

# IRIC

INSTITUTE FOR RESEARCH IN IMMUNOLOGY AND CANCER

Research hub and training centre located in  
the heart of the University of Montreal campus

INSTITUTE FOR RESEARCH  
IN IMMUNOLOGY  
AND CANCER



Université   
de Montréal



# VISION

Be a global standard bearer in basic and applied research to vanquish cancer

# THREEFOLD MISSION OF THE IRIC

- Acquiring new knowledge through high-level basic research
- Accelerating the discovery of new therapies
- Training tomorrow's scientists



# FACTORS FOR SUCCESS

## **A multidisciplinary approach and complementary expertise**

28 fundamental, translational and applied research investigators

## **Cutting-edge research environment and facilities**

11 core facilities available to investigators from here and abroad

## **An access to a research commercialization hub, specialized in drug discovery (IRICoR)**

Including more than 40 chemists and biologists working within the medicinal chemistry core facility

## **Close collaborations with the clinical community and with industry**

A network that includes collaborators across the country

## **Innovative teaching methods to train the next generation of scientists**

More than 200 students a year benefiting from unique mentoring

# HISTORY OF THE IRIC

Growth marked by the installation of 11 core facilities, the hiring of new Principal Investigators and the recruitment of the top students and postdoctoral fellows

**JUNE 2003**

Creation of the IRIC under the leadership of Robert Lacroix, Rector at the University of Montreal

**JUNE 2003**

Pierre Chartrand, first Chief Executive Officer and Guy Sauvageau, Scientific Director

**2003-2004**

Initial investigators: Trang Hoang, Sylvain Meloche, Guy Sauvageau, Marc Therrien

**JAN 2005**

New Marcelle-Coutu Pavilion

**OCT. 2011**

Inauguration of the largest Medicinal Chemistry infrastructure in an academic setting in Canada

**FEB. 2008**

Creation of IRICoR, a research maturation hub aimed at commercializing new anticancer therapies

- First Canadian anticancer drug discovery chain in a university setting

**JUNE 2007**

Guy Sauvageau appointed Chief Executive Officer

**MAY 2006**

Launch of the new graduate program in Molecular Biology, Systems Biology option

**JUNE 2013**

Marc Therrien appointed Scientific Director

**AUG. 2014**

Michel Bouvier appointed Chief Executive Officer

**FEB. 2017**

The IRIC is chosen to host the Oncopole, a development and investment hub to accelerate the fight against cancer

# IRIC BY THE NUMBERS

**11** CORE FACILITIES

IRICoR

**28** PRINCIPAL INVESTIGATORS

**200** YOUNG SCIENTISTS IN TRAINING

**~1000** SCIENTIFIC PUBLICATIONS THUS FAR

**500** DEDICATED INDIVIDUALS

**15 M\$** IN ANNUAL FUNDING



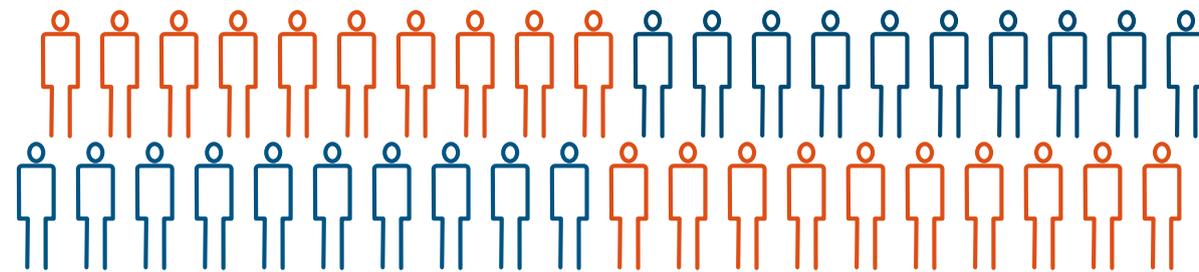


**RESEARCH**

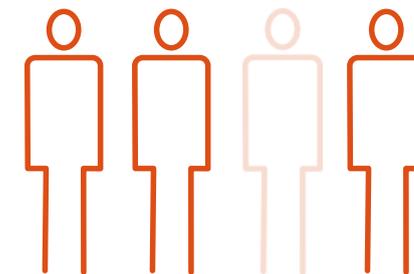


# CANCER IN 2017: THE LEADING CAUSE OF DEATH IN CANADA

It is estimated that in 2017 alone, more than 200,000 new cases will be diagnosed in Canada and that close to 90,000 Canadians will die from cancer (Source: Canadian Cancer Society)



10 OUT OF 2 CANADIANS WILL DEVELOP  
CANCER DURING THEIR LIFETIME



1 OUT OF 4 CANADIANS  
WILL DIE FROM IT



**200,000**  
NEW CASES



**90,000**  
DEATHS

# IMPORTANCE OF RESEARCH

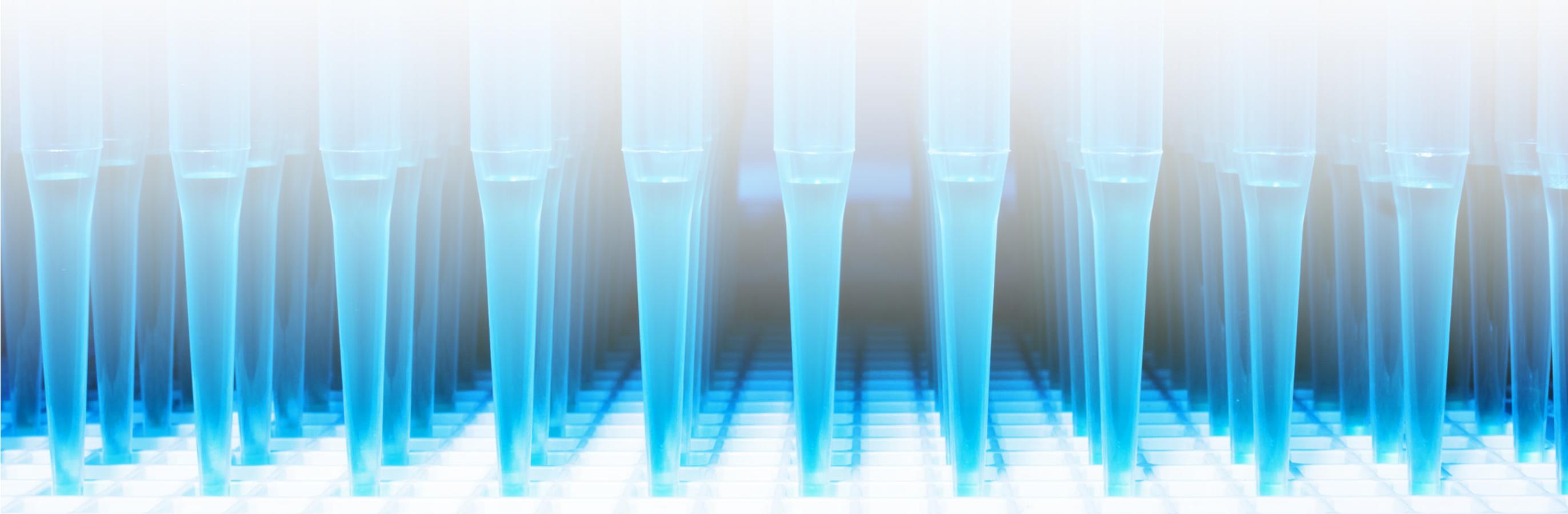
All cancers are the result of genetic alterations in one cell of our body, which results in said cell becoming abnormal, which then leads to a disorderly cell proliferation and tumor formation.

More than 200 different types of cancer can be caused by a number of different mutations producing specific anomalies at the molecular and cellular level.

Traditional therapeutic approaches such as chemotherapy and radiation therapy are nonspecific and are often accompanied by significant adverse side effects.

Investigators are working towards acquiring new knowledge to better understand the mechanisms of cancer and to develop personalized therapeutic approaches.





## PRINCIPAL INVESTIGATORS

The IRIC's investigators form a group of elite scientists with multiple expertise, including physicians, geneticists, cellular and molecular biologists, immunologists, pharmacologists, biochemists and chemists, physicists and computer scientists.

These 28 investigators are from Canada, the United States and Europe. Each investigator was recruited to complement the range of expertise present at the Institute, thus resulting in a multidisciplinary approach to basic research as well as research with a more applied focus, which will have a determining impact on the treatment of the disease.



VINCENT ARCHAMBAULT, PH. D.  
Cell Cycle Regulation



KATHERINE L.B. BORDEN, PH. D.  
Structure and Function of the  
Cell Nucleus



MICHEL BOUVIER, PH. D., FCAHS, FRSC  
Molecular Pharmacology  
Chief Executive Officer



DELPHINE BOUILLY, PH. D.  
Design and Application of  
Electronic Nanobiosensors



SÉBASTIEN CARRÉNO, PH. D.  
Cellular Mechanisms of Morphogenesis  
during Mitosis and Cell Motility  
Director, Academic Affairs



GREGORY EMERY, PH. D.  
Vesicular Trafficking  
and Cell Signalling



LOUIS GABOURY, M.D., PH. D., F.R.C.P.(C),  
F.C.A.P..  
Histology and Molecular Pathology



ÉTIENNE GAGNON, PH. D.  
Cancer Immunobiology



LEA HARRINGTON, PH. D.  
Telomere Length Homeostasis  
and Genomic Instability



TRANG HOANG, PH. D.  
Hematopoiesis and Leukemia



BENJAMIN KWOK, PH. D.  
Chemical Biology of Cell Division



JEAN-CLAUDE LABBÉ, PH. D.  
Cell Division and Differentiation



SÉBASTIEN LEMIEUX, PH. D.

Functional and Structural  
Bioinformatics



JULIE LESSARD, PH. D.

Chromatin structure and  
stem cell biology



SYLVIE MADER, PH. D.

Molecular Targeting in Breast Cancer



FRANÇOIS MAJOR, PH. D.

Ribonucleic Acid Engineering



ANNE MARINIER, PH. D.

Medicinal Chemistry



SYLVAIN MELOCHE, PH. D.

Signalling and Cell Growth



**CLAUDE PERREAULT, M.D., F.R.C.P.(C)**  
Immunobiology



**MARTINE RAYMOND, PH. D.**  
Yeast Molecular Biology



**PHILIPPE P. ROUX, PH. D.**  
Cell Signalling and Proteomics



**GUY SAUVAGEAU, M.D., PH. D., F.R.C.P.(C)**  
Molecular Genetics of Stem Cells



**MATTHEW J. SMITH, PH. D.**  
Signalling and Structural  
Biology of Cancer



**MARC THERRIEN, PH. D.**  
Intracellular Signalling  
Scientific Director



**PIERRE THIBAUT, PH. D.**  
Proteomics and Bioanalytical  
Mass Spectrometry



**MICHAEL TYERS, PH. D., FRSC, FRSE**  
Systems Biology and  
Synthetic Biology



**ALAIN VERREULT, PH. D.**  
Chromosome Biogenesis



**BRIAN WILHELM, PH. D.**  
High-Throughput Genomics



## CELL BIOLOGY

Cancer is caused by the uncontrolled proliferation of abnormal cells. Investigators strive to understand the mechanisms that regulate cell proliferation. They use a great diversity of approaches and experimental models. They study certain important aspects of cell signalling and gene regulation, the mechanics of cell division and cell cycle regulation.



## STEM CELLS AND LEUKEMIAS

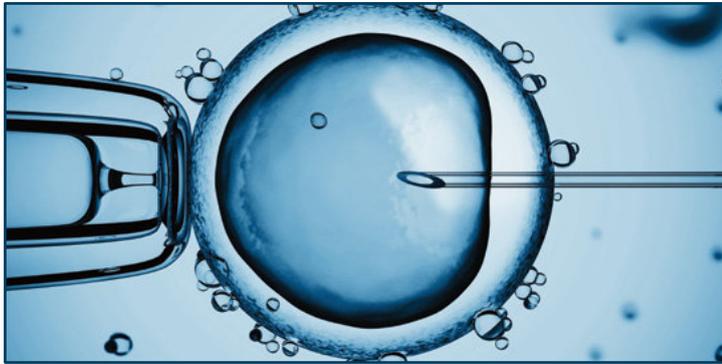
Leukemias are among the cancers that cause the most deaths, and relapses are very frequent. As a result, a number of researchers work in close collaboration with partners from the hospital community to develop therapeutic solutions. Their work has led to several clinical trials currently in progress.



## DIAGNOSTICS TOOLS AND TARGETED THERAPIES

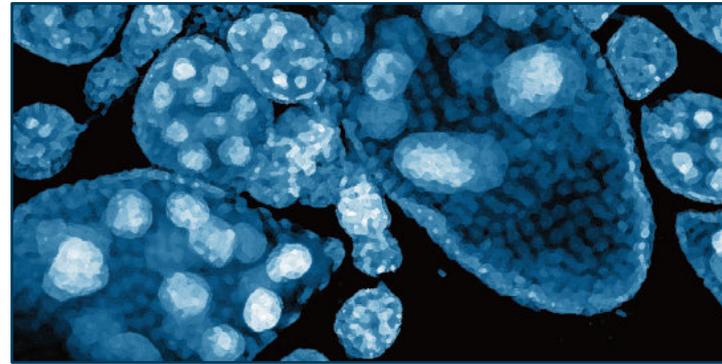
Investigators focus on immunotherapy, ways to overcome the resistance to certain drugs and the development of diagnostic tools. Seven research units combine their expertise to ensure the development of targeted therapies and innovative drugs.

# 11 CORE FACILITIES



## IN VIVO BIOLOGY

Analyses of cancer mechanisms using mouse models



## BIO-IMAGING

Microscopy and image analysis



## BIOINFORMATICS

Complex computer analyses of a large volume of research data



## BIOPHYSICS

Molecular structure and interaction analysis using nuclear magnetic resonance (NMR) spectroscopy



## MEDICINAL CHEMISTRY

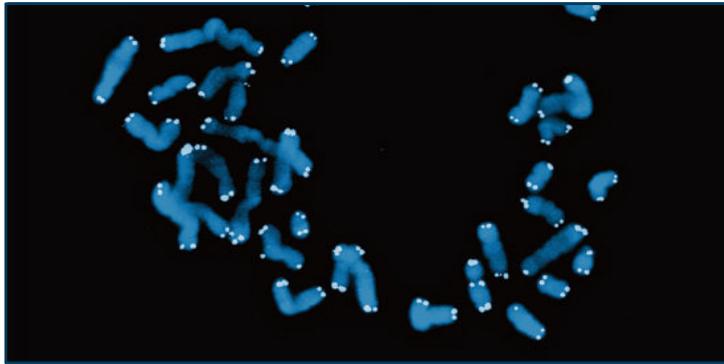
Conception, synthesis and discovery of new drugs



## HIGH-THROUGHPUT SCREENING

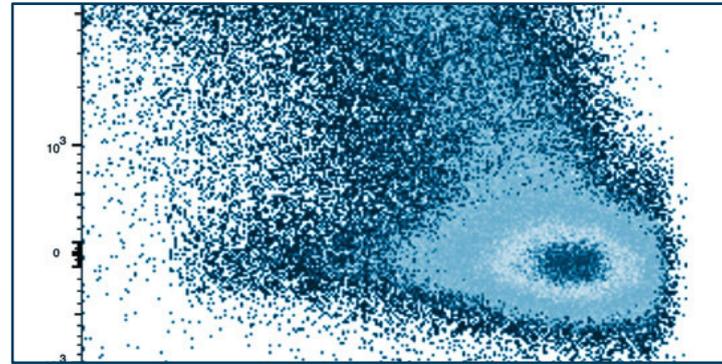
Robotic systems that can measure the effect of hundreds of thousands of molecules

# 11 CORE FACILITIES



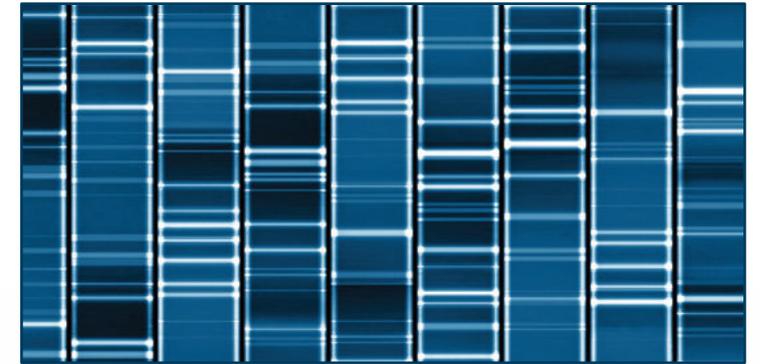
## CYTOGENETICS

Chromosomal structure analysis of normal cells and cancer cells



## FLOW CYTOMETRY

Sorting and analysis of the physical and molecular properties of cells



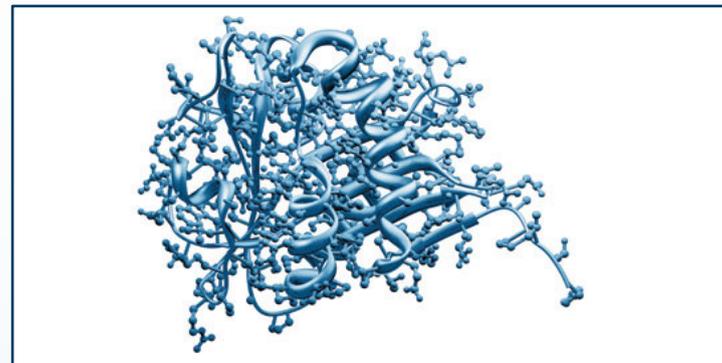
## GENOMICS

DNA extraction, determining the genetic code and measuring gene expression



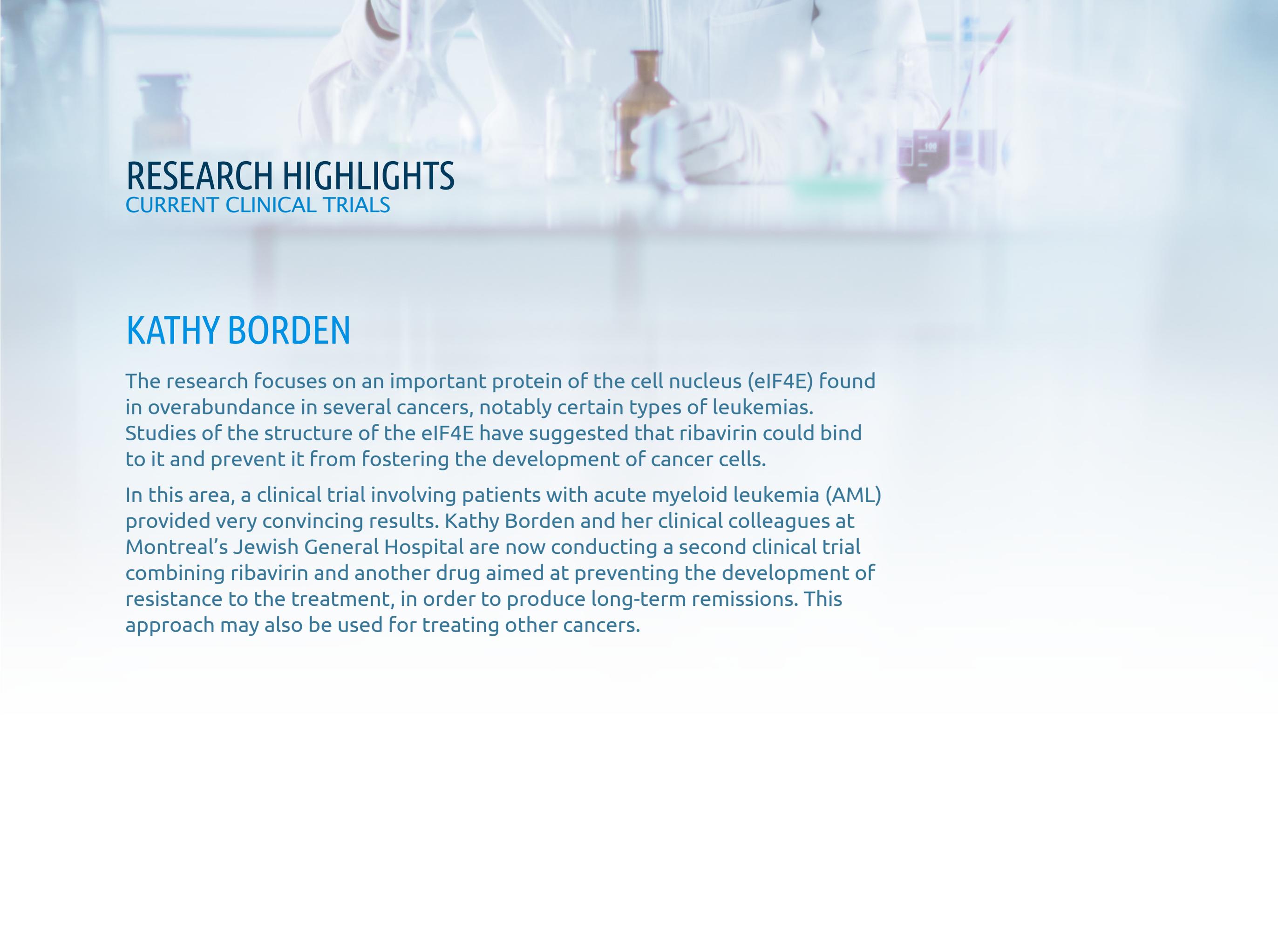
## HISTOLOGY

Preparation and observation of normal or tumor tissue in order to study their pathological properties



## PROTEOMICS

Identification and quantification of proteins based on their chemical composition



## RESEARCH HIGHLIGHTS

### CURRENT CLINICAL TRIALS

## KATHY BORDEN

The research focuses on an important protein of the cell nucleus (eIF4E) found in overabundance in several cancers, notably certain types of leukemias. Studies of the structure of the eIF4E have suggested that ribavirin could bind to it and prevent it from fostering the development of cancer cells.

In this area, a clinical trial involving patients with acute myeloid leukemia (AML) provided very convincing results. Kathy Borden and her clinical colleagues at Montreal's Jewish General Hospital are now conducting a second clinical trial combining ribavirin and another drug aimed at preventing the development of resistance to the treatment, in order to produce long-term remissions. This approach may also be used for treating other cancers.



## RESEARCH HIGHLIGHTS

### CURRENT CLINICAL TRIALS

## CLAUDE PERREAU - PIERRE THIBAU - SÉBASTIEN LEMIEUX

The teams led by Dr. Claude Perreault and Professors Pierre Thibault and Sébastien Lemieux have developed a strategy to identify, for the first time, a wide range of markers present at the surface of leukemic cells that can be recognized by the immune system.

They have developed a therapy that uses these markers to teach T cells from a donor to recognize and destroy the cancer cells of a recipient during a transplant to treat leukemia. This approach, currently in clinical trial at Maisonneuve-Rosemont Hospital, will lead to more effective treatment of leukemias.

On a more long-term basis, it may also be extended to other types of cancer and could even lead to real anticancer vaccines.



## RESEARCH HIGHLIGHTS

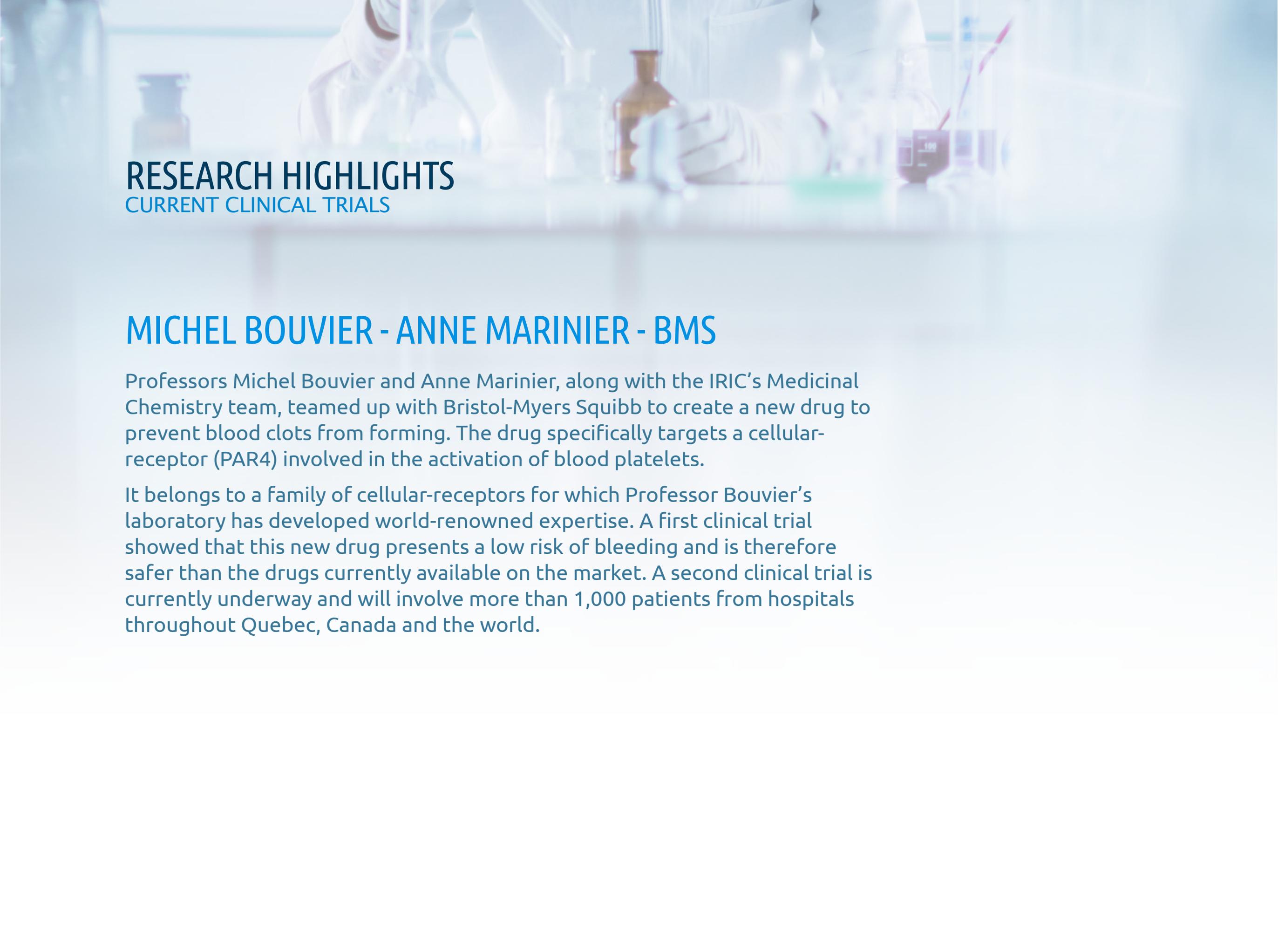
### CURRENT CLINICAL TRIALS

## GUY SAUVAGEAU - ANNE MARINIER

The teams led by Dr. Guy Sauvageau and Professor Anne Marinier developed the UM171 molecule, the first of its kind, which has the capacity to multiply the stem cells present in cord blood. The stem cells from the umbilical cord are used in transplants for the purpose of curing several blood-related illnesses, including leukemia, myeloma and lymphoma.

With the new UM171 molecule, it is possible to multiply cultured stem cells and to produce enough of them to treat adults, notably non-Caucasians who have limited access to grafts because of a lack of donors. This worldwide breakthrough by the IRIC's teams will provide thousands of patients throughout the world with access to a safe stem cell transplant.

A clinical trial currently underway uses stem cells, produced thanks to UM171, at the Centre of Excellence for Cellular Therapy at Maisonneuve-Rosemont Hospital.



## RESEARCH HIGHLIGHTS

### CURRENT CLINICAL TRIALS

## MICHEL BOUVIER - ANNE MARINIER - BMS

Professors Michel Bouvier and Anne Marinier, along with the IRIC's Medicinal Chemistry team, teamed up with Bristol-Myers Squibb to create a new drug to prevent blood clots from forming. The drug specifically targets a cellular-receptor (PAR4) involved in the activation of blood platelets.

It belongs to a family of cellular-receptors for which Professor Bouvier's laboratory has developed world-renowned expertise. A first clinical trial showed that this new drug presents a low risk of bleeding and is therefore safer than the drugs currently available on the market. A second clinical trial is currently underway and will involve more than 1,000 patients from hospitals throughout Quebec, Canada and the world.

# BREAKTHROUGHS IN FUNDAMENTAL RESEARCH (2016-2017)

**Vincent Archambault**

Discovery of a new mechanism that controls the tracking of a key cell division enzyme

**Mike Tyers**

Identification of all genes essential for the survival and proliferation of human cells

**Julie Lessard**

Identification of an epigenetic regulator essential for the production of white blood cells specialized in defending the body against infections

**Marc Therrien**

Thorough understanding of RAF activation, an enzyme involved in several types of cancer

Supporting nearly 15 years of scientific advances since the IRIC was created

# OUR ACHIEVEMENTS IN NEARLY 15 YEARS OF EXISTENCE

7

Departments affiliated with the UdeM

29

Countries hosting associates internationally\*

117

Million dollars in research infrastructure grants

~1000

Research publications in high impact factor scientific journals

\*(United States, Argentina, Brazil, Ireland, United Kingdom, Sweden, Finland, Denmark, Spain, Portugal, France, Luxembourg, Belgium, Netherlands, Switzerland, Germany, Austria, Czech Republic, Italy, Russia, Latvia, Israel, India, China, South Korea, Singapore, Japan, Australia, New Zealand)



**TRAINING**



## THE NEXT GENERATION OF SCIENTISTS

Training the next generation of scientists is very important to the Institute. Therefore, everything is set up for students to receive the best possible training.

They have access to the Institute's cutting-edge facilities, world-class courses, several series of conferences and seminars as well as personalized support.

By choosing to pursue their training at the IRIC, the next generation of scientists receives multidisciplinary training and benefits from the varied expertise of the IRIC's principal investigators. Recruits come from all over the world and actively take part in the advancement of the research projects being conducted at the Institute.



## VARIED PROGRAMS

UDEM PROGRAMS OFFERED AT THE IRIC

Molecular Biology

Biochemistry and Molecular Medicine

Bioinformatics

Chemistry

Informatics

Microbiology and Immunology

Pharmacology

**Systems Biology** — Program unique to the IRIC

Students registered in the M.Sc. program receive an annual research stipend of \$20,000 (minimum).  
Students registered in the Ph.D. program receive an annual research stipend of \$22,500 (minimum).

# SYSTEMS BIOLOGY

Program unique to the IRIC

A program related to the Molecular Biology programs of the UdeM Faculty of Medicine that encompasses:

- Cellular and Molecular Biology
- Immunology
- Biochemistry
- Genetics
- Bioinformatics
- Proteomics
- Drug development
- Clinical aspects of research

SUMMER SCHOOL  
4 MONTHS

LABORATORY ROTATION 1  
4 MONTHS

LABORATORY ROTATION 2  
4 MONTHS

1-YEAR INTENSIVE M.SC.

5-YEAR PH.D.

## SYSTEMS BIOLOGY

# SUMMER SCHOOL IN SYSTEMS BIOLOGY

**SUMMER SCHOOL**  
4 MONTHS

**LABORATORY ROTATION 1**  
4 MONTHS

**LABORATORY ROTATION 2**  
4 MONTHS

The Summer School in Systems Biology offers several theoretical and practical courses covering a wide range of topics related to cancer research. By its rich and dynamic programming, the Summer School will enable you to directly apply the concepts learned in class, develop your autonomy in the laboratory and become familiar with the equipment and scientific resources available at the IRIC. As a result, you will be able to begin or to continue your research activities with confidence.

Within that framework, you will benefit from the expertise and support of an impressive team made up of more than thirty IRIC professors, investigators and professional scientists, from various Université de Montréal departments.

### THEORETICAL COURSES

Cellular and Molecular Biology of Cancer

Molecular Genetics of Eukaryotes

Approaches in Systems Biology

Immuno-oncology (from the lab to the clinic)

### LABORATORY COURSES

Molecular Biology

Genetic Models of Cancer

Bioinformatic Analysis

Functional Genomics

Biochemistry of Proteins

# SYSTEMS BIOLOGY LABORATORY ROTATIONS



## ADVANTAGES OF LABORATORY ROTATIONS

Benefit from the expertise and guidance of two professors-investigators

Broaden your scientific horizon by exploring various aspects of a research topic

Experience the work environment of different research groups

Guide your choice of research topic or research team for the purpose of achieving a Ph.D.

Adopt different experimental approaches in the context of a research topic

Work with various model organisms (e.g., yeast, nematodes, fruit flies, cell lines)

## **UNDERGRADUATE**

Benefit from the IRIC Next Generation Awards program to carry out an internship

Application deadline: January 26, 2018

## **M.SC. AND PH.D.**

Application for the Student Recruitment Event

Deadline: early March

Recruitment event: mid-June

## **M.SC. AND PH.D.**

Application for the Student Recruitment Event

Deadline: none

## UNDERGRADUATE

Benefit from the IRIC Next Generation Awards program to carry out an internship

Application deadline: January 26, 2018

### IRIC NEXT GENERATION AWARDS PROGRAM

Enables Canadian undergraduate students possessing a good university record to receive an award in order to carry out a research internship as part of an IRIC team during the summer.

The value of the awards is \$4,250 for a 12-week internship or \$5,670 for a 16-week internship.

These awards are made possible in large part by all the participants and generous donors contributing to the IRIC Great Challenges Against Cancer event, an annual sports challenge.

**Application deadline:** January 26, 2018

## M.SC. AND PH.D.

### Application for the Student Recruitment Event

Deadline: early March

Recruitment event: mid-June

### APPLICATION TO THE STUDENT RECRUITMENT EVENT

Organized on an annual basis, in June, the purpose of the Student Recruitment Event is to attract and recruit the top prospects in the field of biomedical research.

Its programming and interactive formula make it innovative. The recruiting event provides participants with an opportunity to visit the IRIC, its laboratories and core facilities, to meet the Institute's investigators and students and discuss with them, and take part in one-on-one interviews with the investigators of their choice.

Each year, approximately forty applicants from various countries (Canada, United States, Brazil, France, Germany, Belgium, Switzerland, India, etc.) are selected to take part in three days of recruiting activities in Montreal.

**Application deadline:** March 12, 2018

**Recruitment event:** mid-June

## **M.SC. AND PH.D.**

Application for the Student Recruitment Event

Deadline: none

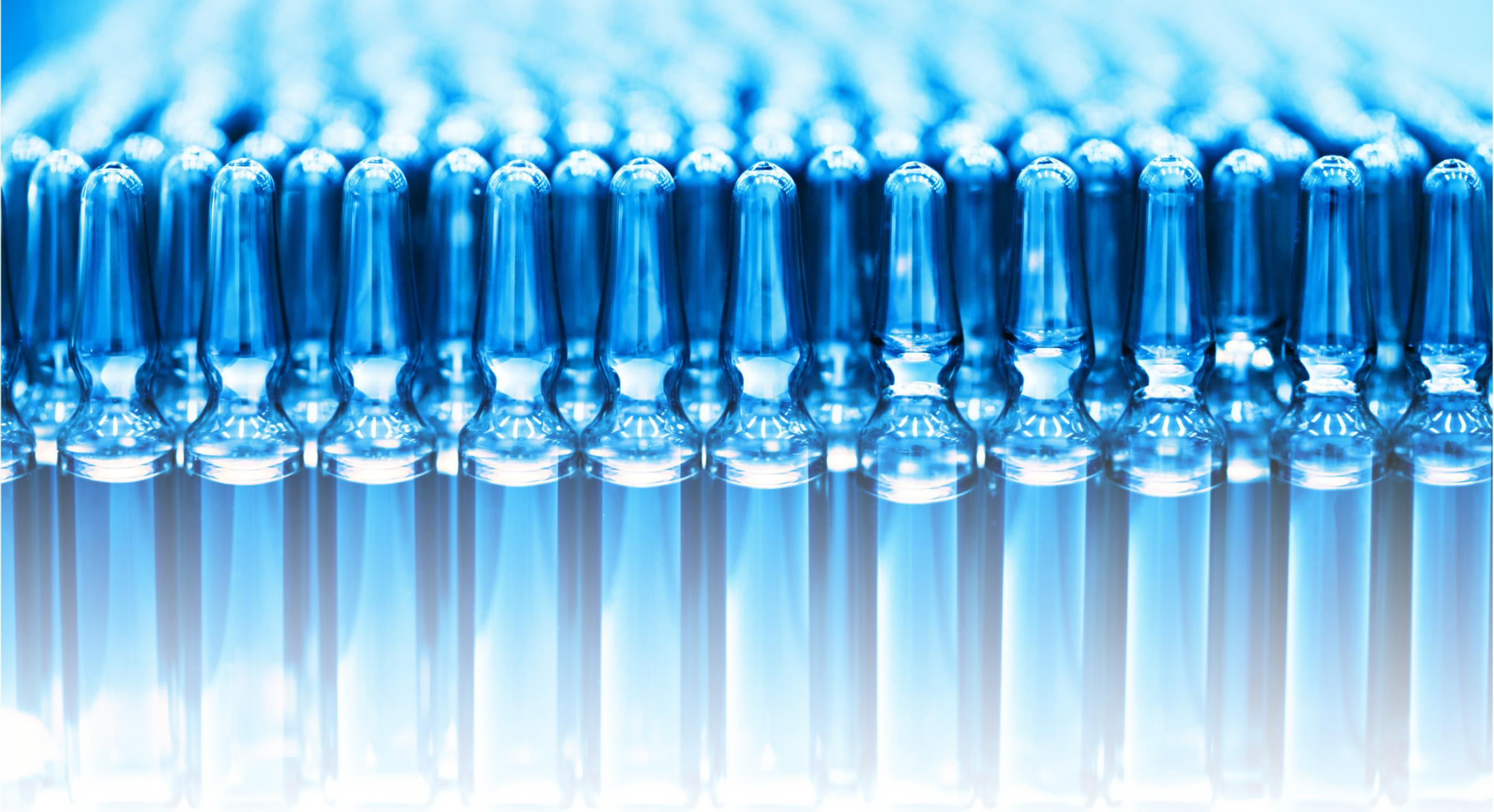
### **APPLICATION FOR THE STUDENT RECRUITMENT EVENT THROUGHOUT THE YEAR**

#### **Eligibility requirements:**

- Demonstrate a strong interest in pursuing graduate studies in the field of cancer research
- Have successfully completed or be enrolled full-time in a Bachelor's or Master's degree program (Master 1 / Master 2) related to life sciences or biomedical research
- Have maintained a minimum cumulative GPA of 3.0 out of 4.3 (70%, B, 12 out of 20, or the equivalent) for M.Sc. candidates, and 3.3 out of 4.3 (75%, B+, or 13 out of 20, or the equivalent) for Ph.D. candidates
- Possess working knowledge of both French and English
- Meet the general admission requirements (Section XI) of the Education Regulations of the Faculty of Graduate and Postdoctoral Studies

**Application deadline:** none





## FROM DISCOVERY TO COMMERCIALIZATION

IRICoR is a research commercialization hub, specializing in drug discovery.

Its team targets the best projects from the academic world in order to transform them into therapeutic innovations that patients will benefit from.

# IRICOR, A KEY DRUG DISCOVERY RESOURCE

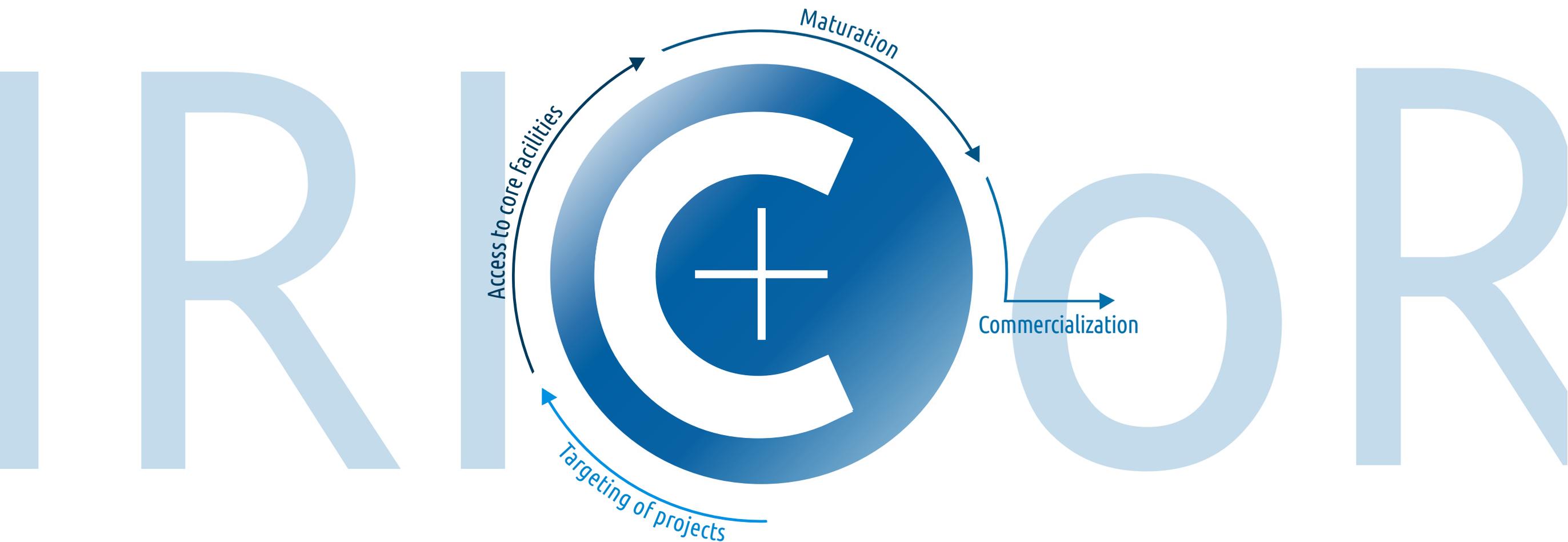
IRICoR, a key drug discovery resource owing to:

- Its ability to attract and select the most scientifically and commercially promising projects
- Its expertise in assisting research teams along the path to the maturation of their drug discovery projects
- Its power to unify and provide the best infrastructures
- Its skill in carrying out successful collaborations between the academic world and the private sector

In collaboration with the public and private sectors, IRICoR addresses unmet needs in oncology and immunology.

# STRATEGIC ASSISTANCE, FROM DISCOVERY TO THE DRUG

IRICoR has provided itself with a versatile business model, adapted to the needs of both the university and private sectors. Its team works on bringing research projects to maturation – by mitigating risk at each step of the commercialization process – so they can lead to the discovery of new drugs.



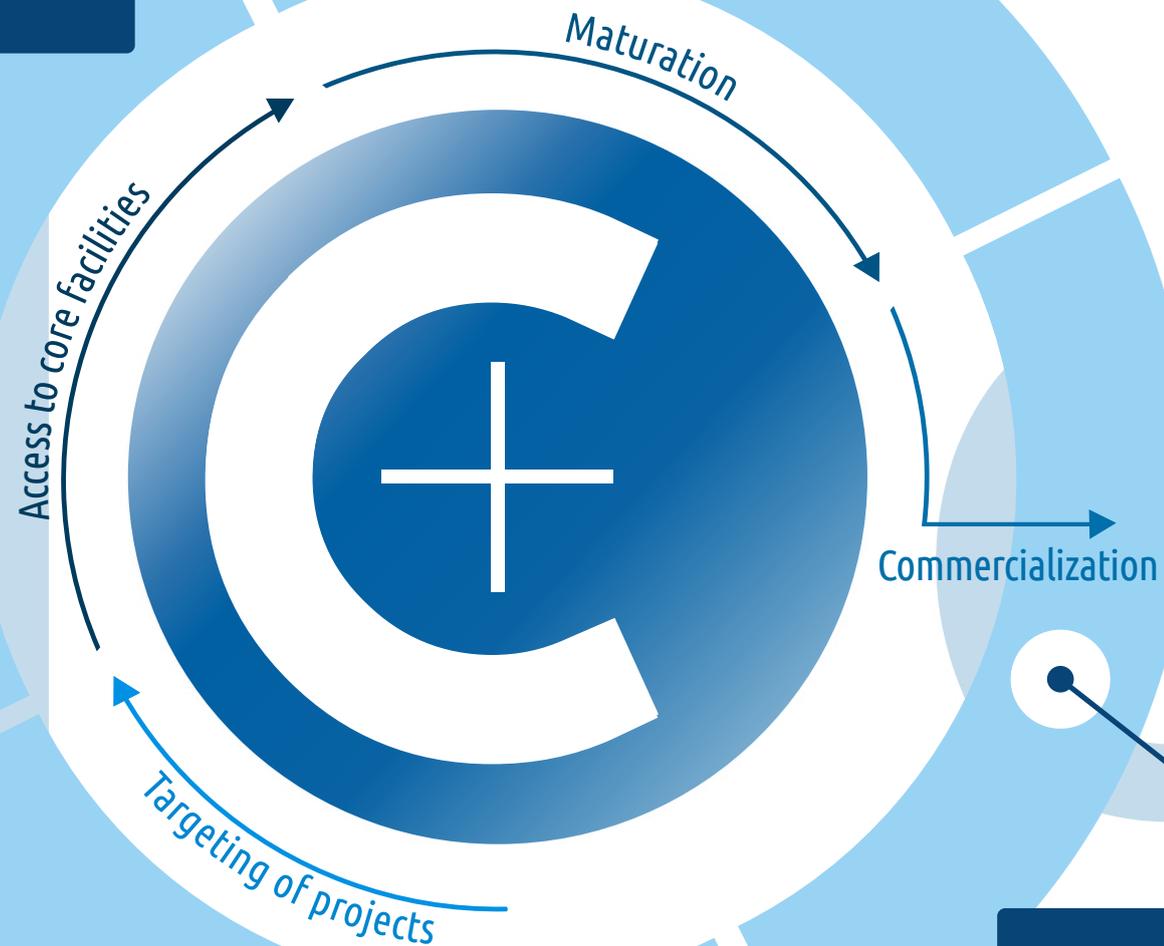
# STRATEGIC ASSISTANCE, FROM DISCOVERY TO THE DRUG

Opportunity to access scientific core facilities at the cutting-edge of technology covering the drug discovery chain

Privileged access to the largest medicinal chemistry team in Canada with industry expertise (42 chemists and biologists)

In-house expertise in intellectual property and business development

Project management according to industry standards



Assessment and selection of projects with high commercial potential aimed at sustaining a portfolio of innovative projects

Agreements reached with targeted partners (scientific and financial)

Creation of new companies

# IRICOR AT THE HEART OF THE ECOSYSTEM

AN EXTENSIVE AND EXPANDING NETWORK



# IRICOR AT THE HEART OF THE RESEARCH ECOSYSTEM

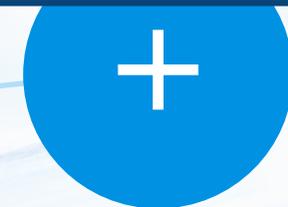
## AN EXTENSIVE AND EXPANDING NETWORK



ACADEMIC COLLABORATORS

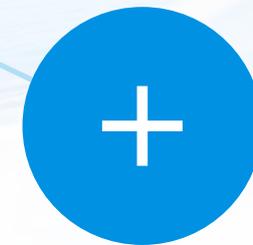
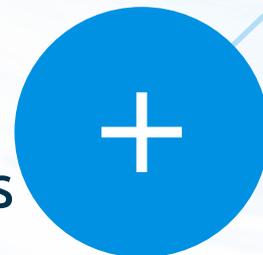


CLINICAL PARTNERSHIPS



STRATEGIC PARTNERS

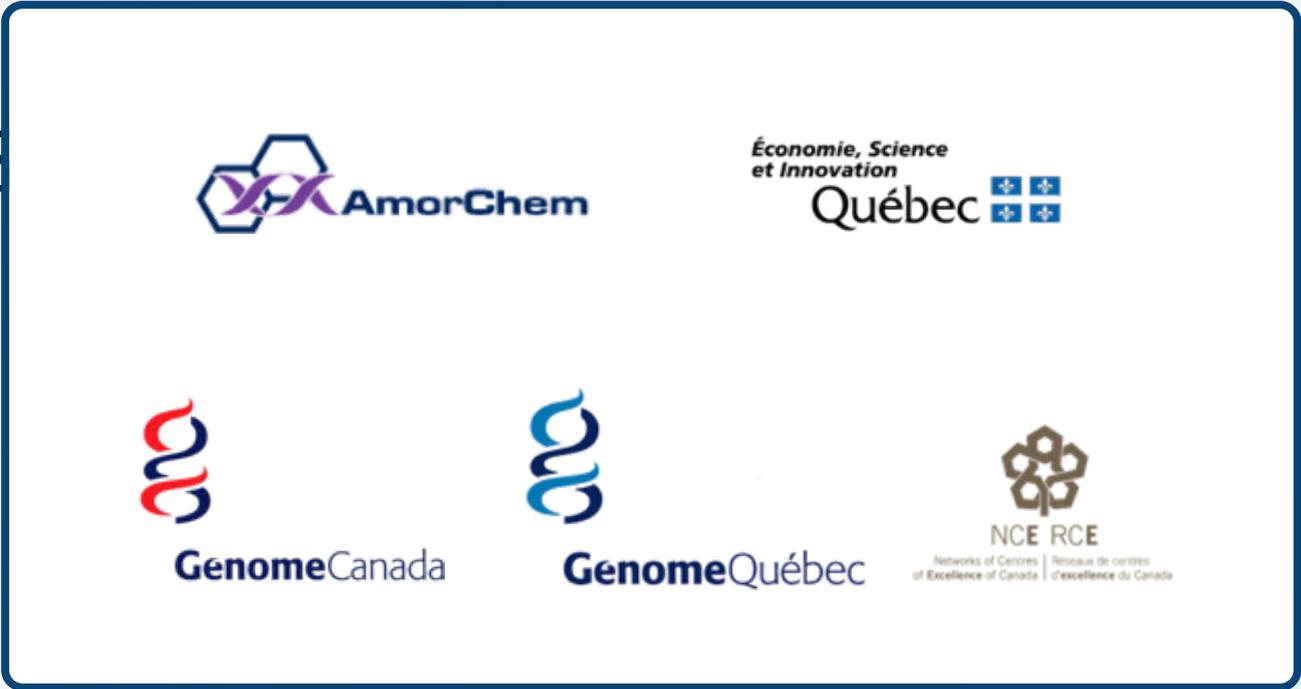
CORE FACILITIES



CECR - NCE

# IRICOR AT THE HEART OF THE ECOSYSTEM

AN EXTENSIVE AND EXPANDING NETWORK



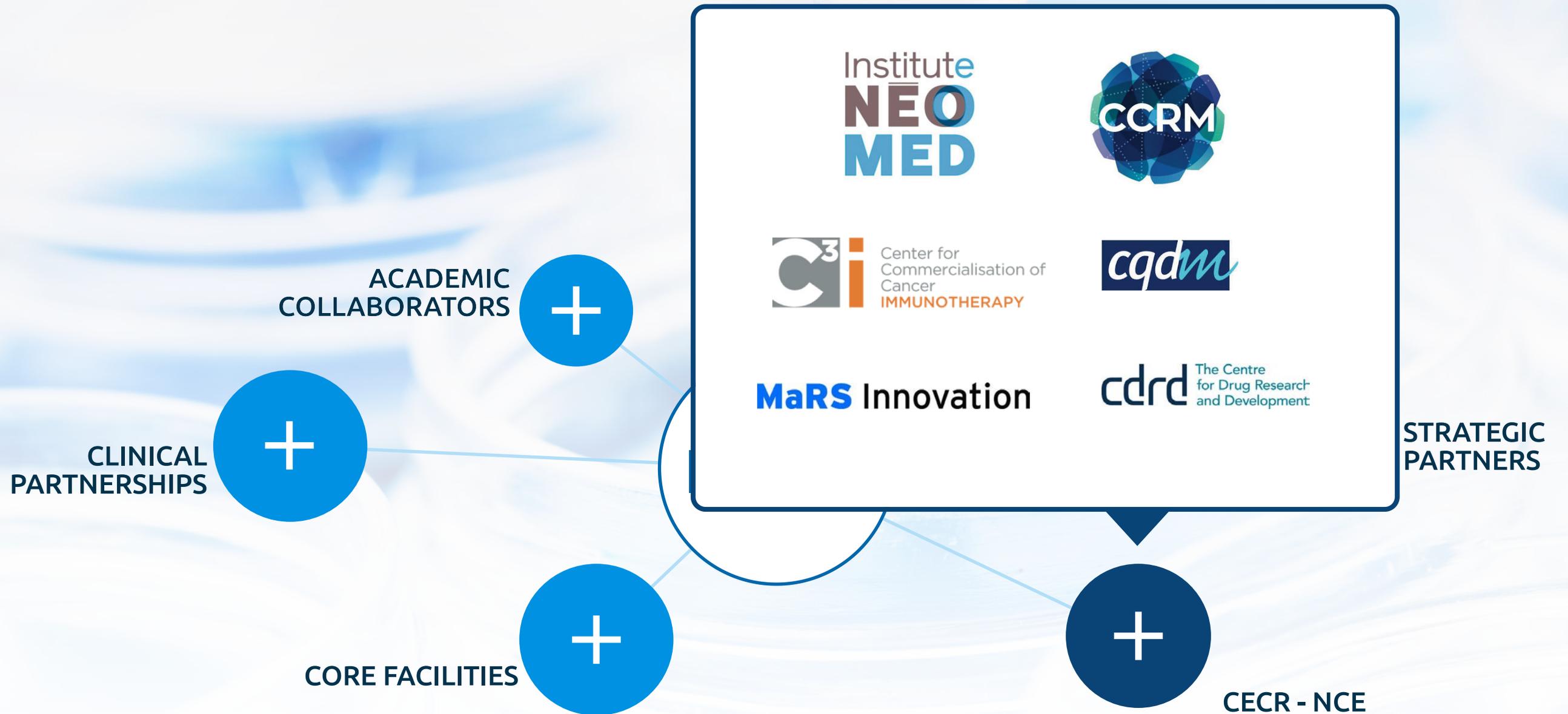
# IRICOR AT THE HEART OF THE ECO

AN EXTENSIVE AND EXPANDING NETWORK



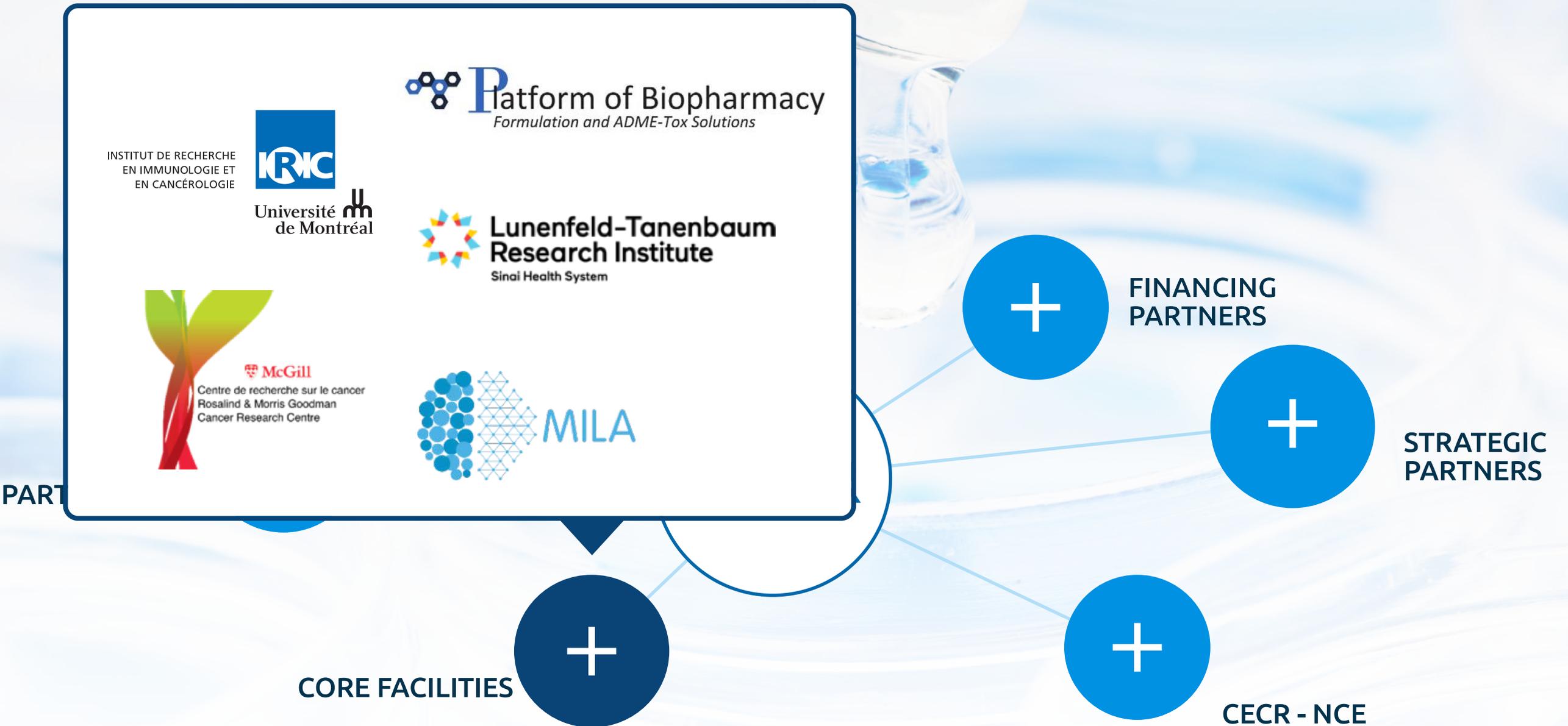
# IRICOR AT THE HEART OF THE ECOSYSTEM

AN EXTENSIVE AND EXPANDING NETWORK



# IRICOR AT THE HEART OF THE ECOSYSTEM

## AN EXTENSIVE AND EXPANDING NETWORK



# IRICOR AT THE HEART OF THE ECOSYSTEM

AN EXTENSIVE AND EXPANDING NETWORK



# HIGH-IMPACT ACHIEVEMENTS

IN LESS THAN 10 YEARS

3

Companies created

~50

Patent families generated

20

Strategic partnerships with industry

~50

Partnership projects

~80

Project financings

23

License agreements

4

Active clinical trials

INSTITUTE FOR RESEARCH  
IN IMMUNOLOGY  
AND CANCER



Université   
de Montréal

IRIC+OR

2950, chemin de Polytechnique | Marcelle-Coutu Pavillon  
Montréal (Québec) H3T 1J4

(514) 343-7770  
dons@iric.ca

Visit the website >>

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