OICR
Ontario Institute for Cancer Research

RESEARCH DISCOVERY CONNECTIONS

ANNUAL REPORT 2014/2015

About the Ontario Institute for Cancer Research

OICR is an innovative cancer research and development institute dedicated to prevention, early detection, diagnosis and treatment of cancer.

The Institute is an independent, not-for-profit corporation, funded by the Government of Ontario. OICR's research supports more than 1,700 investigators, clinician scientists, research staff and trainees located at its headquarters and in research institutes and academia across the Province of Ontario. OICR has key research efforts underway in small molecules, biologics, stem cells, imaging, genomics, informatics and bio-computing.

OICR's Translational Research Mission

OICR's unique translational research model leverages Ontario's province-wide strengths in discovery research, translational medicine and commercialization to maximize impact on prevention, screening and treatment for cancer patients.

OICR's Translational Research Priorities

- **Therapeutic discovery:** find new ways to treat difficult cancers;
- **Clinical development:** use personalized medicine to optimize patient treatment decisions;
- **Population health:** improve cancer care through innovation in prevention, diagnostics, screening and treatment delivery.

Message from the Minister of Research and Innovation

On behalf of the Government of Ontario, it is my pleasure to congratulate the Ontario Institute for Cancer Research for its outstanding accomplishments over the past year. Thank you for fighting for a better life for people with cancer and their families. The research you support brings hope to people around the world and helps drive Ontario's innovation economy.

OICR's inspired leadership in cancer research under the direction of Dr. Tom Hudson, and the partnerships you forge throughout Ontario's research ecosystem, are critical elements to clearing a path towards significant breakthroughs. And I want to further congratulate the institute for its dedication to helping Ontario-based companies commercialize their cancer treatment innovations.

Among many accomplishments over the past year, OICR supported a new and robust infrastructure for cancer clinical trials through the Canadian Cancer Clinical Trials Network. It also backed the Global Alliance for Genomics and Health towards seamless sharing of genetic data on a global scale. Both were accomplished with a collaborative spirit that makes Ontario stand out in a highly competitive global economy.

OICR research teams worked tirelessly over the past 10 years to move discoveries that prevent, detect and treat cancer from the lab to hospitals, clinics and even into people's homes. More Ontarians are alive today because of your dedication to your work and we are proud to support your efforts.

Please accept my thanks and the appreciation of families from across the province for your ongoing efforts and best wishes for another decade of remarkable progress.

Sincerely,
Reza Moridi
Minister of Research and Innovation

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From the Chair of the Board of Directors and the President and Scientific Director

We are pleased to present the annual report for the Ontario Institute for Cancer Research (OICR) for the year 2014-15.

The Institute has established itself as a leading centre of excellence in translational cancer research, benefitting both cancer patients and the economy of the province of Ontario. The excellence of the Institute's research has been internationally recognized. SCImago Journal & Country Rank for 2014 evaluated research institutions worldwide using criteria that included high-quality publications and technological impact, and the percentage of scientific publication output cited in patents. The indicators are size-independent. OICR ranked 1st among 103 Canadian institutions and 27th among 5,200 institutions worldwide.

Cancer is a much feared disease, diagnosed in almost 74,000 people a year in Ontario with more than eight million succumbing to the disease each year. Cancer costs the province more than $1.5 billion a year in hospital, physician and drug costs as well as in indirect costs from lost productivity and premature death. The Institute's translational research mission includes finding new ways to treat difficult cancers, using personalized medicine to optimize treatments and improve cancer care.

By identifying current challenges in the clinic and developing innovative solutions, OICR in the past year made great progress in areas that will have an impact on patients in the near future to help them live longer, healthier lives. Over the last year, OICR has continued to be instrumental in the creation and leadership of large collaborative initiatives that are provincial, national and international in scope and create synergy between different research teams.

Immunotherapy has become one of the most promising treatment modalities for cancer patients. Dr. John Bell, OICR's Program Director, Immuno- and Bio-therapies, is the leader of BioCanRx, a national initiative that will accelerate the development of immuno-based biotherapeutics from discovery through to clinical trials, including cancer-killing viruses, immune cell therapies and synthetic antibodies. BioCanRx received $25 million over five years from the Government of Canada's Networks of Centres of Excellence.

For breast cancer patients, OICR's researchers are helping to improve the quality of life of patients receiving chemotherapy in the adjuvant setting in developing new interventions to reduce emergency room visits related to treatment toxicity (see page 13). In addition, early research is focusing on improving the accuracy screening for patients with dense breast tissue (see page 12) for whom mammography is often inaccurate.

As far as improving the management of patients with early prostate cancer, one of OICR's clinical priorities, we are pleased to report that Dr. John Bartlett, Program Director, Transformative Pathology, is leading a team of 15 multidisciplinary researchers in British Columbia, Ontario and Quebec in a project called PRONTO, which received a $5 million grant over five years from the Movember Foundation. PRONTO researchers will develop a biomarker to help determine at the time of diagnosis if men need aggressive treatment for their prostate cancer or if less aggressive treatment options can be pursued instead. This has the potential to spare many men the harmful side effects of aggressive treatment while still effectively treating their disease. For more about BioCanRx, PRONTO and other milestones this year at OICR, see pages 8, 9 and 18.

Some of the research will have a significant impact on patients in the longer term. The development of a new drug for patients with a type of lymphoma for which minimal therapeutic options are available could have a major impact (see page 10). OICR has long been dedicated to better understanding the genomic basis of cancer. This year we have made the data generated by projects in the International Cancer Genome Consortium far more accessible to many more researchers by moving much of the data to the cloud (see page 15).

OICR increased its research efforts in pancreatic cancer, providing funding for PanCurX. This is a new initiative to reduce the high fatality rate of pancreatic cancer, one of the most deadly types of cancer. While rates of survival for many types of cancer have increased, those for pancreatic cancer have remained largely unchanged for three decades. PanCurX aims to integrate advances in genomics research, new understanding of cancer biology and the clinical research expertise available at the Princess Margaret Cancer Centre to decide how best to treat patients with the hope to ultimately have an impact on survival rates (see page 16).

An important aspect of the Institute's mandate is to create the next generation of cancer researchers in Ontario. Activities range from outreach to high school students with a tour program and hands-on workshops, to supporting young researchers through co-op placements, funding and mentoring. Four very promising researchers, all of whom were recruited to Ontario from outside of the province, are profiled in this report (see page 20).

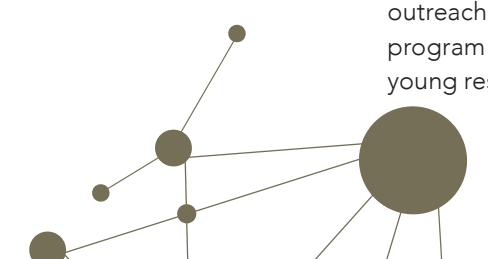
We are looking ahead to the Institute's role in the future as we work with the Ontario cancer research community to develop OICR's strategic plan for the next five years. Last fall the Institute's activities were reviewed by a panel of international scientists which provided valuable feedback on the Institute's current direction. The outcome of the consultation process and the recommendations of the review panel will help us ensure that our research is focused on the areas of highest impact for cancer patients and on benefitting the economy of the province of Ontario.

This past year we welcomed the appointment of Ms. Jeanette Dias D'Souza to our leadership team as Chief Financial Officer. Ms. Dias D'Souza brings extensive financial experience in government and the broader public sector. She oversees OICR's finance and human resources portfolio which includes procurement, grants and awards, and the risk management program.

We thank Dr. Benjamin Neel, who stepped down from the Board of Directors, for his advice and counsel. We welcome Dr. Christopher Paige, Vice-President, Research, University Health Network and Senior Scientist, Princess Margaret Cancer Centre who has re-joined the Board of Directors. His extensive knowledge of the field and his leadership role at one of OICR's biggest collaborators brings a unique and important perspective to our Board.

We acknowledge with gratitude the support of the Government of Ontario through the Ministry of Research and Innovation. This support provides the basis for all of OICR's success and the resulting economic and health benefits for the people of Ontario.

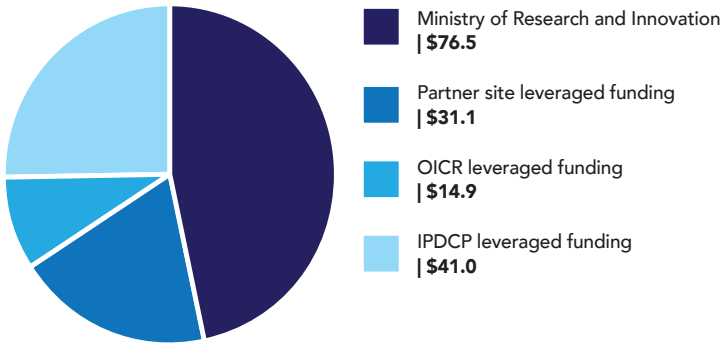
Finally, we would like to thank the staff of the Institute, whose work, dedication, creativity and innovation make OICR the success it is today. Their tireless efforts are fueling the next generation of cancer research and the tools and therapies that will help make cancer a less feared disease for generations to come.



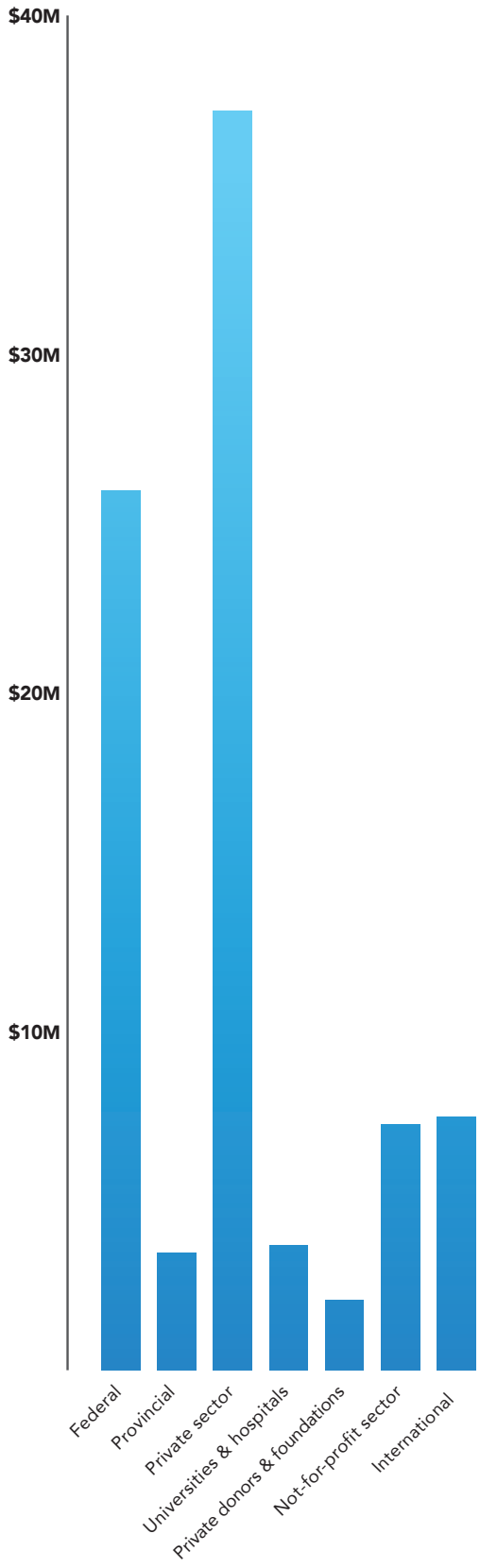
Monitoring Results

SOURCE OF OICR PROJECT FUNDS

(IN MILLIONS OF DOLLARS)

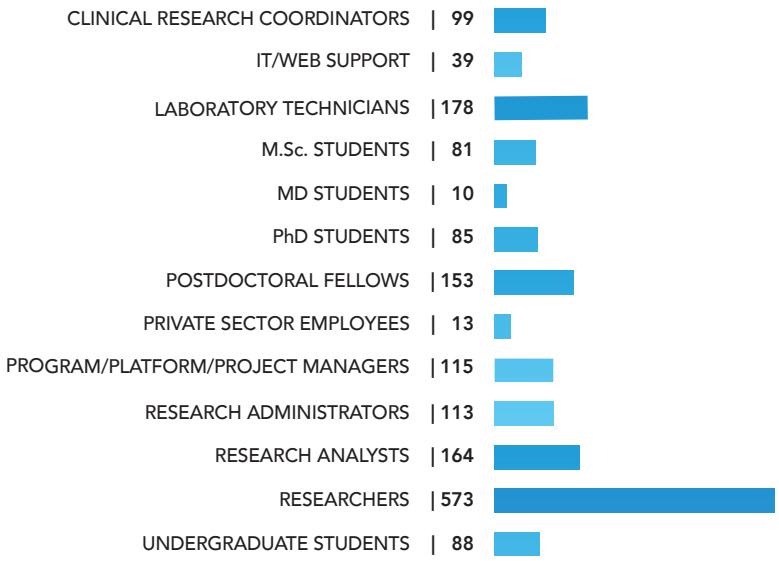


LEVERAGED FUNDS FOR PROJECTS AND AWARDS EXPENDED BY OICR



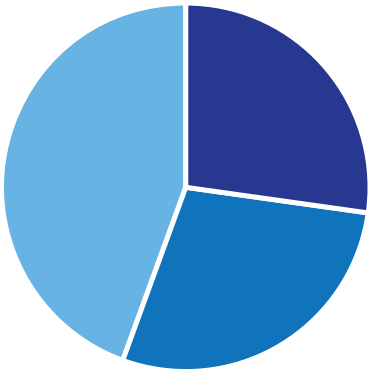
492 PUBLICATIONS IN JOURNALS

1,711 HIGHLY QUALIFIED PERSONNEL WORKING ON FUNDED PROJECTS



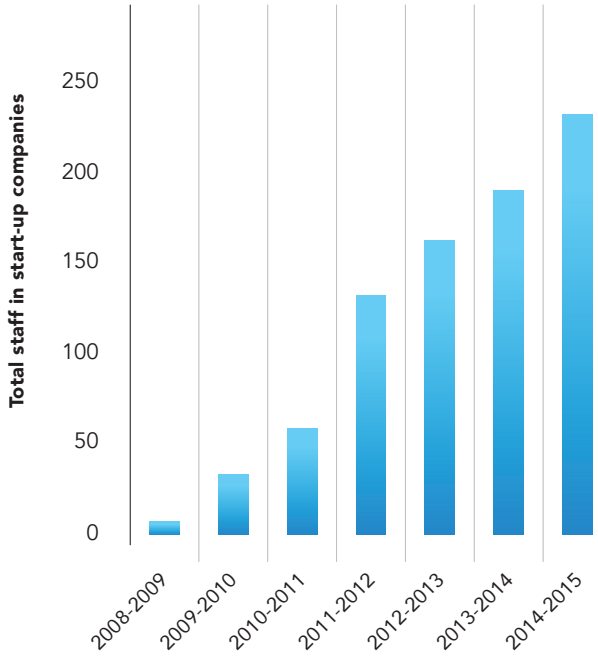
10,259 RESEARCHERS AND TRAINEES AT **180 EDUCATIONAL EVENTS***

* Organized or partially funded by OICR



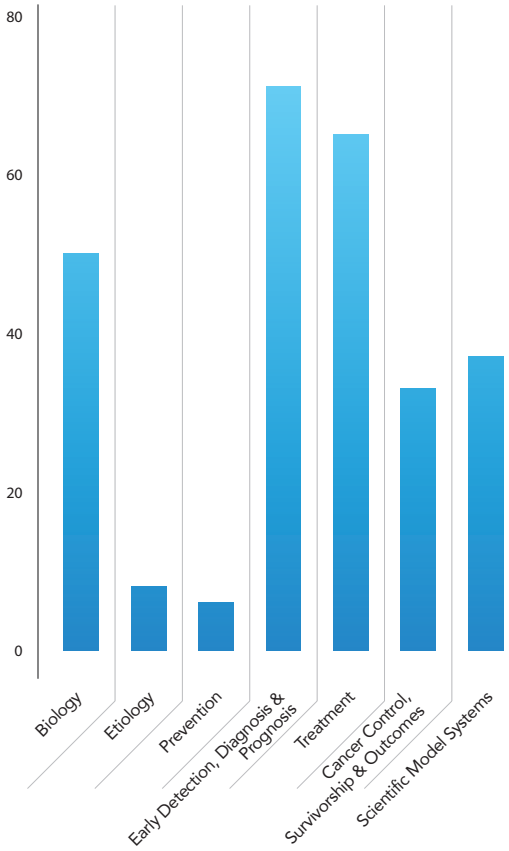
Workshops, courses and seminars
Public events/outreach
Scientific meetings

FACIT FUNDING
CREATING NEW JOBS



These jobs were created as a result of funding by the Fight Against Cancer Innovation Trust (FACIT) of startup companies. OICR created FACIT to manage the commercial development of OICR's and Ontario's oncology assets, attract investment and bring economic benefits to the province.

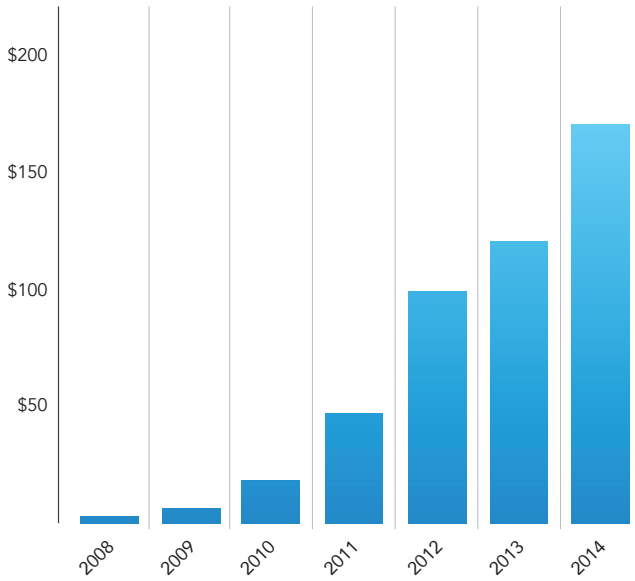
RESEARCH AREAS



NOTE: SOME PROJECTS HAVE AN IMPACT ON MORE THAN ONE RESEARCH AREA

IPDC FUND CUMULATIVE FUNDS LEVERAGED FROM ALL SOURCES

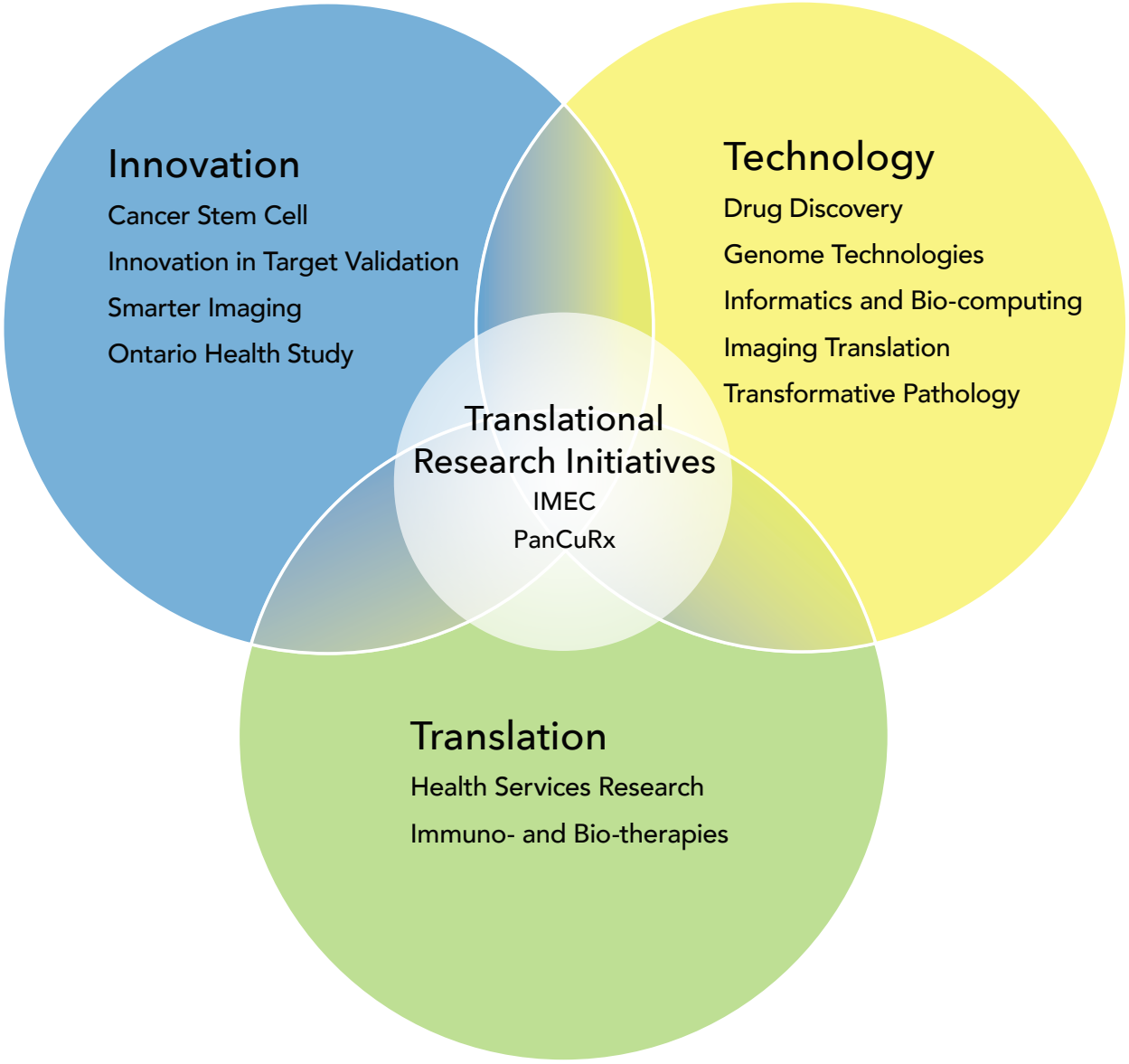
(IN MILLIONS OF DOLLARS)



The IPDC Fund is a program of the Fight Against Cancer Innovation Trust.

Research Framework

Since its launch in 2005, the Ontario Institute for Cancer Research has recruited top scientists from around the world to serve as leaders for its research programs and developed a robust research infrastructure to improve the translation of the latest research discoveries in Ontario into new methods to prevent, diagnose and treat cancer patients.



How OICR programs collaborate
Collaboration among programs, e.g., Translational Research Initiatives, accelerates the flow of research discoveries for testing in the clinic. The Improved Management of Early Cancer (IMEC) is developing new approaches to distinguish aggressive versus non-invasive disease for patients with early breast or prostate cancer. PanCuRx integrates genomics, bio-informatics, biology, imaging and innovative pre-clinical models to develop new treatment approaches for pancreatic ductal adenocarcinoma. For more on PanCuRx and IMEC see pages 16 and 18.

RESEARCH DISCOVERY CONNECTIONS

At the Ontario Institute for Cancer Research we are working together with researchers around the world – across disciplines, across borders and between the lab and the clinic – to ensure the best research discoveries are delivered to patients. In the following pages you can read about a selection of OICR's most promising research projects and see how these discoveries will impact patients in the near future.

A YEAR I

OICR 2014/15 Highlights

It was another exciting year at OICR, with new partnerships formed, collaborations made and milestones achieved. Here are some of the highlights from the past year.

Canada/Israel partnership

In April OICR announced a significant, multi-year commitment by Sylvia M. G. Soyka to launch an international research project focused on identifying molecular drivers associated with metastatic pancreatic cancer. Researchers at OICR, under the direction of Dr. Steven Gallinger, will work with researchers at the Hebrew University of Jerusalem and Sheba Medical Centre in Israel to better understand pancreatic cancer and what drives the disease.

Biocuration

In April hundreds of biocurators, software developers, scientists, clinicians, students from academia and those from government and industry who curate and develop biological databases gathered in Toronto for the 7th International Biocuration Conference, hosted by OICR. The conference provided an open environment for attendees to exchange ideas, many of which play a major role in the advancement of cancer research.

Ontario Health Study Local Study Centres

In July The Ontario Health Study launched its first Local Study Centre in Mississauga, where participants from the community could contribute even further to the Study by providing blood samples and other physical measures. Since then the study has travelled to communities across the province, including Hamilton, London, Ottawa, Peterborough and Windsor, collecting over 2,500 new blood samples to further research into chronic diseases.

Global Alliance

In July the Global Alliance for Genomics and Health released its first application programming interface (API). The new API allows for seamless sharing of genetic data, allowing data producers and consumers of genetic data to better share their information and work together on a global scale.

PRONTO

In July Dr. John Bartlett and his collaborators received a $5 million grant from the Movember foundation for PRONTO, a project that will bring together researchers from across Canada to develop new biomarkers to aid in better managing prostate cancer patients and to better distinguish between aggressive versus non-aggressive disease.

N REVIEW

Stand Up to Cancer

In July, OICR and its international partners launched Stand Up to Cancer Canada, a new Canadian arm of an initiative to build broad support for translational cancer research and produce meaningful advances in cancer treatment. In September, the Stand Up to Cancer telecast was broadcast across North America, raising $109 million in both countries for cancer research. From these funds, Stand Up to Cancer Canada made $22.6 million available shortly after for Canadian researchers to develop new "Dream Teams" focused on breast cancer and cancer stem cells.

10th Anniversary

In September OICR celebrated the 10th anniversary of two of its very first initiatives, the Ontario Cancer Research Ethics Board (OCREB) and the Ontario Tumour Bank (OTB), both of which started as part of OICR's predecessor organization, the Ontario Cancer Research Network. Over the past decade OCREB and OTB have made cancer research in the province more efficient and effective and reinforced the capacity of the province to be a leading jurisdiction in multi-centre cancer trials.

Terry Fox Head Shave Event

On September 8 members of the OICR Terry Fox Great Canadian Hair Do team braved the shave to raise money and awareness for cancer research. At the MaRS Centre in Toronto, participants either had their head shaved, styled or cut to donate for wigs for cancer patients and in the process raised over $10,000 for cancer research.

BioCanRx

In December a new cancer biotherapeutics initiative called BioCanRx was formed in Ottawa with $25 million in federal funding. Built upon the accomplishments of OICR's ORBiT Program under the direction of Dr. John Bell, the national initiative will help to move biotherapeutic discoveries into the clinic.

3CTN

It was a year of rapid growth for the Canadian Cancer Clinical Trials Network (3CTN). The organization announced new funders in January 2015 and one month later announced an extended collaboration with industry partner Janssen, Inc. 3CTN reinforces OICR's commitment to building the required infrastructure for cancer clinical trials.

Centre for the Commercialization of Antibodies and Biologics

In February the Centre for the Commercialization of Antibodies and Biologics was formed, with $15 million in federal funding over five years. The new initiative intensifies efforts to bring next generation drugs to market by enabling the commercialization of biologics. OICR, along with other large institutions in Toronto, is working with the Centre to develop basic research projects into the next generation of biologics.

Canadian Genomics Innovation Network

In March, Genome Canada announced $31 million in funding for the new Canadian Genomics Innovation Network. One of the Network's nodes, The Canadian Data Integration Centre, is led by Drs. Phillip Awadalla, Lincoln Stein and Vincent Ferretti of OICR. It will provide bioinformatics services and software for collecting, harmonizing, analyzing, and publishing data.

Targeting the "undruggable"

BCL6 is a protein involved in the development of diffuse large B-cell lymphoma. Many cancer-causing proteins interact with small molecules that exist naturally inside the cell, making them easier targets for anti-cancer drugs. BCL6 is different. It interacts with large proteins, making it a more challenging target for drug development. OICR's Drug Discovery team has identified and optimized new small molecule inhibitors that target BCL6 and, if successful, their effort could lay the groundwork for other similar types of treatment.

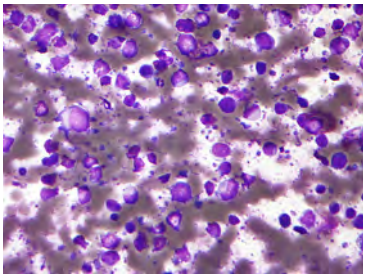
BCL6 is a transcription factor, which is a protein that regulates the flow (or transcription) of genetic information from DNA to messenger RNA. In B-cell lymphoma, BCL6 levels are abnormally high, disrupting the production of proteins that would normally inhibit cell growth. While transcription factors like BCL6 have long been recognized as important drivers of cancer cell growth, they have historically been considered "undruggable."

"In medicinal chemistry, we look for proteins with well defined pockets where a small molecule can bind, resulting in inhibition of protein function," says Dr. Methvin Isaac, Principal Research Scientist and Group Leader, Medicinal Chemistry at OICR.

Dr. Gil Privé, at the University Health Network's Princess Margaret Cancer Centre, has been working on BCL6 for over 15 years. His research expertise in structural biology has led to a better understanding of this protein's architecture, and he was convinced it could be a target for drug discovery. About four years ago, Privé brought his work to the Drug Discovery team at OICR. Together they are developing small molecule drugs that will bind and inhibit the BCL6 protein, blocking uncontrolled B-cell growth and cancer progression.

Initially Dr. Gennady Poda, a computational chemist on the team, performed a virtual screen with over 5.2 million compounds on a computer model of the structure to see which compounds fit best into the BCL6 pocket. Subsequently the best compounds were tested in biology screens, resulting in the identification of weak inhibitors. The accuracy of the computer predictions were soon confirmed

Computational chemistry a branch of chemistry that uses computer simulation to assist in solving chemical problems.



About diffuse large B-cell lymphoma

Diffuse large B-cell lymphoma is a highly aggressive form of non-Hodgkin's lymphoma that constitutes to about 40 per cent of all lymphoma diagnoses. It is a cancer of B cells, a type of white blood cell responsible for producing antibodies. The current standard treatments are chemotherapy and monoclonal antibodies, and while it cures half of all patients, it comes with severe side effects. For the other half of patients, there is currently no effective treatment, underscoring the unmet medical need.

by the experimental determination of 3D structures of the complexes. Next, biologists on the team began developing the testing process to allow the optimization of the initial inhibitors and to better define the biology of BCL6 in preclinical cancer models. The team has now succeeded in producing the first known potent BCL6 small molecule inhibitors that can be tested in animal models. This accomplishment has generated significant interest from the private sector and the team hopes to leverage a potential partnership to accelerate development.

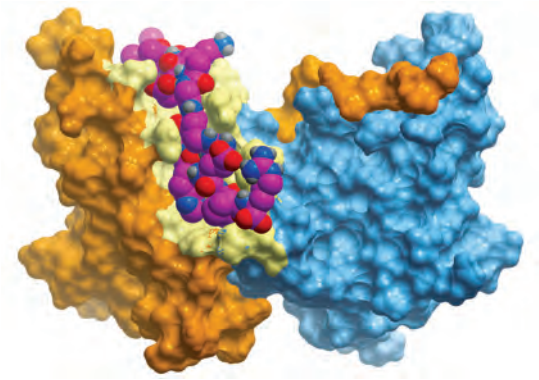
"We're hitting a novel type of biology that really hasn't been targeted with small molecules before"

This success is due to a strong interdisciplinary effort involving biology, medicinal, computational and analytical chemistry within the Drug Discovery team at OICR and the structural biology expertise of Privé's lab.

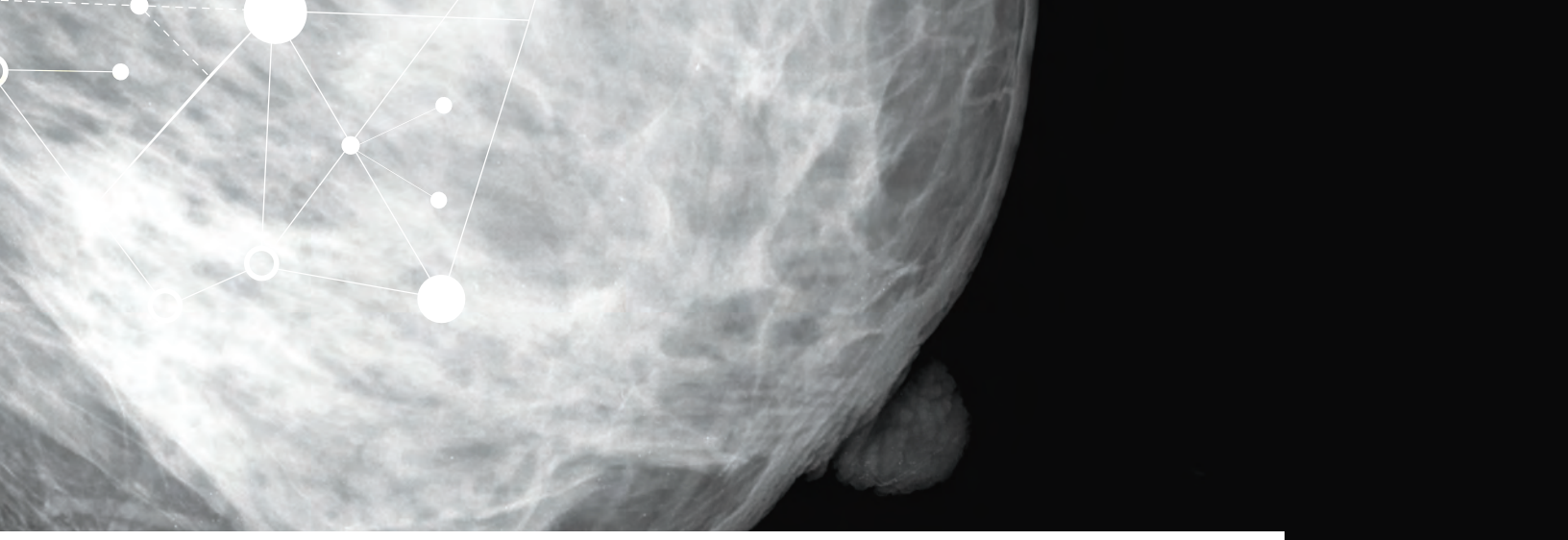
The team hopes the project will open the door to developing a new family of drugs based on other transcription factors beyond BCL6. "We're hitting a novel type of biology that really hasn't been targeted with small molecules before," says Isaac. "If this work is successful it could have implications far beyond one type of cancer."

Dr. Rima Al-awar, Director of the Drug Discovery Program says that while the project is a difficult one, it is very much in line with the Program's goals. "Part of our mandate is to go after those more innovative, more challenging approaches that might otherwise be ignored," she says. "There's some level of risk involved because this is a new area, but there's also a high level of potential reward, both scientifically and clinically, in proving this can be done."

Privé is thrilled to see his many years of basic research moving closer to patients. "Without the involvement of the Drug Discovery group at OICR," he says, "this would have remained an academic project and would never have had the opportunity to be translated into something with potential benefit for patients."



The virtual screen took place inside a computer, where 5.2 million compounds were screened to see which compounds best fit the BCL6 pocket. The process took 31 days on 100 computer cores running simultaneously.



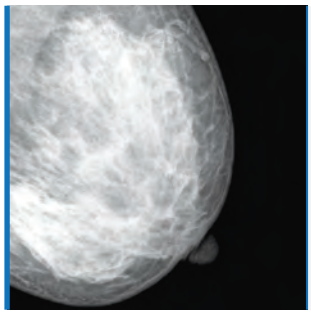
Better screening for dense breast tissue

Having dense breast tissue has been linked with a greater breast cancer risk. For women with breast dense tissue, however, it can be difficult to get a clear diagnosis through one of the most common methods – mammography. This is because dense breast tissue can obscure tumours on mammograms leading to some cancers being missed and dense tissue sometimes mistaken for tumours.

Dr. James Mainprize, a researcher at Sunnybrook Research Institute, and his collaborators are tackling this challenge. "Tumours and dense breast tissue both show up as complicated white masses on mammograms making them hard to interpret and creating a bit of a 'Where's Waldo' dilemma for radiologists," explains Mainprize. "We are developing a method to determine for which women mammography is a good imaging method and which should be evaluated using an alternative modality."

To make this determination the researchers developed a way to assess the "masking index" created by dense breast tissue and predict cases where the chances of properly detecting a tumour were low. Those patients who present with a high masking index could then be redirected to an alternative screening method such as MRI.

Mainprize is now working to incorporate the use of the masking index into the clinical workflow. "Putting this into practice will be beneficial in two ways," says Mainprize. "Cancers within dense breast tissue will be found and treated earlier, boosting chances of a positive outcome. Also, there will be fewer cases where dense breast tissue is mistaken for cancer, resulting in a reduction of recall exams which will reduce anxiety and lower costs to the healthcare system."



Women with more non-fatty tissue in their breasts are said to have dense breast tissue. While research has shown the dense breasts can be six times more likely to develop cancer, early screening can lead to improved and more accurate early diagnosis for women.

Helping patients avoid the emergency department

When dealing with the side effects of chemotherapy, patients are sometimes left with no other option but to go to the emergency department at their local hospital. For several years, Dr. Monika Krzyzanowska and her collaborators have been using administrative health data to better understand the reasons behind these visits and develop strategies to prevent them in the first place.

Krzyzanowska and her team analyzed the administrative data of a group of more than 8,000 women receiving adjuvant chemotherapy for breast cancer. They found that 44 per cent of these women had at least one emergency department visit "Most of these visits didn't result in hospitalization, meaning that we could probably manage these side effects beforehand and prevent visits to emergency departments, which are already overcrowded," says Krzyzanowska.

"We could probably manage these side effects beforehand and prevent visits to emergency departments."

To help address this problem the researchers developed a unique program in which a nurse or pharmacist call patients after their treatment to proactively discuss side effects and ways to deal with them. This program is currently being evaluated through a pilot program at two cancer centres in Ontario, the Odette Cancer Centre and the Thunder Bay Regional Cancer Centre.

"Through the pilot project we have seen that these phone calls help patients manage their symptoms early on and can also provide them with emotional support," says Krzyzanowska. "My hope is that the program will provide patients with better care and improve the healthcare system by freeing up emergency department resources to deal with other patients."

The next step in the project is a randomized controlled trial of the model at 20 cancer centres, which will be funded by OICR. This trial will seek to determine the number of emergency department visits prevented by telephone intervention.

Moving new molecular probes into the clinic

New molecular imaging probes have particular promise for cancer treatment, because they allow doctors to easily and safely see how cancer is progressing and how it is responding to treatment. In less than a decade, the Centre for Probe Development and Commercialization (CPDC) in Hamilton has grown into a world leader in developing and manufacturing next generation imaging probes and has attracted significant new investment to Ontario. OICR-supported collaborations have been instrumental in successfully moving these probes out of the laboratory and into the clinic.

Drs. Rosalyn Juergens and Karen Gulenchyn at Hamilton Health Sciences and St. Joseph's Healthcare Hamilton, as part of a collaboration with the CPDC, are developing one such novel probe to detect treatment-resistant cancers and have translated it into a first-in-human study. This probe targets the biomarker IGF-1R, which is expressed by many cancers. The project will help clinicians understand the biology of an individual patient's cancer in real time in a minimally invasive fashion and combines the development of a novel imaging tool with a potential new drug. "Our collaboration with the CPDC inspires imaging research in many areas relevant to numerous cancers," says Juergens. "With the support of OICR, we are creating a real opportunity to improve patient care using both basic and translational research."

The CPDC is also collaborating with University Health Network (UHN), through a joint venture known as CanProbe. The partnership enables clinician scientists to access probes for a range of targets and diseases, including hypoxia and prostate cancer. This initiative links UHN's world-class imaging and cancer research and patient care programs with CPDC's cyclotron, probe production and discovery expertise. Both projects highlight the importance of collaboration to the Centre's success. "Through collaboration, the CPDC has used its core expertise to discover, translate and commercialize new probes that have real potential to help address critical medical issues for patients," says Dr. John Valliant, the CPDC's CEO and a professor at McMaster University. "Linking Ontario's cancer research and care communities with our Centre positions Canada as a global leader in the emerging and exciting field of imaging biomarkers."

"Our collaboration with the CPDC inspires imaging research in many areas relevant to numerous cancers."

The CPDC was launched through support from OICR and McMaster University, leading to significant leveraged funding from the federal government's Centres of Excellence for Commercialization and Research Program and multiple industry partners.

Cancer and the cloud

For most 'The Cloud' is the place where they back up photos from their phones or store documents that they need to access remotely. However, for scientists working in the field of bioinformatics cloud computing has been an absolute game-changer. Information can now be easily shared between research groups and scientists who were previously without access to high performance computing clusters have suddenly become empowered by the capabilities that cloud computing provides. OICR has taken a lead role within the cancer research community to realize the potential of cloud computing.

Nothing speaks more to the importance of cloud computing to OICR's research efforts than its role in the International Cancer Genome Consortium (ICGC). Since 2008 research teams around the world have been working to sequence the genomes of 50 different cancer types. The data produced by the sequencing is sent to the Data Coordination Centre in Toronto where it is made available to qualified researchers to study. However, the size of the datasets is staggering. Downloading a dataset to a computer for analysis can take months. In addition, many research groups simply do not have access to the computing power necessary to work with the data.

To overcome these challenges OICR joined the Open Cloud Consortium and is working with a founding member of the Consortium, the University of Chicago, to develop the Cancer Genome Collaboratory. The Collaboratory will allow researchers to perform their research in the cloud, doing away with the need to download the data directly and giving them access to high performance computing clusters. Users will have access to data from both the ICGC and The Cancer Genome Atlas. Data from more than 10,000 human cancer genomes and cloud computing resources will be available.

"We are accelerating our efforts to truly understand cancer at the genomic level."

For Dr. Lincoln Stein, Director of OICR's Informatics and Bio-computing Program, the greatest impact that cloud computing has had is providing more researchers with the data and the tools needed to add to our collective knowledge of cancer. "By liberating the data and giving research groups of all sizes the ability to work with it, we are accelerating our efforts to truly understand cancer at the genomic level," says Stein.

Improving outcomes for one of the deadliest cancers

Pancreatic ductal adenocarcinoma (PDAC) is the most common type of pancreatic cancer and one of the most deadly cancers overall. OICR created the PanCuRx Translational Research Initiative to address this serious problem. Already the group is generating new knowledge about the disease to develop more personalized diagnosis and treatment options for cancer patients.

PanCuRx is one of the world's leading programs in pancreatic cancer that includes clinicians based at the University Health Network's (UHN) Princess Margaret Cancer Centre and Sunnybrook Health Sciences Centre, genomic, informatics and molecular pathology teams at OICR laboratories located at MaRS, and cancer biologists based at UHN's Ontario Cancer Institute. PanCuRx research has three themes: the discovery of new PDAC biology, the building of laboratory and computational models to better connect tumour genotype with phenotype and the application of this knowledge to clinical practice.

Often research groups tend to work in "silos", meaning that each group focuses on its own work and shares its work through publishing when the work is complete. PanCuRx's unique, collaborative design allows teams to pursue research and clinical questions in parallel with tight integration between clinical practice and lab research.

"My job is to really bring the patients closer to the research and vice versa."

Dr. Steven Gallinger, Head of Hepatobiliary/ Pancreatic Surgical Oncology Program at UHN and Mount Sinai Hospital, who leads PanCuRx, says the clinical component will be key to the project's success. Finding better solutions for the pancreatic patients he sees in his clinic has been a personal passion for many years, and he is happy to lead a project that has a strategy to

PANCREATIC CANCERS

PDAC is expected to become the second leading cause of cancer death in North America

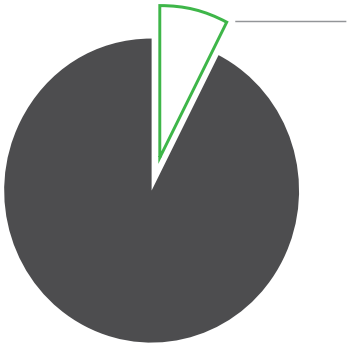
Pancreatic cancer is the **fourth** leading cause of cancer death in Canada

In 2015 approximately

4,600

Canadians will be diagnosed with pancreatic cancer

4,800 will die



Pancreatic cancer currently has the lowest 5 year survival rate of all major cancers

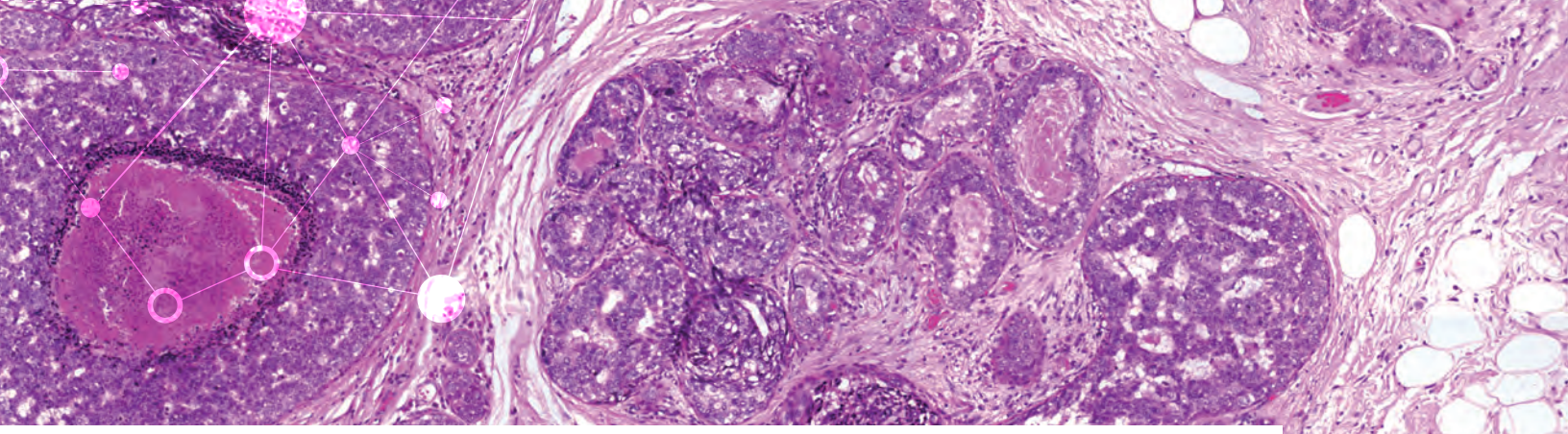
tackle such a difficult disease that it often not given the amount attention and resources it deserves.

"My job is to really bring the patients closer to the research and vice versa. We've really stepped up the clinical component and it is feeding into the research component nicely," he says.

"We hope to turn pancreatic cancer into more of a chronic disease where people live longer with a better quality of life. Many other cancers have achieved that. Now it's time for pancreatic cancer"

The first part of the PanCuRx project is now almost complete, with 150 pancreatic tumour samples collected, sequenced and analyzed. Understanding that only 20 per cent of pancreatic patients have cancers that can be surgically removed, the team is now looking to also study and obtain more samples from the other 80 per cent of patients using a biopsy technique before and while they are undergoing treatment. It is hoped that this information will diversify the data for pancreatic cancer and increase understanding of the disease, while also informing the treatment strategy for patients who participate.

Ultimately, PanCuRx's goal over the next four years is ambitious: to improve the cure rate for pancreatic cancer by a few per cent and improve the one year survival much more, numbers that have not budged significantly in over three decades. "We hope to turn pancreatic cancer into more of a chronic disease where people live longer with a better quality of life," Gallinger says. "Many other cancers have achieved that. Now it's time for pancreatic cancer as well."



New approaches to identifying aggressive cancers

There exists an urgent clinical need for new approaches to distinguish between aggressive or indolent disease in patients with early breast or prostate cancer. To move new technologies into the clinic as soon as possible, OICR launched a translational research initiative called Improved Management of Early Cancer (IMEC).

The multidisciplinary IMEC team is being led by Dr. John Bartlett, Director of the Transformative Pathology Program at OICR, and comprises members of his team as well as researchers from the Institute's Genome Technologies, Health Services Research, Imaging Translation, Informatics and Bio-computing and Smarter Imaging Programs. These scientists are working to develop diagnostic tests based on molecular and genomic testing of clinical samples, as well as new imaging technologies.

One of IMEC's projects, called the "Personalised Risk stratificatiOn for patieNts wiTh prOstate cancer (PRONTO)", received a highly sought-after 2014 Movember Foundation Team Grant. With this funding Bartlett established a team of researchers from across Canada that are working to develop a biomarker that will help clinicians tell if a patient requires aggressive treatment for their prostate cancer or if they can undergo less aggressive treatments instead.

Prostate cancer is responsible for 24 per cent of new male cancer cases in Canada.

"Providing patients and their physicians with this information will allow treatment to be personalized," explains Bartlett. "This means that many men could be spared from the negative side effects of aggressive treatment while ensuring that the disease is being treated effectively."

"Many men could be spared from the negative side effects of aggressive treatment while ensuring that the disease is being treated effectively"

By bringing together experts in multiple fields and focusing on questions of clinical importance, PRONTO and other projects within IMEC are poised to improve care for patients with early breast or prostate cancers.

Better research through collaboration

Translational research requires collaboration. But how do we make that collaboration happen? Drs. David Palma and Aaron Ward are two OICR-affiliated researchers working in London and their unique collaboration has lead to a new technique to better monitor patient outcomes after treatment from novel therapies.

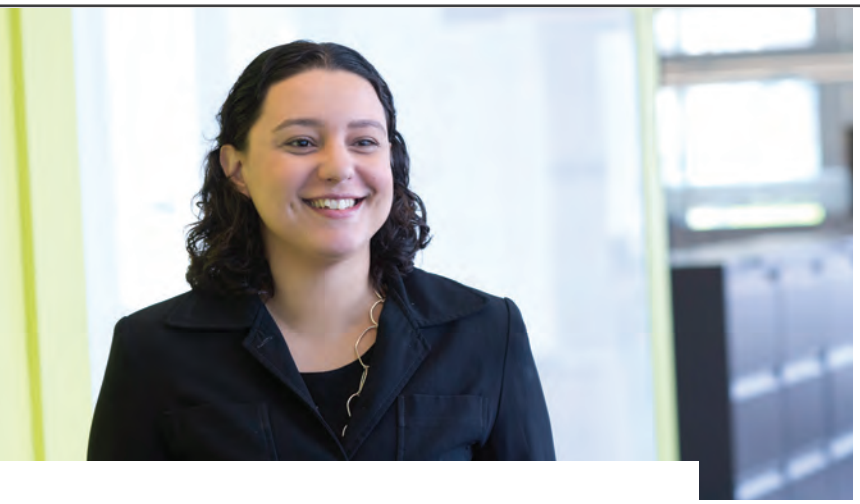
Palma is a clinician-scientist who has been treating patients with a new type of therapy called stereotactic radiation, which uses radiation that is both extremely high-dose and extremely targeted. This is done to better destroy tumour tissue while largely sparing any healthy tissue nearby. Stereotactic radiation is highly effective, but presents a new problem: sometimes tumours appear to be growing instead of shrinking because they develop scar tissue from the treatment, which makes it difficult to assess exactly how patients are responding. "I'd have to tell patients that we have to wait and see what will happen," says Palma, "and that is a very unsatisfactory response."

A big part of the project's success was due to hiring two trainees with very different backgrounds to work in tandem: Dr. Kitty Huang, a radiation oncology resident, and Sarah Mattonen, a PhD candidate in imaging.

Just steps away from Palma's office sits Dr. Aaron Ward, an imaging scientist. During a quick informal visit to Palma's office late one afternoon several years ago, they began discussing the issue. Ward immediately thought a new technology he was working on called texture analysis would help. "I realized then and there that there are a lot of things upstream from the clinic in research labs that clinicians don't really know about," says Palma.

Texture analysis, it turns out, may be an excellent solution to the problem. Humans can look at two images and say they look different, but texture analysis can quantify exactly how those two images differ. Ward and Palma collaborated and found that texture analysis could better differentiate successful treatment from actual progression that requires intervention. The technology is now being validated and developed for clinical application.

Far from seeing the project as a story of chance or coincidence, Palma sees it as a fundamental lesson for successful translational research. "It is crucial to have the opportunity for informal meetings between scientists in different disciplines," he says. "To be truly translational you have to operate outside your comfort zone. The only way to do that is to begin interacting with people who have skill sets that you do not have."



Joema Lima, MD

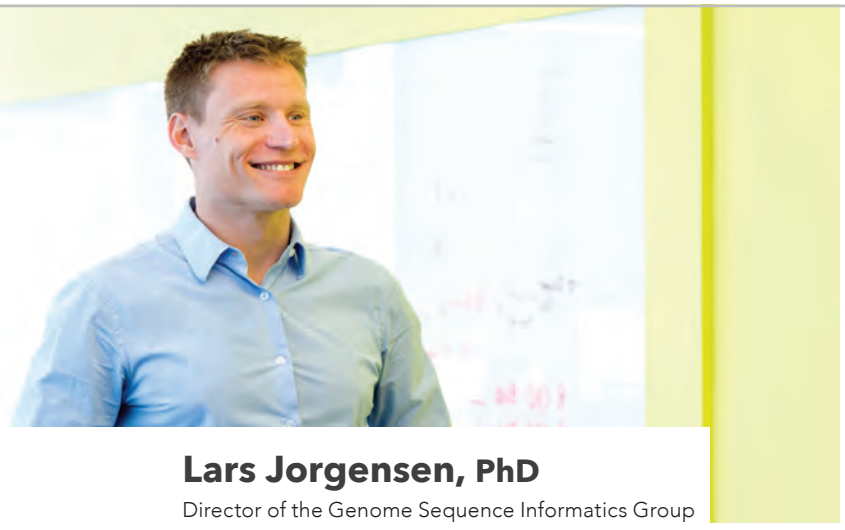
Visiting Researcher
OICR and Sunnybrook Health Sciences Centre

Growing up in a small city in northern Brazil, Joema Lima hoped to become a teacher or to study geography. But then one day in school she learned about Dr. Robert Hooke and his discovery of the cell in 17th century England and she knew she wanted to be a scientist. "It was right there," she says. "That was the moment."

Lima arrived in Toronto this year after spending several years training and working in some of the largest hospitals in Latin America, and then training in several prestigious research hospitals in the United States, including Memorial Sloan Kettering Cancer Center, Johns Hopkins, Brigham and Women's Hospital and the Mayo Clinic.

She is currently working on several breast cancer projects with the Transformative Pathology Program, analyzing tumour samples and providing pathological support, as well as working with the pathology group and Sunnybrook Health Sciences Centre. As an MD by training, she appreciates the ability to combine her own clinical skills with a multidisciplinary approach that combines elements of clinical oncology, radiotherapy and pathology.

Her work here has already given her a much broader understanding of breast cancer's complexity and the impact of breast cancer research. "It is a challenge," she says, "but it is challenge worth doing."



Lars Jorgensen, PhD

Director of the Genome Sequence Informatics Group
OICR

The massive amounts of data produced by genome sequencing have allowed scientists to better understand cancer and how to treat it. However, in order to gain such insights the proper tools are needed to store and analyze this data. Lars Jorgensen works to provide researchers at OICR with these tools so that they can focus on the key scientific aspects of their work.

"To have a major scientific impact you have to do things at scale. In our case that means large amounts of data for large amounts of samples sequenced at OICR," says Jorgensen. "Like any organization we have limited resources, so automation is key to getting the most out of this data."

By creating solutions and tools, Jorgensen and his team are able to handle very large amounts of data. Having foresight is a big part of building these systems. "You need to be able to identify things before they become a problem and always try to be one step ahead," says Jorgensen. "We are going to start seeing even larger amounts and more diverse types of data so building these systems is key to understanding cancer."

Emilie Lalonde

PhD Candidate,
Department of Medical Biophysics, University of Toronto

Emilie Lalonde works at OICR in the Informatics and Bio-computing Program as part of the Canadian Prostate Cancer Genome Network (CPC-GENE) that is working to 'crack' the genetic code of prostate cancer to predict treatment failure for intermediate risk prostate cancers. In her role she applies bioinformatics and machine learning to clinical and genomic data to develop prognostic tests for localized prostate cancer.

"Being part of the Network has given me a chance to work with established researchers from a variety of backgrounds. The multidisciplinary makeup of the team has allowed us to tackle the challenges of prostate cancer from both research and clinical perspectives," says Lalonde. "I loved living in Montreal, but when presented with the opportunity to join CPC-GENE I couldn't say no."

Lalonde and her collaborators recently developed a test, described in a paper published in The Lancet Oncology on which she was lead author, which is the first to combine tumour genomics and oxygen content to predict the biochemical recurrence of prostate cancer following treatment. This test will help physicians fine-tune treatment for patients – preventing the overaggressive treatment of slow-moving prostate cancers and identify those who would benefit from additional treatment.

Wei Zhang, PhD

Postdoctoral Fellow
Lab of Dr. Dev Sidhu at the University of Toronto

Wei Zhang is focused on translational research. That means he works on projects in the lab that will have a direct impact on patients in the clinic.

His work is extremely complex, but could be essential to the development of a whole new line of treatment options for patients with many forms of cancer. He is generating and designing molecules that modulate the signalling process of cells. By doing this, he can help to fix malfunctioning signalling processes and help to keep cancer at bay.

Originally from China, Zhang chose to work in Toronto because it has many unique elements that foster collaboration between disciplines. "Maybe 10 years ago you could work on your own project in isolation, but today you need to collaborate with many different people outside your field in order to succeed."

He finds the complexity of the work very rewarding. "That's the beauty of science. You get to be challenged every day. There's new ideas, new research, new signs. You have difficulties but you conquer them in order to make discoveries."

FINANCIAL STATEMENTS

Independent Auditors' Report

To the Members of the Ontario Institute for Cancer Research

The accompanying summary financial statements, which comprise the summary statement of financial position as at March 31, 2015 and the summary statements of operations and changes in net assets and cash flows for the year then ended, are derived from the audited financial statements of the Ontario Institute for Cancer Research as at and for the year ended March 31, 2015. We expressed an unqualified audit opinion on those financial statements in our auditors' report dated June 25, 2015.

The summary financial statements do not contain all the disclosures required by Canadian accounting standards for not-for-profit organizations applied in the preparation of the audited financial statements of the Ontario Institute for Cancer Research. Reading the summary financial statements, therefore, is not a substitute for reading the audited financial statements of the Ontario Institute for Cancer Research.

Management's responsibility for the summarized financial statements
Management is responsible for the preparation of the summary financial statements in accordance with Canadian accounting standards for not-for-profit organizations.

Auditors' responsibility
Our responsibility is to express an opinion on the summary financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standards 810, "Engagements to Report on Summary Financial Statements".

Opinion
In our opinion, the summary financial statements derived from the audited financial statements of the Ontario Institute for Cancer Research as at March 31, 2015 and for the year then ended are a fair summary of those financial statements in accordance with Canadian accounting standards for not-for-profit organizations.

Ernst & Young LLP

Chartered Professional Accountants
Licenced Public Accountants
Toronto, Canada,
June 25, 2015

A copy of the complete audited financial statements is available upon request.

Statement of Financial Position

Excerpt from the audited financial statements

As at March 31	2015	2014
Assets		
Current		
Cash	$ 12,351,600	$ 11,960,910
Restricted cash and cash equivalents	4,967,823	4,909,861
Accounts receivable	5,780,829	5,201,041
Supplies	331,550	519,140
Prepaid expenses	2,243,476	2,062,204
Current portion of deferred lease expense	72,830	124,848
Total Current Assets	25,748,108	24,778,004
Long-term portion of prepaid expenses	1,309,772	1,171,379
Deferred lease expense	—	72,830
Capital assets, net	27,509,720	34,291,904
Note receivable	300,927	378,274
Fight Against Cancer Innovation Trust	3,945,318	—
	$ 58,813,845	$ 60,692,391
Liabilities and Net Assets		
Liabilities		
Current		
Accounts payable and accrued liabilities	$ 9,303,775	$ 9,324,479
Unearned rental revenue	—	94,179
Term loan	310,000	390,000
Total current liabilities	9,613,775	9,808,658
Deferred contributions	13,225,467	12,245,748
Deferred capital contributions	27,509,720	34,291,904
	50,348,962	56,346,310
Net Assets	8,464,883	4,346,081
	$ 58,813,845	$ 60,692,391

Statement of Operations and Changes in Net Assets

Excerpt from the audited financial statements

Year ended March 31	Cancer Research Program 2015	External Grants Program 2015	2015	2014
Revenue				
Grant from Ministry of Research and Innovation	$ 82,040,463	—	$ 82,040,463	$ 81,408,185
Other grants	1,042,541	13,528,352	14,570,893	12,019,683
Rent	1,253,677	—	1,253,677	1,251,849
Fees, workshops and other income	293,984	—	293,984	557,498
Equity income in Fight Against Cancer Innovation Trust	3,945,318	—	3,945,318	—
	$ 88,575,983	$ 13,528,352	$ 102,104,335	$ 95,237,215
Expenses				
Investigator and research support	$ 37,289,952	$ 5,257,169	$ 42,547,121	$ 38,793,060
Salaries and benefits	24,527,867	4,412,847	28,940,714	30,825,729
Amortization of capital assets	7,614,218	1,800,375	9,414,593	8,657,019
Rent, utilities, taxes and building maintenance	8,990,921	—	8,990,921	6,393,497
Office and general	3,575,633	822,607	4,398,240	4,316,753
Contracted services	741,226	811,609	1,552,835	3,277,935
Information system support	1,096,227	295,293	1,391,520	1,431,044
Workshops and conferences	273,311	78,253	351,564	286,510
Marketing and communications	222,967	47,987	270,954	323,592
Professional fees	124,859	2,212	127,071	527,806
	$ 84,457,181	$ 13,528,352	$ 97,985,533	$ 94,832,945
Excess of revenue over expenses for the year	4,118,802	—	4,118,802	404,270
Net assets, beginning of year	4,346,081	—	4,346,081	3,941,811
Net assets, end of year	$ 8,464,883	—	$ 8,464,883	$ 4,346,081

Statement of Cash Flows

Excerpt from the audited financial statements

Year ended March 31	2015	2014
Operating Activities		
Excess if revenue over expenses for the year	$ 4,118,802	$ 404,270
Add (deduct) items not involving cash		
Amortization of capital assets	9,414,593	8,657,019
Amortization of deferred capital contribution	(9,414,593)	(8,657,019)
Decrease in deferred lease expense	124,848	124,848
Equity income in Fight Against Cancer Innovation Trust	(3,945,318)	—
	$ 298,332	$ 529,118
Changes in non-cash balances related to operations		
Restricted cash and cash equivalents	(57,962)	(59,642)
Accounts receivable	(579,788)	(942,705)
Supplies	187,590	315,360
Prepaid expenses	(319,665)	(219,414)
Accounts payable and accrued liabilities	(20,704)	92,823
Unearned rental revenue	(94,179)	94,179
Deferred contributions	3,612,128	6,230,377
Cash provided by operating activities	$ 3,025,752	$ 6,040,096
Investing Activities		
Purchase of capital assets	(2,523,318)	(18,817,072)
Proceeds on disposal of capital assets	(109,091)	267,332
Repayment of note receivable	77,347	68,328
Cash used in investing activities	$ (2,555,062)	$ (18,481,412)
Financing Activities		
Repayment of term loan	(80,000)	(70,000)
Cash used in financing activities	$ (80,000)	$ (70,000)
Net increase (decrease) in cash during the year	390,690	(12,511,316)
Cash, beginning of year	11,960,910	24,472,226
Cash, end of year	$ 12,351,600	$ 11,960,910

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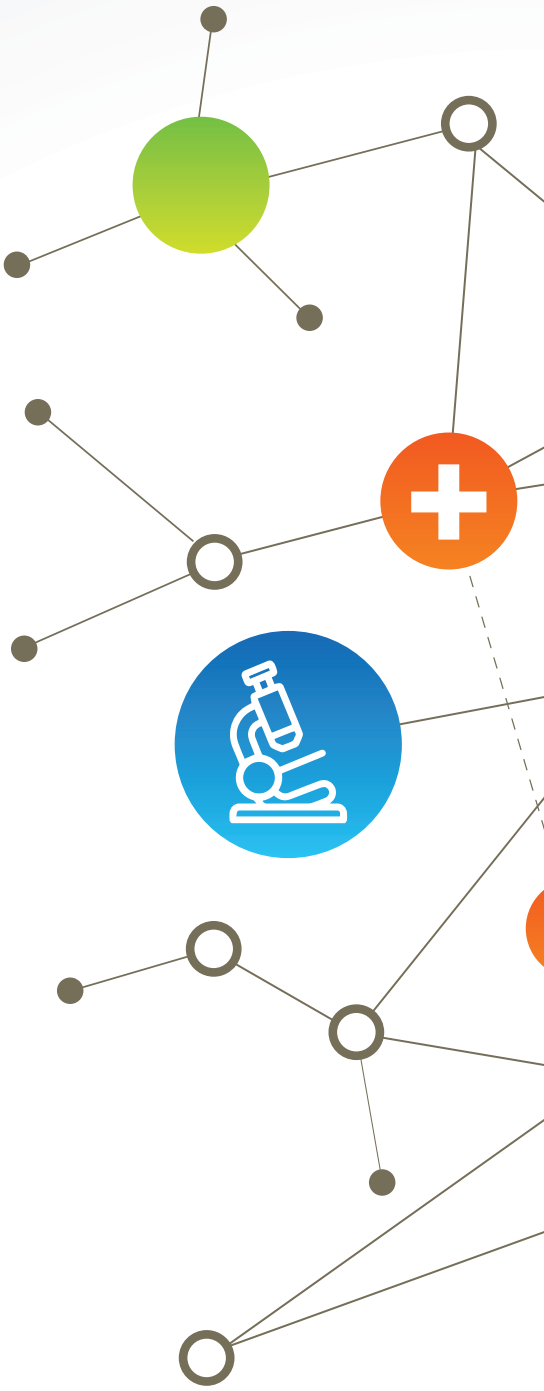

Ontario

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is provided by the Government of Ontario