



McGill

Department of Pathology
GRADUATE STUDIES PROGRAM

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OVERVIEW

Pathology is the specialized area of biomedical science that emphasizes the study of disease, and it is therefore one of the most multi-disciplinary fields of research. Investigators in a pathology department may be utilizing information and experimental techniques originally developed in almost any area of modern biology and, in return, may contribute new knowledge of benefit to many other disciplines. Research on disease may target any of the organ systems, in normal and abnormal conditions, and studies may be conducted from a structural, biochemical or functional perspective at any level; from the intact organism down to specific components of the individual cell.

The McGill Department of Pathology has administrative offices in the Duff Medical Building, and research laboratories in this building plus the Research Institutes of the McGill University Health Center and McGill affiliated hospitals. The University is situated in downtown Montreal, one of the most cosmopolitan cities in North America, and the large campus is located at the edge of Mount Royal, an extensive park containing nature trails, scenic lookouts and a small lake. The city has many recreational and cultural resources including museums, theatres and music varying from classical performances by the Montreal Symphony Orchestra to the outdoor International Jazz Festival held each summer. Public transportation is excellent, and affordable housing can usually be found within walking distance of the campus. McGill, rated #1 in Canada among medical-doctoral universities for ten consecutive years (*Maclean's* 2015), has about 38,500 students, including 7,700 graduate students. There is a Post-Graduate Students' Society centered in a large renovated mansion (Thomson House), which provides an elegant and congenial atmosphere for social functions and an opportunity for interaction between graduate students in all disciplines. The University has an International Student Services Office, and there are numerous student organizations participating in the language and cultural traditions from other countries.

The information below has been organized for the benefit of those who are interested in a graduate degree in Pathology and are considering McGill as a place to study. It also serves as a reference for our current students and staff. Potential applicants are encouraged to contact us directly if additional information is required.

GENERAL DESCRIPTION OF THE TRAINING PROGRAM

Aims of the Program

The Graduate Studies Program in the Department of Pathology has been designed to achieve three major goals:

- 1) To train students in the design, performance, interpretation and documentation of laboratory research by guiding them as they carry out a thesis project in one of the many sub-disciplines of pathology.
- 2) To ensure that students have a comprehensive knowledge of biomedical science, with an advanced and up-to-date understanding of pathology. In addition to the scientific component, Ph.D. candidates should also become familiar with the general principles of diagnostic pathology.
 - a. (Foreign medical graduates should be aware that this level of conceptual knowledge regarding diagnostic procedures is NOT adequate preparation for clinical employment, and those wishing to practise Pathology as a medical specialty should apply for residency training rather than graduate studies.)
- 3) To provide initial training in effective techniques of scientific communication: organizing and delivering lectures and research seminars; preparing and evaluating manuscripts and grant applications.

Beginning Graduate Studies

The program is designed to permit flexibility, so that students may begin their studies in September or January. Students from other locations are advised to arrive several weeks in advance of the fall or winter terms, to become settled before courses begin. Students within the Pathology Department initially help new international students become familiar with the city and the University upon their arrival.

Range of Research Topics

The Department offers research training in a wide variety of areas studying such topics as carcinogenesis, diabetes mellitus, asthma, atherosclerosis, immunology and transplantation, neoplasia and cell biology, pulmonary vascular and airways disease, pulmonary edema, cell differentiation, cell adhesion molecules, biomedical image processing, fetal development, neurodegenerative disorders, organ transplantation and smooth muscle pathophysiology. Modern techniques and equipment include light, fluorescence and electron microscopy (both transmission and scanning), cell and tissue culture, molecular cytogenetics, current methodologies to study immunological, pharmacological, biochemical and physiological properties, as well as morphometry and computerized image analysis.

The student population generally consists of about 10-15 candidates, approximately half of whom are from countries other than Canada. Approximately equal numbers of students register for the M.Sc. and Ph.D. degrees.

Research directors include staff members from the Department of Pathology, plus many professors from other departments within the Faculty who function as co-directors or research advisors, frequently in

collaborative research projects.

The academic environment is also considerably enriched by numerous staff members who do not directly participate in the graduate training program but are frequently conducting clinical research, and interact with members of the research laboratories during seminars, discussions and also in collaborative projects. The Department also runs a residency training program which allows residents to spend up to one year in a research laboratory as an elective. We therefore benefit from additional rewarding interactions between these candidates and our research personnel.

Master of Science (M.Sc.); Pathology (Thesis)

The M.Sc. degree prepares candidates for advanced research or supervisory positions in areas of industry, government or education dealing with health and disease. Some candidates combine their training in pathology with a second area, such as law or dentistry, giving them highly specialized areas of expertise.

Duration of Study and Allocation of Time

Students obtaining a M.Sc. degree are expected to take between 1.5-2 years. During the first year, all students will prepare a research proposal, carry out a portion of the thesis research and take the required courses. During the second year, the M.Sc. student will complete the research, deliver a final seminar, then write and submit the thesis. Throughout the duration of graduate training, all students are also encouraged to attend as many seminars as possible, both in the Department of Pathology and elsewhere.

Doctor of Philosophy (Ph.D.); Pathology

At the end of their studies, Ph.D. graduates should thus be suitably prepared to initiate a career as a university professor or as an independent research scientist in industry or government.

Duration of Study and Allocation of Time

The Ph.D. degree should normally take between 3-4 years. During the first year all students will prepare a research proposal, carry out a portion of the thesis research and take the required courses. For Ph.D. candidates, all formal course work, with the exception of PATH 701, should be completed by the end of the second year, leaving the remaining time for exclusive concentration on the thesis project. Throughout the duration of graduate training, all students are also encouraged to attend as many seminars as possible, both in the Department of Pathology and elsewhere.

REQUIREMENTS FOR ADMISSION

Applicants must have a **BSc or the equivalent degree** with an extensive background in the physical and biological sciences. An academic record equivalent to or better than a **GPA of 3.2** out of 4.0 at McGill is required, for at least the final two years of undergraduate training, with a minimum **CGPA of 3.0** overall. Students with a slightly lower GPA may be considered if they have very favourable supporting letters or have demonstrated an exceptional aptitude for research. Non-Canadian applicants are usually required to take the GRE in order to properly evaluate their suitability, and those who did not complete their previous studies in the English language must also take the TOEFL examination.

Application Procedures

McGill's online application form for graduate program candidates and detailed instructions on how to apply and how to upload required supporting documents can be found on the website for Future Graduate Students at: <http://www.mcgill.ca/gradapplicants/apply/>.

Students are normally accepted into the MSc program, and those candidates showing exceptional ability may be permitted to transfer into the PhD program after one year of training. Applicants who already possess an additional degree (MSc, MD) and have some research experience may be allowed to register for the PhD program directly.

All applications will be evaluated by the Graduate Students Committee. Candidates found suitable must then be accepted by a research director, and adequate funding must be obtained for both personal support and research expenses.

Under special circumstances, consideration will be given to requests for part-time status for a portion of the graduate training program. This would be applicable for an advanced candidate with an established career in research or education who has obtained a partial leave of absence to obtain a graduate degree.

Additional Requirements

- **PERSONAL STATEMENT** An explanation for applying to the program
- **CURRICULUM VITAE** Describing any previous research experience, listing publications, abstracts, or presentations at meetings
- **RESEARCH PROPOSAL** A clear and concise outline of the candidate's plan
(Optional)
- **GRE AND/OR TOEFL** May be required for non-Canadian applicants

Financial aid from the Department and the University is at the present time limited, and from outside granting agencies limited to Canadian citizens and landed immigrants with very high academic standings. Applicants should indicate plans for financial support.

As soon as all the required documents have been received, the application will be reviewed by our Graduate Students Committee, and you will be advised of our decision.

Current Graduate Students

For students currently enrolled in the program, documentation and information concerning courses, seminars, regulations and deadlines can be obtained from the departmental Teaching Office, and all university regulations can be found on the website for Graduate and Postdoctoral Studies at <http://www.mcgill.ca/gps/students/>.

PROGRAM REQUIREMENTS

All students must take **PATH 300** plus a course in statistics if they have not completed these requirements before admission. Candidates with insufficient background in one of the biomedical sciences will be required to take specific courses to remedy the deficiency. These and additional

courses which are relevant to the student's area of research will be chosen in consultation with the research director and Graduate Students Committee.

Master of Science (M.Sc.); Pathology (Thesis) (45 credits)

The program consists of 45 credits:

Thesis Courses (30 credits) - 30 credits obtained by laboratory work and submission of a thesis.

[PATH 690 M.Sc. Research Project I](#) (9 credits)

[PATH 691 M.Sc. Research Project II](#) (9 credits)

[PATH 692 M.Sc. Research Project III](#) (12 credits)

Required Courses (6 credits)

[PATH 620 Research Seminar 1](#) (3 credits)

[PATH 622 Research Seminar 2](#) (3 credits)

Complementary Courses (9 credits)

3 credits, one of the following courses:

[PATH 613 Research Topics in Pathology 1](#) (3 credits)

[PATH 614 Research Topics in Pathology 2](#) (3 credits)

Plus an additional 6 credits from any two graduate level courses offered by the Department. A graduate course in another department may be substituted for one of the Pathology graduate courses upon approval by the research director and Graduate Students Committee.

Doctor of Philosophy (Ph.D.); Pathology

Ph.D. candidates are required to complete courses PATH 613, PATH 614, PATH 620, PATH 622, PATH 701, Candidates will be evaluated primarily on their ability to conduct independent research and submit a thesis, which must be defended orally.

Thesis

A thesis for the doctoral degree must constitute original scholarship and must be a distinct contribution to knowledge. It must show familiarity with previous work in the field and must demonstrate ability to plan and carry out research, organize results, and defend the approach and conclusions in a scholarly manner. The research presented must meet current standards of the discipline; as well, the thesis must clearly demonstrate how the research advances knowledge in the field. Finally, the thesis must be written in compliance with norms for academic and scholarly expression and for publication in the public domain.

A Ph.D. thesis may be submitted in either of two organizational formats. The student may choose the traditional format containing five major sections: Introduction, Methods, Results, Discussion and Bibliography. In contrast, the student may initially organize the work into separate manuscripts for publication in scientific journals, in which case the thesis will consist of a General Introduction, followed by each of the individual typewritten manuscripts, then a General Discussion and Bibliography. Most of our students prefer this design.

Required Courses (12 credits)

[PATH 613 Research Topics in Pathology 1](#) (3 credits)

[PATH 614 Research Topics in Pathology 2](#) (3 credits)

[PATH 620 Research Seminar 1](#) (3 credits)

[PATH 622 Research Seminar 2](#) (3 credits)

[PATH 701 Comprehensive Examination](#) - Ph.D. Candidates

Complementary Courses (9 credits)

Three graduate level courses offered by the Department and any additional courses considered necessary by the research director or the Graduate Students Committee. Up to graduate course in another department may be substituted for one of the Pathology graduate courses upon approval by the research director and Graduate Students Committee.

COURSES

Advanced Undergraduate Course

PATH 300 HUMAN DISEASE (3 credits)

Professor E. Zorychta

The study of human disease, with emphasis on the disorders currently prevalent in North America. Cell injury, inflammation, healing, infection, immune responses, lifestyle and aging, neoplasia, disorders of the major organ systems.

Graduate Courses

The following courses are given in a variable sequence depending on the interests and requirements of graduate students enrolled in the Department. Most of the Pathology graduate courses include some practical experience and guidance in teaching, with verbal and written feedback and assessment of the student's performance.

PATH 613 RESEARCH TOPICS IN PATHOLOGY 1 (3 credits)

Professor E. Zorychta

This course consists of a series of seminars presenting recent developments in many fields of research that are relevant to the study of disease, and a different major theme is chosen each year. Speakers may include graduate students, international experts visiting McGill, as well as members of the Pathology Department and other biomedical disciplines within the University. Students will be evaluated on their ability to organize and deliver a seminar, on their participation during seminars delivered by others, and through submission of major term papers summarizing research topics presented.

PATH 614 RESEARCH TOPICS IN PATHOLOGY 2 (3 credits)

Professor E. Zorychta

This course consists of a series of seminars presenting recent developments in many fields of research that are relevant to the study of disease, and a different major theme is chosen each year. Speakers may include graduate students, international experts visiting McGill, as well as members of the Pathology Department and other biomedical disciplines within the University. Students will be evaluated on their ability to organize and deliver a seminar, on their participation during seminars delivered by others, and through submission of major term papers summarizing research topics presented.

PATH 620 RESEARCH SEMINAR 1 (3 credits)

Professor E. Zorychta and staff

During the first year of the M.Sc. or Ph.D. program (no later than nine months after registration), the student must give an oral presentation of 30-45 minutes duration to the Graduate Students Committee and other members of the Department, describing the research project that will be carried out to fulfill the thesis requirement for the degree. No experimental results are necessary at this stage. The student must demonstrate familiarity with the relevant literature, explain the significance of the proposed project, and present in some detail the methods and experimental design that will be used. The facilities available for such work must be indicated, and equipment and technical expertise must be adequate to permit estimated completion of the work within the time recommended by the Graduate and Postdoctoral Studies (M.Sc. 1.5-2 years, Ph.D. 3-4 years). A 350 word abstract must be submitted to the Teaching Office one week in advance. Written evaluations of the student's performance are submitted by the research director(s), advisors and all members of the Graduate Students Committee, and form the basis for the grade assigned.

PATH 622 RESEARCH SEMINAR 2 (3 credits)

Professor E. Zorychta and staff

During the second year of graduate studies, the student must deliver a standard scientific seminar of 50-60 minutes duration to all members of the Department of Pathology, plus interested colleagues from other disciplines. At this time, the M.Sc. student is expected to have completed all or almost all of the experimental research, and this seminar will provide an overview of the thesis to be submitted. Ph.D. candidates are expected to report on a significant portion of experimental research, describe experiments in progress and outline the additional studies needed to complete the project. A 500 word abstract must be submitted to the Teaching Office one week prior to the seminar. Written evaluations of the student's performance by the research director(s), advisors and all members of the Graduate Students Committee will form the basis for the grade assigned.

PATH 607 BIOCHEMICAL PATHOLOGY (3 credits)

Professor M. Divangahi

Immuno-Pathogenesis of Human Disease: Lectures and seminars covering a range of topics in the field of cytokine biology, the role of cytokines in disease pathogenesis and advanced molecular techniques in the expression and regulation of cytokines.

PATH 652 MOLECULAR BIOLOGY OF DISEASE (3 credits)

Professor C. Baglole

Environmental toxicants: Seminars and discussions led by experts in their respective fields will focus on cellular mechanisms by which environmental toxicants contribute to human diseases. The molecular biology of cardiovascular, respiratory, immunological and other disorders as well as various cancers will be examined in relation to toxicant exposures such as air pollution, endocrine disruptors, chlorine, dioxins, phthalates, arsenic and cigarette smoke. Mechanisms of action will be related to the broader

impact of environmental exposures on humans.

PATH 653 READING AND CONFERENCE (3 credits)

Professor J. Lavoie

Cytogenetics is the science and art of making and analyzing chromosome preparations. This course focuses on human chromosomes, although methodologies and principles apply broadly to other species as well. Basic facts and mysteries about chromosomes will be explained and discussed in the light of clinical examples.

PATH 690 M.Sc. RESEARCH PROJECT I (9 credits)

PATH 691 M.Sc. RESEARCH PROJECT II (9 credits)

PATH 692 M.Sc. RESEARCH PROJECT III (12 credits)

The Research Project courses permit assignment of credits for the experimental component of the graduate degree. Credit for course PATH 692 is received upon successful evaluation of the M.Sc. thesis.

Both M.Sc. and Ph.D. theses may be submitted in either of two organizational formats. The student may choose the traditional format containing five major sections: Introduction, Methods, Results, Discussion and Bibliography. In contrast, the student may initially organize the work into separate manuscripts for publication in scientific journals, in which case the thesis will consist of a General Introduction, followed by each of the individual typewritten manuscripts, then a General Discussion and Bibliography. Most of our students prefer this design.

PATH 701 COMPREHENSIVE EXAMINATION FOR Ph.D. CANDIDATES (6 credits)

Professor E. Zorychta and staff

The examination is conducted to verify that the Ph.D. candidate can achieve the three major goals of the graduate studies training program, namely the ability to carry out independent research, the acquisition of a sufficient base of fundamental knowledge, and the ability to effectively communicate. This examination should be scheduled when a major portion of the research work is completed and preferably before much of the thesis is written.

The student will present an initial seminar on the thesis research of 30-40 minutes duration. (An abstract not exceeding two single spaced pages in length must be delivered to the Teaching Office one week in advance). The examiners will then question the student on the research and its relationship to current scientific knowledge in relevant areas. If the extent of the research or the candidate's knowledge or ability to communicate are found to be inadequate, the examiners will recommend specific measures to be followed to remedy the deficiency. In some cases, the examiners may recommend that the candidate repeat the examination at a later date, after additional progress has been made. The entire procedure should be viewed as a positive experience, with the combined expertise of the examiners being used for the benefit of the candidate.

Examiners: Dr. E. Zorychta plus four members of the Faculty.

TECHNICAL COURSES

Short courses in such topics as the handling of laboratory animals or safe use of radioisotopes are given at McGill at various times. Some of these may be required, depending on the nature of the student's research project.

ANNUAL STUDENT SEMINARS AND PROGRESS REPORT

Departmental regulations require an annual review of the research progress of each graduate student, with submission of a written progress report signed by the research supervisor(s) and two research advisors. This report is submitted following the annual seminar delivered by the student.

M.Sc. students must give two annual seminars to the Department, which are credited as graduate courses PATH 620 and PATH 622 on their transcripts, and Ph.D. candidates must give an additional seminar in their third year during the Ph.D. comprehensive, which is also credited as a graduate course. The first seminar (620) is designed basically as a project proposal for the thesis research. At this time the student will not be expected to provide detailed experimental results, but to demonstrate a thorough understanding of the relevant literature in the proposed area of research, formulate a hypothesis, and explain the appropriateness of the experimental design and laboratory techniques to be used in examining the hypothesis. Subsequent seminars should be presented in the standard manner of a scientific report.

All students remaining in the program after these official courses have been credited (i.e., M.Sc.3, Ph.D.4 or greater) must still give an annual seminar on their research to the Department, after which their progress report will be submitted and suggestions made to facilitate the completion of their thesis. Any student in the above category in September who has completed all experimental work and sincerely expects to submit the thesis before January 1 in the upcoming academic year may request that the Department not schedule a seminar during the fall term. However, if the thesis is not submitted by January 1, the student will have to give a seminar and the Department will schedule it during the winter term.

Annual evaluation is an essential part of the graduate training program and cannot be omitted. It is particularly important in order to ensure that students receive all possible assistance to complete their thesis and receive their degree within the time recommended by the Graduate and Postdoctoral Studies.

FUNCTIONS OF RESEARCH SUPERVISORS, CO-SUPERVISORS, ADVISORS AND THE STUDENT'S RESEARCH COMMITTEE

Supervisors and Advisors

Each graduate student has a research supervisor, who is responsible for approving the design, conduct and interpretation of all research carried out by the student and approving the style and content of the thesis before it is submitted to the University. The supervisor is also responsible for providing the necessary material and facilities for the performance of the experiments. Collaboration between investigators is a frequent and productive way to deal with some of the more complex scientific problems and, therefore, it will often be appropriate for a student to have more than one research supervisor. In such cases, the co-supervisor may be from a department other than Pathology.

Students also choose two research advisors in consultation with their research supervisor, and together, these staff members constitute the individual research committee for that student. One of the advisors may be from another department within the university, when appropriate. The committee members agree to provide help and guidance to the student throughout the period of training. Research advisor 1 also agrees to read and approve the student's thesis before it is submitted to the Graduate and Postdoctoral Studies.

Student's Research Committee

This committee will meet at least once a year, at the time of the student's annual seminar, to assess the progress of the candidate and to provide advice when required. The student will provide a written abstract which will be distributed prior to the annual seminar, and the committee will submit a brief progress report afterwards, containing any recommendations felt to be necessary. Every effort should be made to see that the student completes the thesis within the recommended time. Committee members should also be willing to meet with the student at other times, if requested, for consultation, and to write the necessary letters of recommendation for fellowship applications. The research committee also considers requests for advancement from M.Sc.1 to Ph.D.2 at the time of the first annual seminar. The decision is made in consultation with the Director of Graduate Studies and is based on the demonstrated ability of the student in the laboratory, in formal courses, and in the seminar.

FUNCTIONS OF THE GRADUATE STUDENTS COMMITTEE

The Graduate Students Committee is chaired by the Director of Graduate Studies, and contains an elected group of departmental staff members who are actively involved in research and the training of graduate students. The basic responsibilities of Committee members are as follows:

- 1) To screen applicants for admission and recommend suitable candidates for acceptance. Initial correspondence with the Department is handled by the Director; suitable applicants are then referred to the Committee for review when all necessary documentation is complete.
- 2) To serve on individual research committees which monitor the conduct of graduate student research projects, and provide an annual evaluation of each student in the form of a progress report.
- 3) To serve on the evaluation committees for Ph.D. comprehensive examinations (PATH 701).
- 4) To serve on doctoral defense committees, along with additional examiners from this and other departments.
- 5) To evaluate students for fellowship applications, when required.
- 6) To debate and approve any major changes in the graduate training program.

The Director of Graduate Studies is responsible for maintaining daily operation of the graduate training program. This involves handling initial enquiries by prospective applicants, interviewing candidates, communicating with Graduate and Postdoctoral Studies, counselling graduate students, providing information to research supervisors, participating in all Ph.D. comprehensive examinations and doctoral defense committees, coordinating and setting examinations for the graduate seminar courses,

participating in the Graduate Faculty Council, communicating with members and chairing meetings of the Graduate Students Committee.

FINANCIAL REQUIREMENTS

Please check the following website for complete information on tuition fees and charges:

<http://www.mcgill.ca/student-accounts/tuition-charges/fallwinter-term-tuition-and-fees/graduate-fees>

The M.Sc. program has a minimum residence requirement of three full-time terms and the Ph.D. program has a minimum residence requirement of six full-time terms. Normally, tuition fees are only required for the fall and winter terms, and the graduate student retains full status and privileges during the summer months. Thus, a minimum time of 1.5 years or three years is normally required for the M.Sc. and Ph.D. degree respectively, and the student is expected to be present and actively working toward the degree during this time. Subsequent terms of graduate studies are referred to as additional session and the student is expected to have finished all required course work and most or all of the experimental work in the laboratory, and to concentrate mainly on completing the written thesis.

Our students find that personal and living expenses vary. There is a general guide on how much you can expect your graduate education at McGill to cost in Canadian dollars from the following website <http://www.mcgill.ca/studentaid/finances/cost>. Expenses are often minimized by sharing an apartment and resources with one or more other graduate students.

Resources

Funds for personal support and tuition fees are obtained from one of three sources:

1. Scholarships awarded to the student directly, by a granting agency or government. International students usually obtain such funds independently in advance, from their government or an international agency, while Canadian students located near McGill can receive assistance from prospective research supervisors in applying for Canadian scholarships.
2. Scholarships awarded to the student from local sources, such as hospital research institutes, differential fee waivers (for international students), faculty or departmental awards, or through research grants to the student's supervisor. These are usually obtained after the student begins graduate training.
3. Personal sources of income. This is of particular relevance to international students, as they must pay higher tuition fees, are not eligible for most of the Canadian fellowships, and require proof of adequate financial resources before Canadian immigration will grant them a student visa.

All graduate students who have not obtained funding prior to acceptance are required to apply for every fellowship for which they are eligible, until a source of funds is secured. The Department will provide all necessary assistance and advice to each student in this regard.

FINLAYSON RESEARCH DAY

The Department of Pathology holds an annual Research Day, named in honour of the late Dr. M. Finlayson, who was regarded with respect and affection by his colleagues and students during his many years as a professor at McGill University. This event includes a major seminar delivered by a guest

speaker from another university, brief research seminars by students, the awarding of a prize for the best student presentation and a departmental dinner in the evening. All department members are encouraged to participate, as this event promotes communication of both clinical and scientific information in a congenial and relaxing atmosphere.

GRADUATE AND POSTDOCTORAL STUDIES: ESSENTIAL REGULATIONS

GENERAL STATEMENT CONCERNING HIGHER DEGREES: The Graduate and Postdoctoral Studies Office administers all programs leading to graduate diplomas and higher degrees. It is responsible for the admission of candidates, monitoring regulations and student progress and for recommending to Senate those who may receive the degrees and diplomas.

Students and prospective students are encouraged to consult the website for Graduate and Postdoctoral Studies (<http://www.mcgill.ca/gps/students/>) for details regarding university regulations and policies and to consult Dr. Zorychta or the whenever assistance is required.