BIOMEDICAL SCIENCES

Academic Units within the School of Biomedical Sciences

Anatomy and Cell Biology

The Department offers graduate programs leading to **M.Sc.** and **Ph.D.** degrees. Research in the Department investigates the dynamics and organization of molecules, organelles, cells, and tissues in several major systems of the body. The work makes fundamental contributions to a number of established and emerging multidisciplinary fields such as:

- cell and molecular biology;
- cellular immunology and hematology;
- reproductive biology;
- calcified tissue biology;
- tumour cell biology;
- developmental biology;
- neurobiology; and
- aging.

The Department offers contemporary facilities for the wide range of techniques currently employed in research. Modern methods of cell and molecular biology, immunology, and biochemistry are used in conjunction with specialized microscopy in a variety of experimental systems.

The Department has one of the largest and best-equipped electron microscope facilities in the world. Currently in use are four modern electron microscopes which include a Tecnai F20 and a Titan Krios. Combined with some of these microscopes are computer-aided analytical equipment capable of elemental microanalysis, histomorphometry, reconstruction, and quantitation. The high-voltage microscope is particularly useful for certain analytical electron optical procedures such as electron diffraction, lattice imaging, and three-dimensional electron microscopy.

Funding

The minimum yearly stipend for M.Sc. students is $28,500 for Canadian Citizens and Permanent Residents, and $30,000 for International students. All Ph.D. students receive a minimum yearly stipend of $30,000. The minimum stipend for International students is guaranteed for the duration of the residency period in which students pay their highest fees.

All students are financially supported either by their supervisor or through fellowships or scholarships. Prospective students are urged to make every effort to secure their own funding. Applications may be made for a variety of fellowships administered by the University or by various federal, provincial, or private agencies. For more information on fellowships and awards, see the Graduate and Postdoctoral Studies website.

Departmental Seminars

Nationally and internationally recognized scientists present their research findings to the Department at a regular seminar series throughout the academic year. On a regular basis, graduate students also present their own research progress and results to other students, postdoctoral fellows, and researchers in the Department through the Research in Progress Seminar Series.

Program Overview

Graduate research activities for the **Master of Science (M.Sc.) Cell Biology (Thesis)** involve original experimental work in one of the areas being actively investigated by the Department's research supervisors. Our graduate program offers training in a personal, unique, and multidisciplinary environment in a top Canadian university with worldwide recognition. The thesis-based Master's training is intended for students with a B.Sc. or B.A. degree in life sciences from a university of recognized reputation. Candidates with an M.D., D.D.S., or DVM degree are also welcome. Students are trained in how to address biological problems with an integrative understanding of cell biology by conducting hypothesis-driven projects. The training provides all the tools required for successful careers in academic settings as well as in industry or other fields.

The thesis-based **Doctor of Philosophy (Ph.D.) Cell Biology** is intended for students with a B.Sc., B.A., or M.Sc. degree in life sciences from a university of recognized reputation. Candidates with an M.D., D.D.S., or DVM degree are also welcome.

Anatomy and Cell Biology Admission Requirements and Application Procedures

Admission Requirements

Admission is based on the candidate's academic record and letters of recommendation. A minimum cumulative grade point average (CGPA) of 3.0 out of 4.0 is required. Once a student has submitted all the required documents, the applicant's file will be reviewed by the Graduate Admission Committee. Files that do not meet the minimum requirement will not be considered. Applicants must also be accepted by a research supervisor who is a faculty member or an associate member of the Department of Anatomy and Cell Biology (Adjunct members may serve only as co-supervisors while the primary supervisor must be a full or associate member of the Department). Recommendation for admission will be made once the applicant has secured a supervisor and adequate financial support. Financial support should be in the form of a stipend from the supervisor's research grant or a fellowship held by the student.

Master's Program (Cell Biology)

1. A B.Sc. degree in life sciences or any of M.D., D.D.S., or DVM degrees from a university of recognized reputation
2. Evidence of a high academic achievement with a minimum cumulative grade point average (CGPA) of 3.0 out of 4.0 as indicated in the general guidelines set up by GPS

Ph.D. Program (Cell Biology)

1. An M.Sc. degree in life sciences or any of M.D., D.D.S., or DVM degrees from a university of recognized reputation
2. Evidence of a high academic achievement with a minimum cumulative grade point average (CGPA) of 3.0 out of 4.0 as indicated in the general guidelines set up by GPS

International Applicants

Graduate studies applicants whose mother tongue is not English and who have not completed an undergraduate or graduate degree from a recognized foreign institution where English is the language of instruction, or from a recognized Canadian institution (anglophone or francophone), must submit the following:

TOEFL: Minimum score of 86 on the Internet-based test (iBT) with each component score 20 or higher.

or

IELTS: Minimum overall band score of 6.5.

Application Procedures
McGill's online application form for graduate program candidates is available at: mcgill.ca/gradapplicants/how-apply.

See University Regulations & Resources > *Graduate* > Graduate Admissions and Application Procedures for detailed application procedures. Further details from the department can be found on our Graduate webpage.

All applicants are advised to contact potential research supervisors before the application process since supervisor acceptance is required. Information about the research interests of faculty members can be found in our Departmental Directory. A list of professors who are actively recruiting can also be found on the site.

Program guidelines are listed under the Master's and Doctorate pages on our Graduate Webpage.

Additional Requirements
The items and clarifications below are additional requirements set by this department:

- Agreement of a faculty member to act as Thesis Supervisor and to provide adequate financial support.

Application Dates and Deadlines
Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Anatomy and Cell Biology and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available on our Graduate Webpage.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Biochemistry
The Department of Biochemistry offers M.Sc. and Ph.D. programs, which emphasize laboratory research. Our research interests include:

- molecular and cell biology;
- the regulation of gene and protein expression;
- signal transduction;
- protein structure and function;
- membrane biology;
- cell death and differentiation;
- embryonic development;
- neurobiology;
- bioinformatics;
- cancer.

Specialized graduate training programs in Chemical Biology, Human Systems Biology (Bioinformatics), cancer research/Oncology, and Structural Biology are available. Laboratories are located in the new Bellini Life Sciences Building and Rosalind and Morris Goodman Cancer Research Institute, and the renovated McIntyre Medical Sciences Building, together comprising one of the best-equipped research facilities in Canada. The outstanding quality of our research has been recognized by recent awards including a Gairdner Award, two Killam Prizes, and eight Canada Research Chairs.

Funding
Master's students receive a minimum stipend of approximately $22,000 annually; doctoral students receive approximately $23,000. The Department is committed to helping graduate students secure adequate funding for their research. All students are financially supported either by their supervisor or through fellowships or scholarships. Prospective students are urged to make every effort to secure their own funding. Applications may be made for a variety of fellowships administered by the University or by various federal, provincial, or private agencies. For more information on fellowships and awards, see the Graduate and Postdoctoral Studies website.

Departmental Seminars
Visiting scientists and senior doctoral students present their research findings to the Department at a regular seminar series throughout the academic year. All graduate students are required to attend the regular seminars and additional special lectures, and are encouraged to attend scientific conferences and symposia.

Master of Science (M.Sc.) Biochemistry (Thesis) (45 credits)
The M.Sc. in Biochemistry introduces students to laboratory-based research at an advanced level. The M.Sc. program offers core courses in advanced biochemistry topics, but focuses on laboratory research. The program provides sophisticated training in the technical as well as theoretical aspects of biochemistry, at one of the leading Biochemistry departments in Canada. The M.Sc. program is an excellent preparation for skilled positions in the biomedical sciences, in industry or the public sector, or for superior research in a Ph.D. program.

Master of Science (M.Sc.) Biochemistry (Thesis): Bioinformatics (45 credits)
This program is currently not offered.

Bioinformatics research lies at the intersection of biological/medical sciences and mathematics/computer science/engineering. The intention of the Bioinformatics option is to train students to become researchers in this interdisciplinary field. This includes the development of strategies for experimental design, the construction of tools to analyze datasets, the application of modelling techniques, the creation of tools for manipulating bioinformatics data, the integration of biological databases, and the use of algorithms and statistics.

Students successfully completing the Bioinformatics option at the M.Sc. level will be fluent in the concepts, language, approaches, and limitations of the field.

The option consists of a number of interdisciplinary courses and a seminar designed to bring students from many backgrounds together and to provide a thorough overview of research in this field.

Master of Science (M.Sc.) Biochemistry (Thesis): Chemical Biology (47 credits)
This program is currently not offered.

The Chemical Biology Thematic Group is engaged in a diverse range of research topics, which span structural biology, enzymology, nucleic acid research, signalling pathways, single molecule biophysics, and biophysical chemistry of living tissues. Among the themes that unite the research being performed in this group is the attempt to learn new chemistry and physics from biological systems. We have projects relating to pharmaceutically relevant enzymes such as those involved in drug metabolism and antibiotic resistance; development of therapeutic agents in the control of inflammation, cancer, and viral infections; the chemical biology of NO; quantification of bioenergetic markers of metabolism; self-assembly mechanisms of the HIV-1 virion capsid; liposome microarray systems to address membrane protein dynamics and recognition; studies on reactive oxygen species translocation across the aqueous/lipid membrane interface; RNAi/antisense technologies; dynamic combinatorial chemistry; protein dynamics and function; mechanistic aspects involved in cellular adhesion and transport in membrane and zeolite channels; and cutting-edge microscopes used to examine transport, motility, and reactivity in cells.

The Chemical Biology graduate option is centred on the pursuit of an original research project under the direction of one or more mentors. The program is supported by McGill University and by the Canadian Institutes of Health Research (CIHR) through its Strategic Training Initiatives program.

The program of training incorporates several important features, including a diverse curriculum and programs of seminars, workshops, and discussion groups designed to provide students with a well-rounded exposure to both the chemical and biological aspects of the discipline. The M.Sc. option provides a foundation in the concepts and approaches of Chemical Biology.

Doctor of Philosophy (Ph.D.) Biochemistry

The Ph.D. in Biochemistry trains students in laboratory-based research at the highest level. The Ph.D. program is streamlined to emphasize independent research, and the many areas of biochemistry studied in our Department offer a wide choice of specialties. Students gain in-depth expertise in biochemistry and the biomedical sciences, with the opportunity to carry out research projects at a world-class level and build collaborations with other leading research groups.

Graduates of the Ph.D. program are outstandingly prepared for leadership careers in the basic health sciences in industry, the public sector, or academia.

Doctor of Philosophy (Ph.D.) Biochemistry: Bioinformatics

This program is currently not offered.

Bioinformatics research lies at the intersection of biological/medical sciences and mathematics/computer science/engineering. The intention of the Bioinformatics option is to train students to become researchers in this interdisciplinary field. This includes the development of strategies for experimental design, the construction of tools to analyse datasets, the application of modelling techniques, the creation of tools for manipulating Bioinformatics data, the integration of biological databases, and the use of algorithms and statistics.

Students successfully completing the Bioinformatics option at the Ph.D. level will be fluent in the concepts, language, approaches, and limitations of the field, and have the capability of developing an independent Bioinformatics research program.

The option consists of a number of interdisciplinary courses and a seminar designed to bring students from many backgrounds together and to provide a thorough overview of research in this field.

Doctor of Philosophy (Ph.D.) Biochemistry: Chemical Biology

This program is currently not offered.

The Chemical Biology Thematic Group is engaged in a diverse range of research topics which span structural biology, enzymology, nucleic acid research, signalling pathways, single molecule biophysics, and biophysical chemistry of living tissues. Among the themes which unite the research being performed in this group is trying to learn new chemistry and physics from biological systems. We have projects relating to pharmaceutically relevant enzymes such as those involved in drug metabolism and antibiotic resistance; development of therapeutic agents in the control of inflammation, cancer and viral infections; the chemical biology of NO; quantification of bioenergetic markers of metabolism; self-assembly mechanisms of the HIV-1 virion capsid; liposome microarray systems to address membrane protein dynamics and recognition; studies on reactive oxygen species translocation across the aqueous/lipid membrane interface; RNAi/antisense technologies; dynamic combinatorial chemistry; protein dynamics and function; mechanistic aspects involved in cellular adhesion and transport in membrane and zeolite channels; and cutting-edge microscopes used to examine transport, motility, and reactivity in cells.

The Chemical Biology graduate option is centred on the pursuit of an original research project under the direction of one or more mentors. The program is supported by McGill University and by the Canadian Institutes of Health Research (CIHR) through its Strategic Training Initiatives program.

The program of training incorporates several important features, including a diverse curriculum and programs of seminars, workshops, and discussion groups designed to provide students with a well-rounded exposure to both the chemical and biological aspects of the discipline. The Ph.D. option provides advanced training in Chemical Biology based on independent research.

Financial support for students in the program is available from a variety of sources, including competitively awarded CIHR-funded Chemical Biology Scholarship awards.

Biochemistry Admission Requirements and Application Procedures

Admission Requirements

Admission is based on the candidate's academic record, letters of recommendation, curriculum vitae, and personal statement. A minimum grade point average of 3.2/4.0 (B+) is required. Once a student has submitted all the required documents, the applicant's file will be reviewed by the Graduate Admission Committee. Files that do not meet the minimum requirement will not be considered. Applicants must also be accepted by a research supervisor who is a faculty member or associate member of the Department of Biochemistry. Recommendation for admission will be made once the applicant has secured a supervisor and adequate financial support. Financial support should be in the form of a stipend from the supervisor's research grant or a fellowship held by the student.

Master's Program
Candidates for the M.Sc. degree must hold a B.Sc. degree or its equivalent in Biochemistry or in related disciplines (e.g., biology, chemistry, physiology, microbiology).

Doctoral Program
Candidates who have completed their M.Sc. degree may be admitted directly to the Ph.D. program. Candidates who are admitted to the M.Sc. program and who are interested in the Ph.D. may transfer into the Ph.D. program after successfully completing the transfer seminar (BIOC 701 Research Seminar 1.) and all course requirements. The M.Sc. thesis requirement is then waived.

International Applicants
Applicants to graduate studies whose mother tongue is not English and who have not completed an undergraduate or graduate degree from a recognized foreign institution where English is the language of instruction or from a recognized Canadian institution (anglophone or francophone) must submit the following:

- TOEFL (Test of English as a Foreign Language): N.B. an institutional version of the TOEFL is not acceptable. Minimum acceptable scores are: IBT (Internet-Based Test): 86 overall, no less than 20 in each of the four component scores.
  or
  IELTS: (International English Language Testing System): a band score of 6.5 or greater (Academic module)
- International students who have received their degree outside North America should submit GRE scores: The GRE is not required but is recommended for international students. The Biochemistry subject test is now part of the Biology test. The most important sub-score is "Cellular and Molecular Biology", followed by "Evolution"; "Organismal Biology and Ecology" is less important.

For additional information, please consult the department's website.

Admission Requirements – Bioinformatics or Chemical Biology Option (options are not offered at this time—in review)
As for the regular graduate programs of the Biochemistry Department, acceptance into the Bioinformatics or Chemical Biology option consists of two steps:

1. Preliminary approval by the Department's Graduate Admission Committee based on the student's transcript, references, and other documents submitted with the application. The criteria for assessment at this level are the same as for the regular graduate programs of the Department.
2. Acceptance by a Bioinformatics or Chemical Biology research director. The director must propose a research project for the student that provides training in the methods and philosophy of Chemical Biology. Project proposals are assessed by the Bioinformatics or Chemical Biology Program Committee.

Application Procedures
McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Application Procedures for detailed application procedures. Information for prospective students is also available on the Department of Biochemistry's website.

All applicants are advised to contact potential research supervisors during or before the application process since supervisor acceptance is required. Information about the research interests of faculty members can be found at mcgill.ca/biochemistry/research and mcgill.ca/biochemistry/about-us/department/faculty-members.

Additional Requirements
The items and clarifications below are additional requirements set by this department:

- Curriculum Vitae
- Personal Statement
- Agreement of a faculty member to act as Thesis Supervisor and to provide adequate financial support
- Acceptance by a Bioinformatics or Chemical Biology research director

Application Dates and Deadlines
Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Biochemistry and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at mcgill.ca/gradapplicants/how-apply/application-steps/application-deadlines.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Biomedical Engineering
Excellent laboratory facilities for basic and applied research are available in the Department and in the laboratories of associated staff located elsewhere on campus. The Department operates a network of high-performance workstations and well-equipped mechanical and electronics workshops.

Basic research in the Department concentrates on the application of quantitative engineering analysis methods to basic biomedical research problems. Currently active areas of research include:

- neuromuscular and postural control;
- muscle mechanics;
- the vestibular system;
- oculomotor control;
- the auditory system;
- joint prosthetics;
- biomaterials;
- artificial cells and organs;
- cell and tissue engineering;
- drug delivery;
- microencapsulation;
- microbiome and probiotics;
- functional food and neutraceuticals;
- medical imaging;
- microfluidics;

- nanomedicine and nanotechnology;
- bioinformatics in genomics and proteomics.

Staff members are also active in more applied research related to the development of quantitative analysis tools and instruments for biomedical research. Areas of activity here include: signal analysis, system identification, modelling, simulation and parameter estimation, image processing, pattern recognition, ultrasound, and biorobotics.

For additional information, see the Biomedical Engineering website.

Biomedical Engineering Admission Requirements and Application Procedures

Admission Requirements

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Admission Requirements (Minimum Requirements to be Considered for Admission). In addition, please see the Department's website: *mcgill.ca/bme/studies/translational*.

Application Procedures

McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/how-apply.

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Application Procedures for detailed application procedures.

Please address enquiries directly to the Department.

Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Biomedical Engineering and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at *mcgill.ca/gradapplicants/how-apply/you-apply-mcgill/application-deadlines*.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Note: Applications for Summer term admission will not be considered.

Human Genetics

The Department of Human Genetics provides a unified curriculum of study in genetics. Areas of specialization include:

- biochemical genetics
- genetics of development
- animal models of human diseases
- cancer genetics
- molecular pathology
- gene therapy
- genetic dissection of complex traits
- genetics of infectious and inflammatory diseases
- non-mendelian genetics
- bioinformatics
- behavioural genetics
- neurogenetics
- bioethics
- genomics

Many of our faculty hold cross-appointments in various departments (including: biochemistry, biology, cardiology, medicine, microbiology, immunology, neurology, pathology, pediatrics, pharmacology, psychiatry, etc.) within the Faculties of Science and Medicine and Health Sciences. This enables numerous opportunities for interdisciplinary research and collaboration. The Department conducts research on all sites of the McGill University Health Centre (MUHC), the Montreal Neurological Institute and Hospital, the McGill Life Sciences Complex, the Victor Phillip Dahdaleh Institute of Genomic Medicine, the Centre for Genomics and Policy, the Lady Davis Research Institute, the Douglas Hospital Research Centre and the Goodman Cancer Institute.

M.Sc. and Ph.D. Degrees in the Department of Human Genetics

The Department of Human Genetics offers a clinical master's program, M.Sc. in Genetic Counselling, as well as research training at both the M.Sc. and Ph.D. levels in Human Genetics. Both the M.Sc. and Ph.D. in Human Genetics research programs require the completion of a thesis, which is the major focus of the student's effort. A minimal amount of coursework is required, but specific course choices are flexible and vary according to the student's previous training and current research interest.

Most of the faculty members of the Human Genetics Department are located in McGill teaching hospitals, reflecting the medically learned knowledge at the core of human genetic studies.

Detailed information regarding faculty research interests can be found on the Department website.

The Graduate Training Committee requires that students who have been accepted into the M.Sc. or Ph.D. in Human Genetics research graduate program have a guaranteed minimum stipend, which is determined by the **Faculty of Medicine and Health Sciences Minimum Funding Policy for Thesis-based Graduate Students**. This includes a living allowance **plus the full amount of tuition, along with student and insurance fees**. Current and detailed information regarding financial matters can be found on the Student Funding webpage.

Tuition Assistance Packages

A certain number of tuition assistance packages will be offered to incoming out-of-province/international students for the M.Sc. or Ph.D. in Human Genetics thesis program who have demonstrated outstanding academic achievement. Students who have a **CGPA of 3.5 out of 4.0 or above** (as converted by the McGill GPS guidelines) and who submit an online application and documents by their respective deadline will automatically be considered for assistance. Once applications have been received by the deadline, the Graduate Training Committee will review all eligible applications and award tuition assistance to certain top eligible candidates at the time of admission into the program.

Human Genetics Admission Requirements and Application Procedures
Admission Requirements
M.Sc. in Genetic Counselling
Prerequisites

- Bachelor's or medical degree – minimum cumulative grade point average (CGPA) of 3.2 out of 4.0, or 3.4 out of 4.0 in the last two full-time academic years;
- Recent (within the past five years) university-level courses in molecular/cell biology, biochemistry, advanced genetics (preferably human), statistics, and a minimum of two courses in psychology;
- Some experience (either paid or volunteer) working with adults in a counselling or advisory capacity, ideally in a crisis setting.

For detailed information, visit the Genetic Counselling Program website.

M.Sc. and Ph.D. in Human Genetics
Prerequisites

- B.Sc. – minimum CGPA of 3.2 out of 4.0;
- A minimum of 6 credits in cellular and molecular biology or biochemistry, 3 credits in mathematics or statistics, and 3 credits in genetics.

Admission is based on acceptance by a research supervisor, confirmed funding for the duration of the academic program, and an online application evaluated by the Graduate Training Committee.

Prospective graduate students should complete the online application and indicate the name of the secured research supervisor.

Enrolment in the Bioinformatics option can only be approved after a student has been admitted into the Department. There is an agreement for the option that must be signed by the student, supervisor, and Department, and enrolment in the option is subject to space availability and other constraints that the Department cannot assess at the time of admission. For more information, please contact the Graduate Program Coordinator.

For detailed information, visit the Human Genetics program website.

Language Requirements

Applicants to graduate studies whose mother tongue is not English, and who have not completed an undergraduate or graduate degree from a recognized foreign institution where English is the language of instruction or from a recognized Canadian institution (anglophone or francophone), must submit a TOEFL or IETLS test score to McGill University. For TOEFL, a minimum score of 100 on the Internet-based test (iBT) is required, with each component scoring 20 or higher. On the IELTS the minimum standard for consideration is 7.

Note: TOEFL scores must be sent electronically by the testing agency to McGill University using our institution code of 0935. Scanned copies of results or hard copies sent in the mail will not be entered as received in your application. IELTS scores also must be submitted electronically by the test centre to McGill University.

Application Procedures

McGill's online application for graduate program candidates is available at mcgill.ca/gradapplicants/apply.

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Application Procedures for detailed application procedures.

Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Human Genetics and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at mcgill.ca/gradapplicants/how-apply/application-steps/application-deadlines.

Applications for thesis programs submitted after these deadlines may be considered, if a suitable supervisor can be secured. However, these applications will not be considered for departmental funding or entrance awards.

The **M.Sc. Genetic Counselling program** accepts applications for the Fall term only. **No late applications or applications for Summer or Winter terms for the Genetic Counselling program will be considered under any circumstances.**

Microbiology and Immunology

The Department offers graduate programs leading to the degrees of **M.Sc**. and **Ph.D**. Each program is tailored to fit the needs and backgrounds of individual students. The graduate program is designed to offer students state-of-the-art training, concentrating on four key areas of research:

- cellular and molecular immunology
- microbial physiology and genetics
- molecular biology of viruses
- medical microbiology

Basic research discoveries in microbiology may lead to improved drug design and vaccine development to treat and prevent diseases. The Department has many notable facilities and resources, including a cell sorter, ultra centrifuges, confocal microscope, real-time PCR facilities, cryostat for immunocytochemistry, and facilities for radio-isotope studies and infectious diseases. We foster close ties with McGill's teaching hospitals and research centres to promote multidisciplinary research.

Master of Science (M.Sc.) Microbiology and Immunology (Thesis) (45 credits)

The primary goal of this program is to provide students with unique opportunities to learn experimental designs and fundamental research techniques, and objectively synthesize information from scientific literature. These tools enable the students to focus on major research topics offered by the Department: molecular microbiology, mycology, microbial physiology, virology, genetics, immunology, drug design, and aspects of host–parasite relationships. Each M.Sc. student chooses their preferred major research area and research supervisor. Following an interview, the student is presented with a research topic and offered a studentship (amounts vary). Each student must register for our graduate courses (two seminars, two reading and conference courses). If pertinent to the student's research program, the research advisor may advise the student to take additional courses.

Most of our students, after one year, are proficient researchers, and some first authors of a research publication. M.Sc. students may fast-track to the Ph.D. program after three terms of residency. The remaining students advance their microbiology background by opting to enter into medicine, epidemiology, biotechnology, or pharmaceutical disciplines.

Doctor of Philosophy (Ph.D.) Microbiology and Immunology

The primary goal of the Ph.D. program is to create a self-propelled researcher, proficient in experimental designs and advanced methodologies applicable to the varied and rapidly changing disciplines in microbiology and immunology. Close research supervision and bi-weekly laboratory sessions impart the requisite research discipline and objective assessment of acquired or published research data.

A Ph.D. student, if promoted from our M.Sc. program, without submitting the thesis, is required to register for one additional graduate seminar and one additional reading and conference course, but the bulk of their time is devoted to research. Other requirements include a yearly presentation of the accumulated research data to the Ph.D. supervisory committee, successfully clearing the Ph.D. comprehensive examination, two years after registration into the Ph.D. program, and finally submission of a thesis. The research theme must be original, and the acquired data and hypothesis must be defended orally by the student. Each student receives a stipend for the entire duration and a minimum six-semester residency is required for the completion of the program.

Microbiology and Immunology Admission Requirements and Application Procedures

Admission Requirements

Master of Science (M.Sc.)

Candidates are required to hold a B.Sc. degree in microbiology and immunology, biology, biochemistry, or another related discipline; those with the M.D., D.D.S., or DVM degrees are also eligible to apply. The minimum cumulative grade point average (CGPA) for acceptance into the program is 3.2 out of 4.0.

Applicants to graduate studies whose mother tongue is not English, and who have not completed an undergraduate or graduate degree from a recognized foreign institution where English is the language of instruction or from a recognized Canadian institution (anglophone or francophone), must submit documented proof of competency in oral and written English. Before acceptance, appropriate exam results must be submitted directly from the TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing Systems) Office. An institutional version of the TOEFL is not acceptable. Applications will not be considered if a TOEFL or IELTS test result is not available.

- TOEFL Internet-Based Test (iBT): a minimum overall score of 86 (no less than 20 in each of the four components)
- IELTS: a minimum overall band score of 6.5

The TOEFL Institution Code for McGill University is 0935.

Doctor of Philosophy (Ph.D.)

Students who have satisfactorily completed an M.Sc. degree in microbiology and immunology, a biological science, or biochemistry, or highly qualified students enrolled in the departmental M.Sc. program, may be accepted into the Ph.D. program provided they meet its standards.

Application Procedures

McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/how-apply.

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Application Procedures for detailed application procedures.

All applicants must approach academic staff members directly during or before the application process since no applicants are accepted without a supervisor.

Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Supervisor Confirmation Form
- Personal Statement
- CV

Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Microbiology and Immunology and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at mcgill.ca/gradapplicants/how-apply/you-apply-mcgill/application-deadlines.

Online applications and all required documents must be submitted prior to the application deadline.

Pharmacology and Therapeutics

The Department of Pharmacology and Therapeutics offers training leading to **M.Sc.** (Thesis) and **Ph.D.** degrees.

Pharmacology is a multidisciplinary science that deals with all aspects of drugs and their interactions with living organisms. Thus, pharmacologists study the physical and chemical properties of drugs, their biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and other uses. The Department provides broad exposure and training in both basic and clinical research across various specialized areas, including:

- neuropharmacology;
- reproductive pharmacology;
- endocrine pharmacology;
- receptor pharmacology;
- cardiovascular pharmacology;
- cancer;
- developmental pharmacology;
- autonomic pharmacology;
- clinical pharmacology;
- biochemical pharmacology;
- molecular biology;
- toxicology.

The Department currently boasts 51 full and affiliate members, who have research laboratories located in the McIntyre Medical Sciences

Building and in a variety of hospitals, institutes, and industry including the Douglas Hospital Research Centre, Allan Memorial Institute, Montreal Children's Hospital, Montreal General Hospital, Montreal Heart Institute, Lady Davis Research Institute, Pfizer Canada, and MUHC Research Institute. The participation of researchers from both industry and government ensures the relevance and applicability of the Department's training programs.

Pharmacology and Therapeutics Admission Requirements and Application Procedures
Admission Requirements

Candidates are required to hold a B.Sc. degree in a discipline relevant to the proposed field of study; those with the M.D., D.D.S., or DVM degrees are also eligible to apply. A background in the health sciences is recommended, but programs in biology, chemistry, mathematics, and physical sciences may be acceptable.

Admission is based on a student's academic record, letters of assessment, and—whenever possible—interviews with members of Pharmacology Graduate Training Committee. Students are required to take the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS), except as follows: in accordance with McGill policy, only those whose mother tongue is English, who graduated from a recognized Canadian institution (anglophone or francophone), or who completed an undergraduate or graduate degree at a recognized foreign institution where English is the language of instruction are exempt from providing proof of competency in English.

Inquiries relating to all aspects of graduate study should be directed to the Graduate Coordinator (gradstudies.pharmacology@mcgill.ca), Department of Pharmacology and Therapeutics, as early as possible in each academic year.

Application Procedures

McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/how-apply.

See University Regulations & Resources > *Graduate* > *Graduate Admissions and Application Procedures* > Application Procedures for detailed application procedures.

Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Curriculum Vitae
- Personal Statement
- Two (2) confidential letters of recommendation preferably from professors or research-related employers

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Pharmacology and Therapeutics and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at https://www.mcgill.ca/pharma/students/graduate/admissions

Please refer to our website for complete deadlines.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Physiology

The Physiology Department offers training leading to **M.Sc**. and **Ph.D**. degrees. The scope of the ongoing research, and close connections with the McGill teaching hospitals, offer excellent opportunities for collaborations with hospital-based scientists. Research in the Department covers a broad range of topics from systems neuroscience to molecular and cellular biology. Interests include studies of nuclear and membrane receptors, transporters, channels, and signal transduction pathways, to the broader integration of physiological systems (cardiovascular, respiratory, renal, endocrine, immune, and central nervous systems) using an array of molecular and cellular approaches as well as quantitative techniques in data collection, analysis, and mathematical modelling by computational means.

All graduate students in Physiology receive financial support. Any faculty or associate member who agrees to supervise a graduate student who does not hold a fellowship is financially responsible for that student. Students are encouraged to apply for a fellowship; further information is available on our department's Awards and Financial Assistance page.

Physiology Admission Requirements and Application Procedures
Admission Requirements

Admission to the graduate program is based on an evaluation by the Graduate Student Admissions and Advisory Committee (GSAAC), and on being accepted by a research supervisor. Final acceptance is contingent upon approval of the recommendation of the applicant by Enrolment Services, from whom official notification will be received.

Candidates for the M.Sc. degree must hold a B.Sc. degree or its equivalent. Candidates who have completed an M.Sc. may be admitted directly to the Ph.D. program. M.Sc. students interested in a Ph.D. may fast track to the Ph.D. program after 12–18 months. The M.Sc. thesis requirement is then waived. Candidates with exceptional academic records may be considered to proceed directly to the Ph.D. degree from the B.Sc. degree.

A minimum CGPA of 3.2 out of 4.0 or a GPA of 3.4 in the last two years is required for an application to be considered.

The GRE General Test is no longer required.

Language Requirements

Test of English as a Foreign Language (TOEFL): minimum score of 86 on the Internet-based test with each component score not less than 20 OR IELTS (International English Language Testing System) with an overall band of 6.5 or greater. Only those whose mother tongue is English, who graduated from a North American institution (anglophone or francophone) or who completed an undergraduate or graduate degree at a foreign institution where English is the language of instruction are exempt from providing proof of competency in English.

Application Procedures

McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/how-apply.

See the Application Procedures page for more information.

Applications should be submitted as early as possible in order to facilitate processing. However, no applications will be considered after the application deadlines.

Additional Requirements

The items and clarifications below are additional requirements set by this department:

- Curriculum Vitae
- Two letters of reference
- Personal Statement
- TOEFL (if applicable)
- List of supervisor preferences

Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Physiology Department and may be revised at any time. Applicants must verify all deadlines and documentation requirements well in advance on the appropriate McGill departmental website; please consult the list at mcgill.ca/gps/contact/graduate-program.

Information on application deadlines is available at www.mcgill.ca/gradapplicants/how-apply/you-apply-mcgill/application-deadlines.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Interested candidates should refer to the Department of Physiology's website for details regarding application procedures, as well as other important information.

- Biochemistry (Ph.D.)
- Biochemistry (Thesis) (M.Sc.) (45 credits)
- Biochemistry (Thesis): Bioinformatics (M.Sc.) (45 credits)
- Biochemistry (Thesis): Chemical Biology (M.Sc.) (45 credits)
- Biochemistry: Bioinformatics (Ph.D.)
- Biochemistry: Chemical Biology (Ph.D.)
- Biomedical Science Translational Research (Gr. Cert.) (15 credits)
- Cell Biology (Ph.D.)
- Cell Biology (Thesis) (M.Sc.) (45 credits)
- Genetic Counselling (Non-Thesis) (M.Sc.) (48 credits)
- Human Genetics (Ph.D.)
- Human Genetics (Thesis) (M.Sc.) (45 credits)
- Human Genetics (Thesis): Bioethics (M.Sc.) (45 credits)
- Human Genetics (Thesis): Bioinformatics (M.Sc.) (45 credits)
- Human Genetics: Bioinformatics (Ph.D.)
- Microbiology and Immunology (Ph.D.)
- Microbiology and Immunology (Thesis) (M.Sc.) (45 credits)
- Pharmacology (Ph.D.)
- Pharmacology (Thesis) (M.Sc.) (45 credits)
- Pharmacology (Thesis): Environmental Health Sciences (M.Sc.) (45 credits)
- Pharmacology: Environmental Health Sciences (Ph.D.)
- Physiology (Ph.D.)
- Physiology (Thesis) (M.Sc.) (45 credits)
- Physiology (Thesis): Bioinformatics (M.Sc.) (45 credits)
- Physiology (Thesis): Chemical Biology (M.Sc.) (45 credits)
- Physiology: Bioinformatics (Ph.D.)
- Physiology: Chemical Biology (Ph.D.)
- Translational Biomedical Engineering (Gr. Cert.) (15 credits)
- Translational Biomedical Engineering (Non-Thesis) (M.Sc.A.) (45 credits)

School of Biomedical Sciences

School of Biomedical Sciences
3605 Rue de la Montagne
Montreal QC H3G 2M1
Website: mcgill.ca/sbms

Anatomy and Cell Biology

Department of Anatomy and Cell Biology
Strathcona Anatomy and Dentistry Building
3640 University Street, Rooms M21-M31
Montreal QC H3A 0C7
Canada
Telephone: 514-398-6350
Fax: 514-398-5047
Website: mcgill.ca/anatomy

Biochemistry

Department of Biochemistry
McIntyre Medical Sciences Building
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Montreal QC H3G 1Y6
Canada
Christine Laberge: Student Affairs Officer/Graduate Program Coordinator
Telephone: 514-398-2423
Email: christine.laberge@mcgill.ca
Website: mcgill.ca/biochemistry

Biomedical Engineering

Department of Biomedical Engineering
Duff Medical Building
3775 University Street, Room 316
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Telephone: 514-398-6736
Website: mcgill.ca/bme

Human Genetics

Department of Human Genetics
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Telephone: 514-398-4198
Fax: 514-398-2430
Email: dept.humangenetics@mcgill.ca
Website: mcgill.ca/humangenetics

Microbiology and Immunology

Department of Microbiology and Immunology
Duff Medical Building, Room 511

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Website: mcgill.ca/microimm

Pharmacology and Therapeutics

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Website: mcgill.ca/pharma

Physiology

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