medicine gets personal
2014 UHN research report
University Health Network (UHN) comprises four hospitals: Princess Margaret Cancer Centre, (PM Cancer Centre), Toronto General Hospital (TGH), Toronto Rehab (TR) and Toronto Western Hospital (TWH). It also has five research institutes: PM Cancer Centre, Techna Institute for the Advancement of Technology for Health (Techna), Toronto General Research Institute (TGRI), Toronto Rehabilitation Institute (TRI) and Toronto Western Research Institute (TWRI). The scope of research and complexity of cases at UHN have made it a national and international source for discovery, education and patient care. UHN is a research hospital affiliated with the University of Toronto (UT) and is a member of the Toronto Academic Health Science Network (TAHSN).

UHN Research Snapshot

**Total Researchers**  883
- Fellows  675
- Graduate Students  767

**Total Trainees**  1,442
- Support Staff  1,628
- Research Space  981,953 sq. ft.
- Publications  2,910

**Total Funding**  $344,384,007

*Cover Image: Margaret Kinyanjui, PhD, Research Communications Officer, Research Communications Department, Research Support Services, University Health Network*
Making Medicine Personal

Recent advances in our understanding of human biology have set in motion a potential revolution in health care based on an individual’s unique makeup. The best ways to acquire and integrate personal information into medical practice comprise major challenges to UHN’s research teams.

Medicine has always been personal—at some level—whether or not we knew it.

First, we each have a personal array of genes: our genome. Sometimes these genes are defective from birth, leading to diseases that may be mild to catastrophic. More commonly, genes mutate over the course of our lives; most mutations are inconsequential, but some lead to serious diseases like cancer. Acting on this knowledge remained nearly impossible until the advent of fast and accurate methods to determine the genetic makeup of normal and cancer cells, and the discovery of drugs that target particular mutations. Our research teams are developing ways to integrate this information into medical practice. Clinical trials focused on integrating molecular profiling of tumours into cancer diagnostics and treatment are already well underway.

At a different level, what could be more personal than when your immune cells attack your own tissue? This occurs in autoimmune inflammatory diseases such as rheumatoid arthritis, inflammatory
bowel disease and multiple sclerosis. While there have been major advances in treating these conditions, we still do not know why some patients respond to one anti-inflammatory drug while others do not. UHN research teams are discovering new ways to predict response and tailor interventions for these patients.

A bold example of personalized medicine is growing new tissue from a person’s own cells. UHN researchers have established protocols to grow heart cells to replace damaged tissue, insulin-producing cells to control diabetes and cartilage-producing cells to improve damaged joints. New imaging technologies are also being developed to monitor these cells in the body, which is critical for their use in the clinic. These early steps portend an entirely new approach to treating disease.

Making medicine personal at UHN goes far beyond cells, molecules and tissues.

Can there be anything more personal than talking to your surgeon as an electrode is inserted into your brain? UHN has pioneered deep brain stimulation for movement disorders, depression, Alzheimer disease and other disorders. Because each brain is unique, dialog between patient and surgeon helps pinpoint the exact location of the electrode, transforming the patient into a key member of their own surgical team.

Ultimately, making health care personal means putting the patient first. At UHN, integrated care teams bring together health professionals and patients with the aim of optimizing care and improving the patient experience. Collaborative practice for a patient recovering from stroke brings together individuals skilled in acute care, and experts in rehabilitation and patient/family education.

A critical issue is to determine if personalized medicine is affordable—or if it is, in fact, the only way to make health care sustainable. In the long run, will customized treatments save money through greater efficiency and fewer subsequent visits? UHN researchers are studying the effect of personalized approaches on the health care system and beyond. These studies will guide policy makers on the most effective use of our health care dollars and help health care providers to better use existing resources.

Even with our four hospitals, five research institutes and four foundations (The Princess Margaret Cancer Foundation, Toronto General & Western Hospital Foundation, Toronto Rehab Foundation, Arthritis Research Foundation), UHN cannot progress fast enough on our own to meet our lofty goals. Fortunately, we are helped enormously by our partnership with the University of Toronto and the other research hospitals in the Toronto Academic Health Science Network. Working with these colleagues and others in Canada and around the world, UHN researchers are improving health care at multiple levels by making medicine personal.
Depressive disorders exert huge tolls on society through health care-related costs and lost productivity. Moreover, it is very difficult to predict which treatments will benefit which patients. In fact, very little is known about why some individuals respond well to certain treatments, while others do not. To address this issue, Dr. Jonathan Downar investigated whether individual patient response to repetitive transcranial magnetic stimulation (rTMS) could be predicted by imaging the brain using functional magnetic resonance imaging (fMRI). rTMS treatment for depression uses powerful, focused magnetic field pulses to alter activity within emotion-regulating brain regions.

Brain maps were created for 25 patients before and after rTMS treatment. About half the patients showed a positive response to treatment, while the other half had little improvement. After analyzing the fMRI images, Dr. Downar’s team found that patients that responded well to rTMS had high connectivity within specific circuits in the frontal lobes of the brain. These regions have been previously linked to depression and, on a functional level, are involved in self-regulation of thoughts, feelings and behaviour.

This study provides important new insights into the underlying neurobiological mechanisms that indicate which individuals may respond better to rTMS treatment and brings researchers one step closer to better customizing rTMS for different patients.

Measuring brain connectivity could be used to ensure that individuals are provided with therapies that benefit them the most.

Salomons TV et al. Neuropsychopharmacology 2014 Jan. Supported by Ontario Brain Institute, Canadian Biomarker Integration Network for Depression, Buchan Family Foundation and Toronto General & Western Hospital Foundation.
The dorsal medial prefrontal cortex (dmPFC) and its nearby neural networks are believed to have a central role in regulating emotion and the pathophysiology of major depression.
Making Hepatitis C History
Tailoring a cure to each patient’s infection

Over 180 million people worldwide are infected with the hepatitis C virus (HCV). The virus causes progressive damage to the liver that can lead to liver failure or liver cancer. Traditionally, HCV infections are treated with a combination of medications for up to a year that can cause serious side effects yet have relatively low cure rates. A person’s response to these medications varies and depends on age, race, the strain of virus, the amount of virus in the blood and the extent of liver damage.

In the past two years, significant progress has been made in the fight against HCV; researchers have identified several drug combinations that are highly effective at curing HCV infections. One of these drug combinations was evaluated in a study led by Dr. Jordan Feld.

The study enrolled over 600 patients who had never been treated previously and were infected with genotype 1 HCV, the most common strain of the virus. Participants received either the new therapeutic regimen or a placebo—pills containing no medicine—for 12 weeks. Overall, 96% of patients treated with the new regimen were cured of their infection and the pills were tolerated well with only mild side effects.

HCV leads to more years of life lost than any other infectious disease in Ontario and is the most common cause for liver transplantation. With this new treatment regimen and others in development showing extremely high cure rates with relatively few side effects, eliminating HCV infection from Canada is now possible.

Representative heat map of Canada showing total HCV cases per province (red >100,000; orange >25,000; green <1,000; data from Public Health Agency of Canada, 2007). The new therapeutic regimen, represented by the blue pill, could help eliminate the virus.
Cancers arise due to spontaneous changes in DNA, which accumulate over time and cause unrestricted cell growth. The accumulation of these changes makes it challenging to ascertain which ones initiated the cancer.

To bypass this problem, researchers normally introduce DNA errors into cells and then use the cells as a tool for identifying cancer-causing genes. However, this has only been successfully achieved using cells from zebrafish and mice. Recent efforts by Dr. Rama Khokha’s laboratory have provided a powerful new method to address this gap. Using several cutting-edge genomic techniques, they successfully introduced traceable genome-wide DNA errors into normal human cells.

The team used a new combination of retroviruses and short DNA sequences to insert DNA at random sites across the genome. This rapidly transformed the normal cells into tumour cells with DNA alterations comparable to those found in many human cancers.

Detailed genomic analyses of these newly generated tumours yielded 80 candidate genes with the potential to drive cancer growth. Importantly, one of the genes was defective in at least one in ten of the tumours that were generated. This gene is known to be involved in regulating DNA organization and has previously been shown to suppress cell growth.

As Dr. Khokha explains, “Our results reveal the potential for using viruses and transposons to rapidly uncover new cancer-causing targets. This will accelerate the global effort to decipher the genes, pathways and networks that drive cancer development and growth.”
Research Feature: Cancer Genetics
The Road to Recovery

Customizing stroke rehabilitation one step at a time

For those recovering from a stroke, walking using each side of the body equally (i.e., symmetrically) can be a challenge. This ‘gait asymmetry’ is due to impaired movement control on one side of the body, a common stroke-related condition. While a frequent rehabilitation goal is to restore symmetry, there are few studies on how gait asymmetry changes with rehabilitation, making it difficult to know which approach works best in which patient.

To address this, Dr. Kara Patterson followed the individual progress of stroke rehabilitation inpatients over two years. Patients showed robust improvements in controlling leg movements, balance and overall mobility. However, over 80% of those with gait asymmetry did not improve in symmetry of either length or timing of steps taken by each side when walking.

People with gait asymmetry could be at risk for further complications, such as loss of bone density in the compromised limb or injury to the functioning limb. This study reveals a need to re-evaluate rehabilitation programs after stroke and place more attention on restoring gait symmetry.

“Although movement control improves after rehabilitation, gait asymmetry persists in stroke patients,” says Dr. Patterson. “This suggests that there are other unknown underlying causes that need to be targeted during rehabilitation and coupled with individualized feedback for each patient. Such customized programs could help patients to correct their gait using approaches that work best for them.”

Tailored rehabilitation solutions could help patients regain the full use of both sides of their body after a stroke.

Patterson KK et al. Neurorehabil Neural Repair. 2014 May. Supported by Heart & Stroke Foundation (Focus on Stroke personnel award), Canadian Stroke Network, Canada Foundation for Innovation, Ontario Innovation Trust, Ministry of Research and Innovation, and Toronto Rehab Foundation.
Photothermal therapy is a promising treatment option in cancer. It works like this: a nanoparticle converts laser light into localized heat that kills nearby cancer cells. Gold nanoparticles are currently used for photothermal therapy, but they are non-biodegradable and have toxicity concerns.

An emerging alternative nanoparticle is the porphysome, which is biodegradable and as effective as gold in transforming laser light into heat energy. An added benefit is that porphysomes may accumulate in tumour tissue, which along with the precision of laser light delivery, ensures that healthy cells remain unharmed. Unlike a metal such as gold, porphysomes can break apart and lose their ability to convert light into heat under sustained high-intensity light.

Dr. Gang Zheng and his team are leading the race to develop porphysomes for cancer therapy. Recently, they created a porphysome loaded with manganese particles. They found that these porphysomes are non-toxic, have excellent photothermal properties and are highly stable (able to maintain their photothermal ability even after prolonged light exposure).

Adding manganese also makes these particles detectable by MRI. This has important implications for image-guided therapy, as porphysomes can be used to simultaneously visualize tumours and apply treatment in real time.

This porphysome is a valuable new tool for personalized therapies that could be used to target a variety of difficult-to-treat cancers.

Cancer cells close to laser-excited porphysomes are killed. Both the location of the laser and the ability of porphysomes to be targeted to tumours allows for the treatment to be tailored to each patient.
Better Health Through Chemistry
Expanding medicinal chemistry at UHN

Basic research provides insights into the mechanisms, pathways and genetics of human diseases. These insights power a new way of developing therapies known as rational drug design: seeking out substances capable of affecting disease pathways to provide therapeutic benefits to patients. Whether it is to block an enzyme in a cancerous tumour or to prevent the build-up of plaques in the brain that cause Alzheimer disease, new drugs hold great promise for the future of health care.

Between the discovery of a disease pathway in the lab and the first clinical trial of a new drug is a critical effort by medicinal chemists to find chemicals that have the desired effect. By strategically designing small molecules to interact with a biomolecular target, medicinal chemists must identify and optimize a compound that is ‘drug-like’—a compound that safely influences the molecular target in the body, while avoiding the creation of toxic side-effects.

UHN’s drug discovery efforts received a major boost last year with the launch of a new medicinal chemistry facility at TWRI headed by Dr. Donald Weaver, a medicinal chemist and neurologist who has led several successful drug design programs. The facility provides computational resources for drug design and modelling; and facilities for the biological screening and preclinical development of candidate drugs.

This new facility complements existing UHN medicinal chemistry capabilities that include the Therapeutics Group at the Campbell Family Institute (led by Dr. Henry Pauls, Director, Medicinal Chemistry) and the Center for Molecular Design and Preformulations (led by Dr. Lakshmi Kotra, Director). These facilities collaborate with UHN researchers to provide the specialized computer simulations, chemical synthesis and detailed analysis needed to develop a new drug. Adding a new dimension to these facilities is UHNShanghai, a foreign enterprise wholly owned by UHN, that synthesizes chemical reagents and pharmaceutical intermediates for use in research and development services worldwide.

Medicinal chemists help transform biological insights into innovations that improve health for Canadians.

Image caption: Compound 1140 (black) represents the pinnacle candidate in the search for a drug to prevent harmful plaques in Alzheimer disease. It was optimized from a pool of representative compounds (coloured) using a structure-based design program (courtesy of Dr. Donald Weaver).
Year in Discovery
A selection of high-impact research at UHN

Earlier Detection of Leukemia
A team of scientists led by Dr. John Dick identified a mutation in the protein known as DNMT3α that is linked to the development of acute myeloid leukemia (AML). AML is a cancer that grows in bone marrow and interferes with the production of normal blood cells. The identification of DNMT3α mutations as a pre-leukemic marker could lead to earlier detection and improved strategies for the treatment of AML. Shlush LI et al. Nature. 2014 Feb.

Improving Quality of Life
The results of a clinical trial led by Dr. Camilla Zimmermann suggest that early palliative care can significantly enhance the quality of life in patients with advanced cancer. Better quality of life, including reduced emotional distress and physical pain, can improve compliance with medical treatments and relationships with caregivers. Patients with cancer typically have a reduced quality of life, which worsens with progression of the disease. Zimmermann C et al. Lancet. 2014 May.

From Drug Discovery to Clinical Testing
A possible anticancer therapy has been discovered by scientists at the Campbell Family Institute. Dr. Tak Mak and his team identified the enzyme PLK4 as a new cancer target. The finding led to the identification of CFI-400945 as a potential anticancer drug. Administration of CFI-400945 inhibited the activity of PLK4 and reduced tumour growth in mice. Clinical testing is now evaluating the drug’s ability to reduce solid tumour growth. Mason JM et al. Cancer Cell. 2014 Aug.

A Better Treatment for HIV
A superior treatment for human immunodeficiency virus (HIV) was discovered. The new drug dolutegravir, along with the drug combination of abacavir and lamivudine, was found to be more effective and had fewer side effects than the currently recommended treatment for HIV. The clinical trial was led by Dr. Sharon Walmsley, who is currently studying the efficacy and safety of this new drug combination over a longer time period. Walmsley SL et al. N Engl J Med. 2013 Nov.

Inflammation in Diabetes
Inflammation mediated by macrophages (a type of blood cell) contributes to the development of type 2 diabetes (T2D). By altering the activity of a subset of nerves, Dr. Minna Woo and her team promoted the anti-inflammatory activity of macrophages, which prevented the onset of T2D in an experimental model. Inducing the anti-inflammatory state of macrophages may represent a powerful new strategy to prevent and treat T2D. Wang L et al. Nat Med. 2014 May.

Dealing with Stress to Prevent Cancer
Blood is sustained by hematopoietic stem cells (HSCs) that survive for long periods of time and are able to self-renew. Because of their longevity, HSCs are exposed to stressful stimuli, like fluctuations in nutrient levels and toxic substances, that can damage cells and make them cancerous. Dr. John Dick and his team recently revealed the cellular mechanism that maintains a healthy HSC pool by clearing individual cells that have been damaged by stress. van Galen P et al. Nature. 2014 June.
Research Advancements
Discoveries to Reality
A selection of UHN commercialization milestones

2013 UHN Inventors of the Year
The recipients of UHN’s Inventor of the Year award are scientists who have demonstrated an outstanding ability to apply biomedical research towards the creation of new, inventive and patient-oriented technologies, products and therapeutics. The 2013 award was presented to two recipients: The Campbell Family Institute’s Drug Development Team (led by Dr. Tak Mak) for the development of multiple new cancer therapeutics; and Dr. Ralph DaCosta for a device that can detect bacterial infections in wounds.

The Campbell Family Team developed multiple new cancer drugs that are in or are nearing clinical trials. The most recent drug, CFI-400945, shows preclinical efficacy in the difficult-to-treat ‘triple negative’ form of breast cancer. Their research has also led to licensing agreements and the founding of several spin-off companies (eg, Miikana, Agios). These discoveries are major contributions to the cancer treatment landscape.

Dr. DaCosta invented a handheld optical imaging device that detects the quantity and distribution of bacteria in wounds. It can deliver results at the point of care, enabling clinicians to make informed decisions in real time. This inexpensive device may also help to revolutionize wound care in developing countries.

UHN transforms innovative research into technologies, products and drugs that reach people worldwide.

Photo caption (L-R): Drs. Ralph DaCosta and Tak Mak.
Medical Device
MyndMove™ is a therapy marketed by MyndTec Inc., a company co-founded by Dr. Milos Popovic. It helps to recover hand and arm motion in patients suffering from paralysis caused by stroke or spinal cord injury. During rehabilitation, a patient actively attempts a movement (e.g., holding a cup) while a trained therapist uses the non-invasive device to stimulate various sets of muscles to create functional movements. This strengthens new neural connections specific to each patient that expedite recovery from paralysis and minimize long-term disability. This year, milestones include: Health Canada medical device licensing approval, a nationwide launch of MyndMove™ and the issuance of its first US patent.

Therapeutic Agent
The research of Drs. John Dick and Jean Wang has revealed new ways to target cancer stem cells. Cancer stem cells are formed when normal stem cells, immature cells found in bone marrow that give rise to all blood cells, develop certain mutations that lead to blood cancers like acute myeloid leukemia. Cancer stem cells are often resistant to conventional therapies. The research findings, licensed to Trillium Therapeutics Inc., will help to develop more effective drugs to target mutations in leukemia. Trillium recently secured $33 million towards their cancer stem cell program based on this research. These funds will help advance new drug studies, drug manufacturing and Phase I clinical trials.

Quality Assurance
Drs. Mohammad Islam, Robert Heaton and David Jaffray have developed IQM, a device that provides an automated ‘final check’ of machines that deliver radiation therapy (pictured above). These machines require vigilant quality testing because each radiation therapy treatment has an individualized plan due to factors that can change even within the same patient (e.g., position). IQM streamlines quality assurance testing to ensure safe and successful delivery of radiation. In turn, this maximizes the time that machines can be used to treat cancer patients (over 50% receive radiation during their treatment). This year, IQM was licensed to iRT, a German start-up company, and was deployed to over 20 clinical testing sites.
Targeting Each Patient’s Tumour
On September 10, 2014, a team of researchers led by Drs. Bradly Wouters and Robert Bristow were awarded $6.6 million over five years from the Terry Fox Foundation. These funds will support research to develop new and more personalized treatments that target the low oxygen levels in tumours—a characteristic that may contribute to a cancer’s ability to resist treatment and spread within a person. Other UHN researchers involved in this project include Drs. David Jaffray, Marianne Koritzinsky, Michael Milosevic and Anthony Fyles.

The announcement was made by Dr. Victor Ling (President and Scientific Director, Terry Fox Research Institute) during a special event held at PM Cancer Centre. According to Dr. Ling, a total of $14.6 million was awarded through the Terry Fox New Frontiers Program to five innovative research projects across Canada—three of which were in Ontario. “Each of the Ontario-based projects that we are funding has the potential to revolutionize care for patients with hard-to-treat or advanced cancers through a personalized approach to treatment,” said Dr. Ling.

Terry Fox Foundation funding will support innovative research programs that will accelerate the growth and realization of personalized medicine treatments.
Clinical Trials
On September 12, 2014, Brain Canada announced that it will provide $10 million to fund a Phase III trial (the FRONTIER trial) to evaluate the effectiveness of NA-1, a promising new drug developed by Dr. Michael Tymianski. To test the drug’s ability to reduce the damage caused by a stroke, paramedics will administer the drug to 518 stroke patients in Toronto, Peel Region and Vancouver starting in January 2015. “NA-1 is the only emergency treatment that can re-open blocked arteries if given within three to four-and-a-half hours of the onset of stroke symptoms,” says Dr. Laurie Morrison, lead researcher on the FRONTIER trial.

Infrastructure
On January 8, 2014, the Canada Foundation for Innovation announced that nine teams led by UHN researchers were awarded $4.8 million through its John R. Evans Leaders Fund program. This investment, with additional contributions from the private sector, the Ontario Ministry of Research and Innovation, and UHN foundations, will help to develop state-of-the-art facilities to advance research focused on arrhythmias (P. Backx), spinal cord injury (M. Fehlings), cancer (D. Jaffray, H. He, T. Pugh), diabetes and obesity (T. Lam), neurodegenerative diseases (D. Weaver), infectious and neurological diseases (L. Kotra) and vision disorders (V. Wallace).

Researchers
This year, five UHN researchers successfully renewed their Tier 1 Canada Research Chairs, including Drs. Tak Mak (Chair in Inflammation Responses and Traumatic Injury), Linda Penn (Chair in Molecular Oncology), Benjamin Neel (Chair in Signal Transduction and Human Disease), Eleanor Fish (Chair in Women’s Health and Immunobiology) and Gordon Keller (Chair in Embryonic Stem Cell Biology). Over the next seven years, these Chairs will provide $7 million to help support the innovative research programs of these world-leading scientists.
UHN Ranked Number One
For the fourth year in a row, UHN was listed as Canada’s top-funded research hospital on the Top 40 Research Hospitals in Canada List 2014, released by RE$EARCH Infosource Inc. The list ranks hospitals across Canada by research funding data. During the 2013 fiscal year, UHN reported $312 million in research expenditures.

caTissueSuite Launch
On December 20, 2013, caTissueSuite was officially launched at UHN. This comprehensive database gives researchers access to information on tissue samples collected and analyzed across UHN’s research labs. This includes clinical data (eg, pathology reports) and patient consent information.

New Global Partnership
The PM Cancer Centre signed a Memorandum of Understanding with India’s Tata Memorial Centre to create a partnership aimed at advancing innovation and delivery of best practices in cancer care, research and education. The centres will pool their knowledge and expertise, and encourage academic collaboration.

UHN’s Vector Facility
The much-anticipated Vector Core Facility was officially launched at the Krembil Discovery Tower this year. This essential resource, which is led by Dr. Jeffrey Medin, will provide researchers with custom-made tools for gene delivery, markers for in vivo cell tracking and next-generation tools to optimize cell therapy applications.

Customizing Medicine
Techna hosted its second annual Symposium focused on the topic of personalized cancer medicine (PCM) and its future potential in health care. Experts from across disciplines and sectors discussed the technologies needed to realize PCM and the challenges ahead for research, development and implementation.

Top Cancer Discovery
Dr. Camilla Zimmermann’s research, which determined the factors that influence the quality of life of individuals caring for patients with advanced cancer, was selected as one of the top discoveries of 2013 by the Canadian Cancer Society. The study suggested that early palliative care would improve the well-being of caregivers.
Research Distinctions
Selected honours bestowed upon UHN researchers

Dr. David Alter
2013 Heart & Stroke Foundation Ontario Mid-Career Investigator Award

Dr. Nigil Haroon
2013 SAA-Jane Bruckel Young Investigator Award, Spondylitis Association of America (SAA)

Dr. Catherine O’Brien
Early Researcher Award, Ontario Ministry of Research and Innovation

Dr. Phyllis Billia
Clinician Scientist Salary Award (Phase 2), Canadian Institutes of Health Research
2014 Young Investigator Award, Basic Science Category, Canadian Cardiovascular Society

Dr. Brian Hodges
2014 ASME Gold Medal Award, Association for the Study of Medical Education (ASME)

Dr. Lillian Siu
Board of Directors, American Association for Cancer Research

Dr. Marcelo Cypel
Early Researcher Award, Ontario Ministry of Research and Innovation

Dr. Murray Krahn
2013 Dr. Jill M. Sanders Award of Excellence in Health Technology Assessment, Canadian Agency for Drugs and Technologies in Health

Dr. Peter St George-Hyslop
2014 Dan David Prize, Dan David Foundation

Dr. Michael Fehlings
Fellow, Royal Society of Canada

Dr. Douglas Lee
2014 Robert E. Beamish Award, Canadian Cardiovascular Society

Dr. Donna Stewart
Member, Order of Canada

Dr. John Dick
Fellow, The Royal Society (UK)

Dr. Tak Mak
2014 Dr. Chew Wei Memorial Prize in Cancer Research, University of British Columbia

Dr. Ian Tannock
Member, Order of Canada

Dr. Tak Mak
2014 Dan David Prize, Dan David Foundation

Dr. Catherine O’Brien
Early Researcher Award, Ontario Ministry of Research and Innovation

Dr. Brian Wilson
Fellow, The Optical Society
2014 Britton Chance Biomedical Optics Award, International Society for Optics and Photonics
UHN Foundations

Arthritis Research Foundation

The Princess Margaret Cancer Foundation

Toronto General & Western Hospital Foundation

Toronto Rehab Foundation
A Day at the Races On October 6, 2013, the Arthritis Research Foundation proudly held the 14th annual Day at the Races, the Foundation’s signature fundraising event in support of arthritis and autoimmune disease research. This event has raised over $1,680,000 for arthritis and related autoimmune disease research.

This year, Honorary Chair Dr. Edward Keystone was recognized for his outstanding research contributions in the areas of rheumatoid arthritis and clinical therapeutics.

Dr. Keystone is committed to overcoming key challenges currently faced by rheumatologists. One of these challenges is the lack of clinical tools that are capable of predicting how individual patients will respond to different medications. This is particularly important because treatments are often administered by trial and error, which can be prohibitively costly and expose patients to harmful side effects. Dr. Keystone’s work addresses this issue through exploring ways to better utilize the existing suite of therapeutic options so that the right treatment is provided at the right time to the right patient.

Dr. Keystone’s research program is also focused on the development of new rheumatoid arthritis therapies that more effectively target the disease. His approach takes full advantage of new, cutting-edge technologies, analytical approaches and computing power. This highly collaborative project represents an unprecedented global effort to pinpoint the genes and protein markers that identify early signs of rheumatoid arthritis, predict disease progression and the optimal therapy for individual patients, as well as inform the development of innovative therapies.

The ultimate success of this research will be to translate findings into innovative strategies that prevent disease onset and drive remission.

Photo caption (L-R): Peter Kircher, Sandy Hawley, Helen Ching-Kircher and Dr. Edward Keystone (photo by Jono & Laynie Co.)
The Princess Margaret Cancer Foundation

Billion Dollar Challenge: Getting Closer
On October 15, 2014, The PM Cancer Foundation celebrated the halfway point in its five-year Billion Dollar Challenge with an event called ‘A Golden Day’. The campaign aims to help revolutionize cancer care by supporting the creation of a new gold standard of personalized cancer medicine. The funds raised are already facilitating PM Cancer Centre’s largest physical research expansion in its history and its most ambitious recruitment drive.

The halfway celebration of the Billion Dollar Challenge was attended by supporters from the Canadian mining industry who donated over $3.2 million—represented by six gold bars. Ian Telfer, Chairman of the Board of Goldcorp Inc., spoke at the event on behalf of the gold mining industry and the thousands of patients treated at the Centre each year. As a patient benefitting from research into more precise and personalized cancer care, he was pleased to make his own generous donation to support research at the PM Cancer Centre.

The PM Cancer Centre is getting closer to realizing its goal of personalized cancer medicine, thanks to new technology and a better understanding of the individual and complex nature of cancer. The IMPACT and COMPACT studies are excellent examples of how the Centre is re-tooling and preparing for a more personalized approach to cancer diagnostics. These studies have already sequenced the DNA of over 2,000 tumours and used this information to direct patients to clinical studies of drugs targeted to their specific type of cancer.

The Billion Dollar Challenge is a partnership between the Foundation and researchers at PM Cancer Centre. At the beginning of the campaign, each group was challenged to raise $500 million over five years. At the halfway point, the groups have raised $576 million.

Photo caption: Canadian gold mining industry leaders (left image) Ian Telfer with RCMP Officers and (right image; L-R) Sean Boyd, President and CEO of Agnico Eagle Mines Limited, with Ian Telfer (photo by Michael Tenaglia).
A New Home for Discovery  Over seven years of planning, fundraising and construction culminated in the celebration of the official opening of the Krembil Discovery Tower on November 20, 2013. At the heart of the celebration was a tribute to the generosity of the Krembil Family.

“Researchers will tell you they don’t lack ideas or pathways to pursue in their labs—they lack only the human and physical resources to do so. That’s what we told Bob and Linda Krembil and family,” said Tennys Hanson, President and CEO of Toronto General & Western Hospital Foundation. The Krembil Family listened and stepped forward with a $30 million lead gift for the building, which was matched with an additional $30 million in private funding. With $60 million in donations secured, UHN was able to attract $29 million in support from the Canada Foundation for Innovation for the Tower.

“The Krembil Discovery Tower is now a reality thanks to the fundraising efforts of our generous donor community who were inspired by the Krembil family’s leadership,” said John Mulvihill, Chair of the UHN Board of Trustees. He also acknowledged Robert Krembil’s volunteer services as a UHN Trustee and son Mark Krembil’s involvement as a Toronto General & Western Hospital Foundation Board Member.

At the celebration, Robert Krembil explained why it was so important to his family to support TWRI. “We have been involved with neuroscience at TWH for several years and have observed the evolving breadth and depth of talent. Our team of scientists and clinicians is exceptionally impressive on many dimensions in comparison to other neuroscience centres around the world. Now we have a facility that is appropriate for such a renowned group.”

Photo caption (L-R): Jacob Krembil, John Mulvihill, Stacey Krembil, Nancy Mulvihill, Linda Krembil, Mark Krembil, Dr. Gerry Halbert, Tootsie Halbert and Robert Krembil (photo by John Loper).
New Outpatient Centre Opens its Doors

Toronto Rehab’s Fred A. Litwin Outpatient Centre is a one-stop destination for patients and families, housing a number of essential services under one roof. The multimillion dollar donation from Fred A. Litwin and the Litwin family is enabling pioneering research and more efficient service for thousands of patients each year.

“Toronto Rehab is a jewel in the health care landscape,” says Fred Litwin, Chief Executive Officer and President of Forum Financial Corporation. “The hospital cares for individuals as they regain their independence and recapture their potential. What could be more rewarding than helping people return to their families, their communities and their lives? I am so proud of my family’s association with this great hospital.”

Through the Fred A. Litwin Outpatient Centre, patients can access the latest therapies being developed by researchers at Toronto Rehab. For example, patients with paralysis resulting from spinal cord injury and stroke can now have their limb function restored through Functional Electric Stimulation (FES)—a therapy that uses electricity to push muscles into action and retrain the central nervous system. MyndMove™, a device created by Dr. Milos Popovic, has produced unprecedented levels of recovery and is the first therapy to produce significant increases in upper arm mobility in patients.

The Litwin family’s transformative gift is enabling world-leading advances that will impact the future of health care. “On May 29, 2014, Toronto Rehab celebrated the establishment and the dedication of the Fred A. Litwin Outpatient Centre,” says Cindy Yelle, President and CEO of Toronto Rehab Foundation. “It was an important moment that will undoubtedly go down in the history of this great organization.”

Photo caption: Fred and Mary Litwin pictured in Toronto Rehab’s Fred A. Litwin Outpatient Centre (photo by William Suarez).
UHN Research Institutes

Princess Margaret Cancer Centre

Techna Institute

Toronto General Research Institute

Toronto Rehabilitation Institute

Toronto Western Research Institute
Princess Margaret Cancer Centre

Research Space 390,672 sq. ft.
External Funding $150,154,247
Publications 1,224
Senior Scientists 45
Scientists 17
Affiliate Scientists 14
Assistant Scientists 3
CCRU 297
Total Researchers 376
Fellows 286
Graduate Students 242
Total Trainees 528
Total Staff 780

Research Council on Oncology (RCO)

Director, PM Cancer Centre; Chair, RCO; Director, Executive Committee Benjamin Neel
Executive Committee Mitsuhiko Ikura, Rama Khokha, Senthil Muthuswamy, Pamela Ohashi, Gary Rodin, Ming-Sound Tsao, Brian Wilson, Bradly Wouters
Chair, Appointments Committee Rama Khokha
Medical Director, Laboratory Medicine Program Sylvia Asa
Medical Director, Cancer Program Mary Gospodarowicz
Head, Radiation Medicine Fei-Fei Liu
Head, Medical Oncology and Hematology Malcolm Moore
Head, CCRU Amit Oza
Chief, Surgical Oncology Jonathan Irish
Executive Director, Research Operations Lisa Alcia
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Research Space 9,730 sq. ft.
External Funding $2,366,677
Publications 249
Core Leads 8
Faculty 3
Affiliated Faculty 39
Total Researchers 50
Fellows 11
Graduate Students 55
Total Trainees 66
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Financials

Core and external research funding in 2013/2014

Total Core Research Funding

$72,802,750

- UHN Foundations: $27,541,361
- Rental Income: $6,756,918
- Other (including ancillary revenues): $22,767,191
- Grant Funding (indirect costs): $8,887,000
- Investment Income: $3,449,330
- Ministry of Health and Long-Term Care: $3,400,950

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Total External Project Funding
$271,581,257
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Trainees, Research Committees: Data is current as of September 1, 2014. The institute trainee counts reflect only those trainees supervised by researchers with a primary appointment at the institute.

Space: Data provided by UHN Research Facilities Planning & Safety and based on space audited by September 30, 2014 across UHN sites. To account for significant transitions in research space at TWRI and PM Cancer Centre during the 2014 calendar year, data is projected to be accurate as of end of December, 2014. Core facilities and Research Support Services spaces are not included in institute space totals.

Financial Data: All figures represent the fiscal year ending March 31, 2014, and include the PM Cancer Centre, TGRI, TRI, TWRI, Techna and Research Operations. Figures have been provided by UHN Research Financial Services. Total funding includes External and Core Funding amounts and is listed within the UHN Research Snapshot on the inside front cover.

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Welcome Message: Dr. Robert Bell was the Chief Executive Officer (CEO) of UHN until May 23, 2014. Ms. Justine Jackson is the acting interim CEO until January 1, 2015.
The hard-copy version of this report was printed on 100% recycled paper, which saved a total of:

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