood glucose levels; a pump that delivers the hormone(s); and a "smart" dosing method that links the sensor with the pump. Dr. Rabasa-Lhoret's team is conducting clinical trials comparing two versions of the artificial pancreas (one that only delivers insulin, and one that delivers insulin and glucagon) with traditional insulin pump therapy in adults and adolescents with type 1 diabetes. So far, the results are very promising: the artificial pancreas reduces the risk of having
dangerously low and dangerously high blood glucose. Dr. Rabasa-Lhoret is now testing the artificial pancreas in adolescents in three challenging situations: three nights at a diabetes camp; three days at a diabetes camp; and three weeks in an outpatient setting (home, school, etc.). This artificial pancreas has a great potential to improve the quality of life and health of people with type 1 diabetes, to prevent hypoglycemia and to lessen the burden of diabetes for both families and health care providers.

**Dr. Julie Robitaille (Operating Grant 2014-2017)**
Laval University (Québec, QC)

**Project title:** Impact of gestational diabetes mellitus on offspring health: role of the prenatal and postnatal environment.

**Summary of research:** When a mother has gestational diabetes (diabetes during pregnancy), both she and her child have a higher risk of developing metabolic syndrome later in life; however, risk can be lowered again by changing diet and physical activity. Dr. Julie Robitaille is studying the children of women who have had gestational diabetes to examine how the condition, and lifestyle behaviours after the birth, impact the child’s risk of developing obesity, type 2 diabetes and other complications. This study will help develop prevention strategies for reducing the risk of obesity and type 2 diabetes in this population.

**Dr. Przemyslaw Sapieha (Operating Grant 2014-2017)**
Maisonneuve-Rosemont Research Centre (Montréal, QC)

**Project title:** Neuroimmune crosstalk in diabetic retinopathy

**Summary of research:** Dr. Sapieha is exploring the role of molecules that guide blood vessels and nerve cells, and are typically only produced in developing embryos. During diabetes, his team found these guidance cues to be highly produced by nerve cells in the eye and cause damage associated with retinopathy (a type of blindness that is a common complication of diabetes). This research may provide insight into new medications that could block these signals and potentially delay the development of retinopathy.

**Dr. Norbert Schmitz (Operating Grant 2016-2018)**
Douglas Hospital Research Institute, Montréal, QC

**Project title:** Systemic inflammation and the risk of depression in people with type 2 diabetes: A prospective community study

**Summary of research:** Dr. Schmitz wants to know if systemic inflammation plays a role in the relationship between type 2 diabetes control, depression and cardiovascular complications. His team is using population-based survey data from Québec and conducting interviews to determine if there is an association between these conditions. If successful, the results of this study would suggest that inflammation is a risk factor for depression and poor health outcomes in people with type 2 diabetes and treatments to target inflammation should be developed.
**Dr. Shao-Ling Zhang (Operating Grant 2013-2016)**

CR-CHUM, University of Montreal (Montréal, QC)

**Project title:** AT2R deficiency accelerates perinatal programming induced by maternal diabetes

**Summary of research:** Dr. Zhang is studying the relationship between gestational diabetes (diabetes during pregnancy) in mothers and the baby’s increased risk for health problems later in life. This study may shed new light on why children born to mothers with diabetes are at greater risk for obesity and conditions related to metabolism. Dr. Zhang’s research may provide information that could stop this process and prevent conditions in children whose mothers have gestational diabetes.