

SUPPORT THE BBDC

Leading up to the 100th anniversary of the discovery of insulin in 2021, the University of Toronto's Banting & Best Diabetes Centre – with one of the largest concentrations of diabetes scientists in the world – is uniquely positioned to make history once again



Banting & Best Diabetes Centre
UNIVERSITY OF TORONTO

bbdc.org

A DRAMATIC DISCOVERY

U of T proved fertile ground in turning an idea into the game-changing discovery of insulin



In late October of 1920, a surgeon and U of T medical graduate named **Frederick Banting** had an idea. After spending the day preparing to give a metabolism lecture to medical students, he read a journal article focused on diabetes and a type of cell cluster in the pancreas. During a night of disturbed sleep — his mind spinning with worries of money and his fledgling practice, alongside thoughts of pancreatic cell clusters — he devised a way to test whether secretion from those cells could relieve symptoms of diabetes.

With no research experience or access to laboratory space, he reached out to U of T Physiology Professor **John James Rickard Macleod** — an international expert in diabetes and carbohydrate metabolism. Macleod deemed it an idea worth testing, but only if Banting were willing to devote several months exclusively to the project. The professor offered guidance in research techniques, access to a U of T laboratory and equipment, as well as the support of his research assistant, Physiology and Biochemistry student **Charles Best**.

Banting and Best spent the spring and summer of 1921 testing his theory — binding the pancreas of dogs to extract secretions from the cell clusters in question and injecting this substance into dogs whose pancreas they had removed. After repeated failures and refinements, their extract began to bring down blood sugar levels, and they managed to keep a diabetic dog, “Marjorie,” alive for 70 days.

As excitement grew in the fall of 1921, visiting Biochemistry Professor **James Bertram Collip** joined the team, focused on developing a purer form of the extract. On December 30, 1921, the team presented the findings of their work to the American Physiological Society.

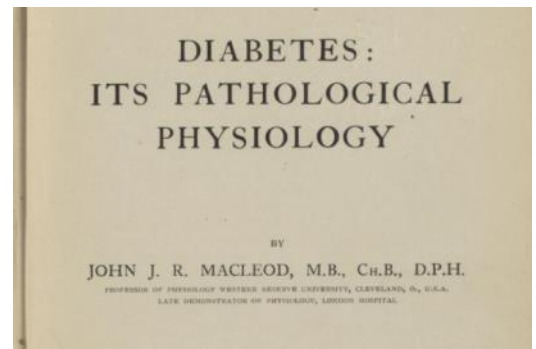
Soon after, a 14-year-old boy named **Leonard Thompson** became the first diabetic patient saved by what became known as “insulin” — receiving a successful injection of the purified extract on January 23, 1922. By June, insulin production had ramped up at U of T’s Connaught Antitoxin Laboratories, an agreement for large-scale production was signed between the University and Eli Lilly & Co., and Department of Medicine Chair Dr. **Duncan Graham** had opened a Diabetic Clinic in the Toronto General Hospital — bringing insulin swiftly from lab bench to bedside, with dramatic results. A Nobel Prize in Medicine followed and insulin became widely available in 1924, saving countless patients to the present day.

“Patients who were brought into the emergency ward, unconscious in diabetic coma, [and] when they were injected with insulin they awakened dramatically, snatched from death’s door.”

— *Dr. Wilfred G. Bigelow, U of T surgeon who witnessed transformation*

While many lived longer and relatively healthy lives, this story has an ominous afterword. The very first patient “snatched from death’s door,” Leonard Thompson, only lived an additional 13 years, dying April 20, 1935 from pneumonia related to his diabetes.

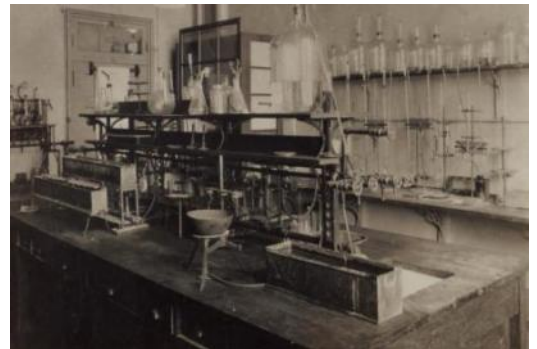
Despite the dramatic and life-saving discovery of insulin, diabetes remains a tenacious adversary to this day.



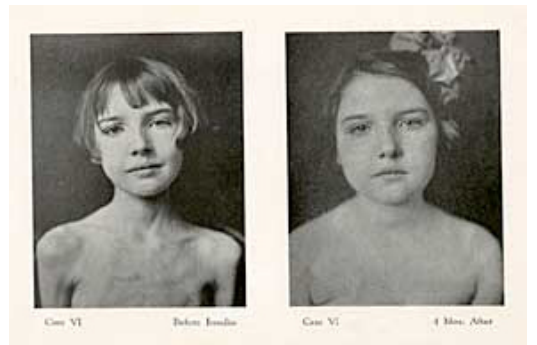
Physiology Professor **J.J.R. Macleod** was an international leading expert in diabetes and carbohydrate metabolism. He published this monograph in 1913, was recruited to U of T in 1918, and was co-recipient of the Nobel Prize in Physiology or Medicine in 1923.



Frederick Banting (right) and **Charles Best** are recognized for their discovery of insulin at the University of Toronto



The U of T Physiology laboratory where insulin was discovered



The impact of insulin was dramatic — patients who were wasting away were suddenly “snatched from death’s door”

A GROWING CRISIS

Almost 100 years after the discovery of insulin, diabetes remains a major health crisis

Without this pivotal discovery, the patients dramatically saved by insulin would have never survived. But as the still-untimely death of the first patient saved by insulin shows, diabetes is complicated.

And its complications can be devastating — both for those with type 1 diabetes, whose bodies lose their ability to produce insulin, and those with type 2 diabetes, who lose response to the insulin they produce and whose bodies produce inadequate amounts of insulin to adequately control blood sugar. Chronically high blood sugar can lead to blindness, heart disease, stroke, kidney disease, nerve damage, depression and more. Foot ulcers can lead to amputation; kidney failure can require long-term dialysis or kidney transplantation. At the other side of the pendulum, low blood sugar brought on by a mismatch of insulin to the needs of the body can lead to sudden loss of consciousness or seizures, and can be fatal.

Keeping blood sugar levels regulated throughout the ebbs and flows of the day is an exceedingly difficult task. Today those living with diabetes do their best with imperfect therapies and resources — regularly measuring their blood sugar, and adjusting insulin injections, meals, exercise and many other treatments accordingly. While we have made great progress in bringing diabetes under control, we still fall short of striking the perfect balance — often with dire consequences.

With rates on the rise and a health-crisis unfolding, it is becoming increasingly urgent to do more. Type 1 diabetes is not preventable. 86,000 children worldwide develop type 1 diabetes each year and approximately 1 in 4 individuals are diagnosed as adults. As type 2 diabetes is tied not only to genetic factors, but also to a sedentary lifestyle and unhealthy diet (making stigma yet another barrier), the prevalence of diabetes is increasing in lock step with obesity rates. An estimated three and a half million people in Canada are living with diabetes, and that number is expected to rise to five million by 2025 — a 44 per cent increase. It is costing Canada's health-care system in the range of \$14 billion a year. And yet, we still have limited defenses against this impending epidemic.

With one of the largest concentration of diabetes scientists in the world, the Banting & Best Diabetes Centre is uniquely poised to change that. Our members lead critical discovery in basic science, patient-oriented research and large-scale clinical trials across a network of nine academic hospitals and research institutes, as well as twelve community-affiliated hospitals and sites. The Centre has an unparalleled advantage in tackling such a complex and intractable disease.

At this pivotal time, we need to accelerate diabetes research by equipping our top researchers with protected time and resources, recruiting additional researchers and collaborators and investing in the next generation — just as was done for Drs. Banting and Best. As U of T prepares to celebrate the 100th anniversary of the discovery of insulin in 2021, we are determined to make history once again. This centennial will be particularly meaningful as it marks a new chapter in the history of diabetes.



3.5 million

people in Canada are living with diabetes

5 million

people in Canada are estimated to develop diabetes by year 2025 — a **44%** increase

\$14 billion

estimated cost of diabetes to Canada's health-care system in 2015

"The University of Toronto's Banting & Best Diabetes Centre has one of the largest concentrations of top diabetes scientists in the world. Our members are leading not only discovery research and clinical trials, but also in taking that knowledge and directly impacting care. If you think diabetes research, you think Toronto."

— Dr. **Gary Lewis**
Director of U of T's Banting & Best Diabetes Centre,
Professor in the
Department of Medicine
and Department of
Physiology

WHY SUPPORT THE BBDC?

By supporting the Banting & Best Diabetes Centre you are supporting the current and the next generation of diabetes researchers who are working toward a cure for diabetes and its complications.

An idea can change the world, but only when it is nurtured in fertile ground. As in the case of Drs. Banting and Best, discoveries like insulin only happen when the right people are given the time, resources and the support they need to pursue their ideas.

The Banting & Best Diabetes Centre supports diabetes research, care and education at the University of Toronto and its affiliated hospitals and research institutes across the city including SickKids, Mount Sinai Hospital, University Health Network, Sunnybrook Health Sciences Centre, St. Michael's Hospital, Women's College Hospital, Centre for Addiction and Mental Health and many other community-affiliated sites.

We bring together researchers and health professionals across multiple disciplines to lead discoveries in patient-oriented research, large-scale clinical trials and basic science, and to identify innovative ways to manage diabetes and improve the lives of those living with the condition.

- We provide research grants for innovative, city-wide collaborative and interdisciplinary diabetes research.
- We provide new U of T faculty members pursuing a field in diabetes research with much needed support through New Investigator Grants.
- We fund the next generation of clinical and basic science researchers through every stage of their training from undergraduate summer studentships to graduate scholarships to post-doctoral fellowships.
- We foster and develop continuing health education and quality improvement initiatives for all members of the diabetes team – physicians, nurse practitioners, nurses, dietitians, pharmacists, and other health professionals with the aim of providing a tangible impact at the patient level.
- We promote the exchange of new scientific information and collaborations with diabetes researchers both locally and internationally through scientific conferences.

Leading up to the 100th anniversary of insulin, the U of T and its affiliated hospitals and research institutes remain the world-leading force in discovering new treatments, developing crucial insights and translating new knowledge into improved care.

For more information about the Banting & Best Diabetes Centre, our members and programs, please visit www.bbdc.org.

OPPORTUNITIES FOR INVESTMENT & NAMING

DISCOVERY RESEARCH CATALYST GRANTS

Supporting innovative, city-wide collaborative and interdisciplinary research at the University of Toronto and its affiliated hospitals and research institutes to help find a cure for diabetes or prevent its complications.

SUPPORTING THE NEXT GENERATION OF DIABETES RESEARCHERS

Graduate scholarships for basic, translational and clinical scientists, as well as *Postdoctoral Fellowships*, enable the best and brightest to train with the best researchers in the world. Dedicated funding allows them to pursue diabetes-focused research as they develop into the next generation of leading investigators, health-care professionals and clinician-scientists.

FACULTY SUPPORT

As new graduates complete their training and become faculty members, they are in critical need of financial support and protected time to foster their research. *New Investigator Grants* allow us to attract the world's most promising diabetes researchers to lead the field.

Named *Chairs* and *Professorships* are among the highest honours that can be bestowed upon a faculty member. They allow leading diabetes researchers to dedicate increased resources and time to diabetes-focused research and initiatives.

BBDC ENDOWMENT

An *endowment* will provide the Banting & Best Diabetes Centre with a reliable source of income in perpetuity to support the above activities, enabling us to accelerate research and initiatives to improve lives of those living with diabetes and to find new ways of preventing, treating and managing diabetes.

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