IRCM INSTITUT DE RECHERCHES CLINIQUES DE MONTRÉAL
AFFILIÉ À L'UNIVERSITÉ DE MONTRÉAL

M.Sc. option in Molecular and Cellular Medicine

Molecular Biology Programs at the Faculty of Medicine
University of Montreal

Summary

Cycle
Graduate Cycles (2nd cycle)

Rank
Master of Science (MSc)

Credits
45 credits

Duration
1 year (three terms)

Education plan
Full time, with day classes and internships

Admission term
Admission in the fall only

Location
Clinical Research Institute of Montreal (IRCM)
110, avenue des Pins Ouest

Open to international students

Contact person for program information

Myrna Khuon, Program Coordinator
514 987-5716 | mcm@ircm.qc.ca

Presentation

With the objective of meeting emerging needs, the Institut de recherches cliniques de Montréal (IRCM) has developed the Master's degree option in cellular and molecular medicine (MCM) to train a new generation of scientists with in-depth knowledge of molecular biology, who are also aware of a global vision of the study of human diseases.

This unique and innovative program is affiliated with the molecular biology programs of the Faculty of Medicine of the Université de Montréal.

Program Strengths

- Accelerated progress in one year allowing a gateway to the PhD without writing a thesis;
- Two intensive four-month internships (32 credits) in two different IRCM laboratories;
- Experience on different IRCM technological platforms (bioinformatics, genomics, proteomics, flow cytometry, imaging and microscopy, animal models);
- Exposure to different aspects of clinical research in courses given by clinician-researchers.

General objectives

- To train versatile graduate students who will have a broad vision of biomedical research;
- Provide unique translational research training to align fundamental research with clinical practice needs;
- To train a new generation of scientists mastering the new technologies of fundamental research;
- Provide quality intensive training, allowing students to validate their interest in medical research and adequately prepare them for postgraduate studies

Structure and curriculum

The option has a specific course curriculum, including 45 credits distributed over a one-year period (three terms): five mandatory courses (12 credits), two laboratory internships with report writing (32 credits) and a research seminar (1 credit).

Fall		
Course	Title	Credits
BIM 6073	Translational research practice	5 cr.
BIM 6026	Molecular and cellular biology 1	2 cr.

Winter		
Course	Title	Credits
BIM 6075A	Internship with report 1	16 cr.
BIM 6028	Molecular and cellular biology 2	2 cr.
MMD 6005R	Ethics and Health Research	1 cr.
BIM 6035	Research seminar 1.1	--

Summer		
Course	Title	Credits
BIM 6075B	Internship with report 1	16 cr.
BIM 6074	Translational medicine practice	2 cr.
BIM 6035	Research seminar 1.2	1 cr.

Since the IRCM is a bilingual environment and the MCM option welcomes students from around the world, the vast majority of courses are taught in English. However, since this option is offered by the Université de Montréal, all assignments and exams can also be written in French.

Funding and scholarships

At the IRCM, all students selected for the MCM Master's option receive an annual scholarship of $ 20,000 (Bombardier-Molson Scholarship).

Students, supported by members of the academic affairs department, are also encouraged to apply to various external scholarships competitions.

Many scholarships are offered by the Faculty of Graduate and Postdoctoral Studies (FESP) and the Faculty of Medicine of the Université de Montréal such as :

- Bourse d'exemption des droits supplémentaires de scolarité pour étudiants internationaux (C)
- Bourse de MÉRITE aux cycles supérieurs
- Bourse d'excellence de la Faculté des études supérieures et postdoctorales

Other scholarships from granting agencies are also available to facilitate graduate studies, including:

- Canadian Institutes of Health Research (CIHR)
- Natural Sciences and Engineering Research Council (NSERC)
- Canada Research Chairs (CRC)
- Fonds de recherche du Québec - Santé (FRQS)
- Fonds de recherche du Québec - Nature et technologies (FRQNT)

Admission and requirements

Candidates for the Master's degree option in molecular and cellular medicine are recruited directly by the IRCM's Academic Affairs department.

Admission requirements

- You must have successfully completed or be enrolled in a bachelor's degree or master's degree program in a relevant discipline (biochemistry, biology, microbiology, chemistry); or hold a medical degree with a right to practice in Canada or Quebec; and have significant experience in basic research.
- You must have maintained a minimum cumulative average of 3.0 out of 4.3 (70%, B, 12 out of 20, or equivalent).
- Meet the general eligibility requirements (section XI) of the Faculty of Graduate and Postdoctoral Studies Pedagogical Regulations.

Application process

1. Fill in this online form. The form must include your resume, university transcripts and a motivation letter (700 words).
2. Ask a letter of recommendation from someone who can assess your ability to pursue a career in biomedical research. This should be sent by e-mail directly from the author to mcm@ircm.qc.ca.
3. Selected candidates will be interviewed by the MCM option selection committee.
4. Selected candidates must then submit an application to the registrar's office of Université de Montréal. Application to certain scholarships may also be required for students outside Quebec.

Evaluation of applications

Applications are evaluated by a selection committee composed of IRCM researchers. Candidates are selected primarily on the basis of academic record, biomedical research experience and motivation to pursue graduate studies.

Application deadlines

Student Status

- Quebec students: from January 1 to May 31
- Canadian, non-Quebec resident: from January 1 to April 1*
- French and Belgium (francophone): from January 1 to May 1
- International: from January 1 to April 1*

* These deadlines may differ. For the exact date, contact the academic affairs direction via the following email address: mcm@ircm.qc.ca

Submit an application

Accelerated transition to a PhD

The PhD in Molecular Biology, option in Cellular and Molecular Medicine, is a continuation of the training of the Master's option in MCM. Offered at the IRCM, it provides students with multidisciplinary training in molecular biology with an emphasis on the latest technologies used in fundamental and translational research. The research themes in MDC are mainly focused on the study of human diseases.

Doctoral training requires the selection of a research director at the beginning of the program.

For a description of the MDC doctoral program, visit the IRCM website.

Index of pedagogical activities of the curriculum

BIM 6026 – Molecular and cellular biology 1

Graduate Cycles | 2 credits | Fall term

Understanding of basic molecular mechanisms and cellular structures. Molecular analysis of complex systems (immunology, neurobiology, developmental biology).

BIM 6028 – Molecular and cellular biology 2

Graduate Cycles | 2 credits | Winter term

Understanding of basic molecular mechanisms and cellular structures. Molecular analysis of complex systems (immunology, neurobiology, developmental biology).

BIM 6035 – Research seminar

Graduate Cycles | 1 credit | Winter and summer terms

Teach the student to synthesize their research, present orally and discuss their project. The student is required to participate in the presentations of other students.

BIM 6073 – Translational research practice

Graduate Cycles | 5 credits | Fall term

COURSE OFFERED EXCLUSIVELY TO STUDENTS OF THE MASTER'S DEGREE OPTION IN MCM

Practical and theoretical training modules on the use of advanced technological platforms in molecular biology and biomedical research; use of these techniques for translational health research.

Offered as modular courses covering the use of the following technologies and their application to basic and translational research: cytometry, microscopy and cell biology, genomics, proteomics, bioinformatics, and animal models in biomedical research.

Training objectives:

- To be aware of the possibilities of using certain advanced techniques used in biology to study human diseases;
- Apply different molecular biology techniques in laboratory research experiments;
- Refine the ability to approach an issue through the scientific method.

BIM 6074 – Translational medicine practice

Graduate Cycles | 2 credits | Summer term

COURSE OFFERED EXCLUSIVELY TO STUDENTS OF THE MASTER'S DEGREE OPTION IN MCM

Links between the fundamental laboratory and the clinical environment; integration of solid translational medicine concepts and ethical issues. Exposure to the clinical environment and concepts of personalized medicine.

Training objectives:

- Understand the biological basis of human diseases, their treatments and their consequences on the patient;
- Summarize current challenges in medical practice and identify gaps that require investigation in fundamental research;
- Compare these questions with the ethical considerations necessary for the conduct of research involving human subjects;
- Integrate the fundamental knowledge of molecular biology into a concrete clinical issue.

BIM 6075A – Internship with report 1

Graduate Cycles | 16 credits | Fall term

COURSE OFFERED EXCLUSIVELY TO STUDENTS OF THE MASTER'S DEGREE OPTION IN MCM

Research project in applied human biology under supervision, with writing an internship report in the form of a scientific manuscript.

Training objectives:

- Design and carry out molecular and cell biology experiments;
- Refine your logic, methods and research practice in a translational medicine context.

BIM 6075B – Internship with report 2

Graduate Cycles | 16 credits | Fall term

COURSE OFFERED EXCLUSIVELY TO STUDENTS OF THE MASTER'S DEGREE OPTION IN MCM

Research project in applied human biology under supervision, with writing an internship report in the form of a scientific manuscript.

Training objectives:

- Design and carry out molecular and cell biology experiments;
- Refine your logic, methods and research practice in a translational medicine context.

MMD 6005R – Ethics and Health Research

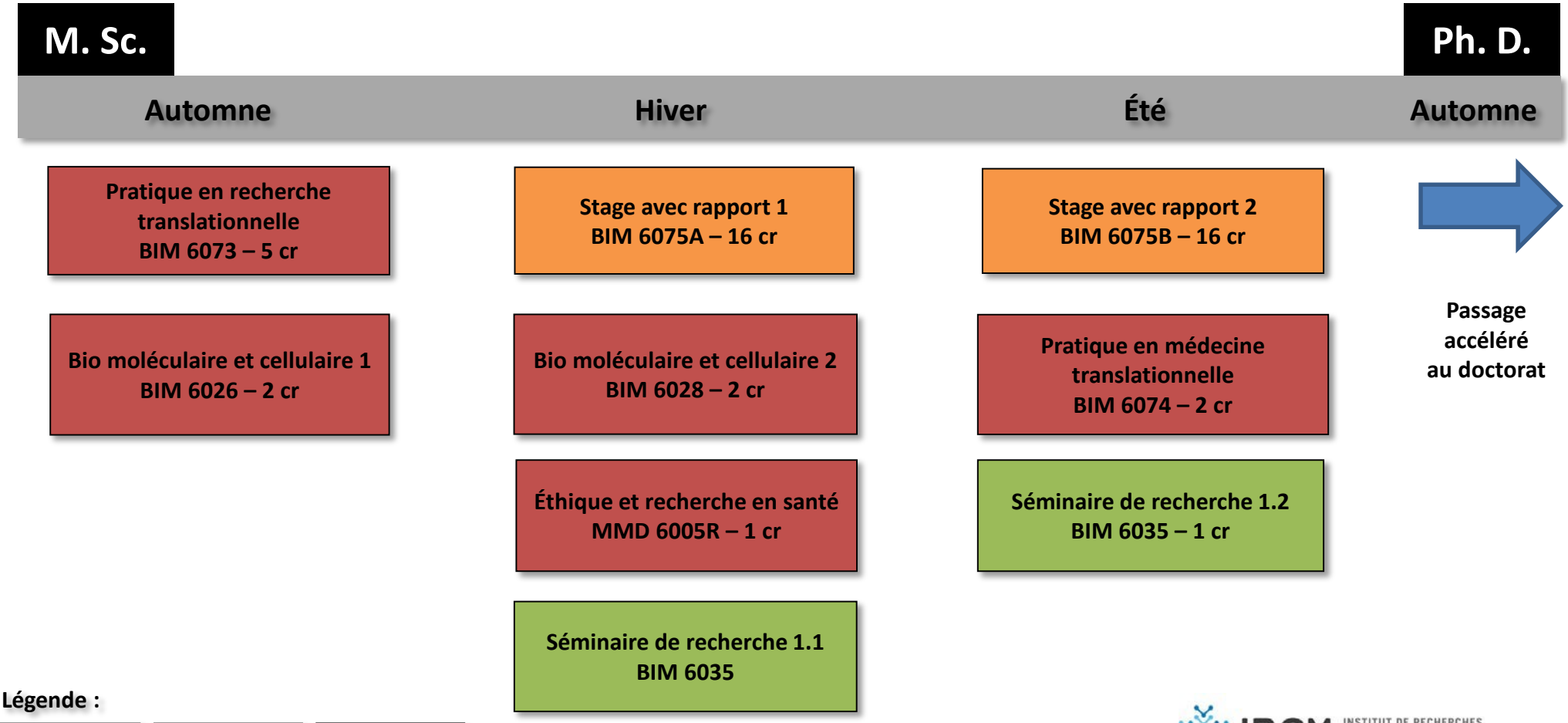
Graduate Cycles | 1 credit | Winter term

Biomedical developments and research ethics; major regulatory texts; the ethical and technoscientific relationship; the ethical evaluation of a project; the scientific integrity of the researcher.

Cursus et aperçu des cours de l'option de maîtrise MCM

L'option de maîtrise en médecine cellulaire et moléculaire (MCM) comprend plusieurs cours offerts dans le cadre des programmes d'études supérieures de biologie moléculaire de l'Université de Montréal.

L'option a un cursus de cours particulier, incluant 45 crédits distribués sur une période d'une année (trois trimestres) : cinq cours obligatoires (12 crédits), deux stages en laboratoire avec rédaction de rapport (16 crédits chacun) et un séminaire de recherche (1 crédit).



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BIM6073 : Pratique en recherche translationnelle

Responsables : Woong-Kyung Suh, Nicole Francis et collaborateurs

Puisque les futurs biologistes sont dorénavant appelés à maîtriser les récentes technologies de pointe et à transposer leurs connaissances au bénéfice du milieu clinique, la maîtrise MCM inclut une formation pratique et théorique intensive sur l'utilisation des technologies de pointe en biologie moléculaire. Le cours *Pratique en recherche translationnelle* est offert sous le format de cours modulaires traitant de l'utilisation des technologies suivantes et de leur utilisation appliquée à la recherche fondamentale et translationnelle :

- **Cytométrie** : Présentation des aspects techniques et théoriques de la cytométrie de flux et du tri cellulaire, ainsi que leurs applications en sciences biomédicales;
- **Microscopie et biologie cellulaire** : Utilisation de l'histologie et de l'immuno-histochimie en recherche fondamentale et dans l'analyse des échantillons cliniques. Acquisition d'images et de vidéos par diverses techniques de microscopie;
- **Génomique** : Présentation et pratique de diverses techniques pour l'étude de l'expression des gènes (microarray d'ADN; qPCR; séquençage à haut débit);
- **Protéomique** : Introduction à la protéomique et à ses stratégies pour différentes analyses (interactions protéine-protéine, phosphoprotéines, métabolites, lipides, etc.), présentation des aspects techniques de la spectrométrie de masse et l'analyse des données MS;
- **Bio-informatique** : Familiarisation avec les concepts, méthodes et outils de bases de la bio-informatique, analyse de données d'expériences de séquençage à grande échelle (RNA-seq et ChIP-seq);
- **Modèles animaux en recherche biomédicale** : Présentation des concepts de transgénèse, criblage génétique et édition du génome.

De façon spécifique, ce cours vise les objectifs suivants :

- Connaître les possibilités d'utilisation de certaines techniques de pointe utilisées en biologie dans l'étude des maladies humaines;
- Appliquer différentes techniques de biologie moléculaire lors d'expériences de recherche en laboratoire;
- Affiner la capacité à aborder une question par la méthode scientifique.

BIM6074 : Pratique en médecine translationnelle

Responsables : André Veillette et collaborateurs

Dans le cadre du cours *Pratique en médecine translationnelle*, les étudiants auront la possibilité de rencontrer des patients sous la supervision de chercheurs-cliniciens. Parallèlement à l'exposition en milieu clinique, ce cours fait état des défis actuels rencontrés en clinique afin de mettre l'accent sur les domaines de recherche fondamentale prioritaires qui auront un impact clinique. Les concepts de médecine personnalisée et les enjeux éthiques de la recherche clinique sont aussi des sujets abordés dans ce cours.

De façon spécifique, ce cours vise les objectifs suivants :

- Comprendre les bases biologiques des maladies humaines, de leurs traitements et de leurs conséquences sur le patient;
- Résumer les défis actuels de la pratique médicale et mettre en évidence les lacunes nécessitant une investigation en recherche fondamentale;
- Mettre en parallèle ces questions avec les considérations éthiques nécessaires à la poursuite de recherche chez des sujets humains;
- Intégrer les connaissances fondamentales de la biologie moléculaire à un enjeu clinique concret.

BIM6075A et B : Stage avec rapport 1 et 2

Responsables : Javier Di Noia et collaborateurs

Les étudiants à la maîtrise MCM effectuent deux stages de recherche de quatre mois, qui alternent aux trimestres d'hiver et d'été, dans deux laboratoires différents de leur choix en biologie moléculaire. Ainsi, dans le cadre du cours *Stage avec rapport 1 et 2*, les étudiants réalisent un projet de recherche en biologie humaine appliquée sous supervision, avec rédaction d'un rapport de stage sous forme d'un manuscrit scientifique.

Les objectifs principaux du stage sont d'amener l'étudiant à :

- Concevoir et exécuter des expériences de biologie moléculaire et cellulaire;
- Affiner sa logique, ses méthodes et sa pratique de la recherche dans un contexte de médecine translationnelle.

Les cours BIM6073 et BIM6074 ainsi que les stages BIM6075A et B ont été développés par le corps professoral de l'IRCM et sont offerts exclusivement aux étudiants à la maîtrise MCM.

Les cours BIM6026, BIM6028 et BIM6035 sont offerts par les programmes de biologie moléculaire de l'Université de Montréal. Visitez leur site Web pour obtenir leurs descriptions.