

Medical Microbiology and Immunology
Graduate Program Handbook
2008/2009



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1. General Information

The Department of Medical Microbiology and Immunology offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Students may specialize in the following areas: bacteriology, immunology, virology, macromolecular crystallography, or perinatal infections. The department also has interest in the areas of mycology, parasitology and clinical microbiology. Both programs require coursework, completion of a research project and preparation and successful defense of a thesis.

Staff members are currently carrying out research in various aspects of cellular, molecular, reproductive and tumor immunology, microbial pathogenesis and the development of novel methods for the diagnosis and treatment of infectious diseases.

Department members are drawn from specialists in the basic biomedical sciences of medical microbiology and immunology, applied clinical microbiology and infectious diseases. We also have members cross-appointed from other basic science departments (Biochemistry, Biological Sciences and Cell Biology) and from clinical divisions or departments (Medicine, Surgery, Nephrology, Oncology, Pediatrics and Pulmonary Medicine). Consequently, we provide an environment fostering fruitful cross-disciplinary interactions that enrich our graduate program. Major research funding comes from the Canadian Institutes of Health Research (CIHR-formerly Medical Research Council of Canada); the National Health Research and Development Programme (NHRDP); the Natural Science and Engineering Research Council (NSERC); National Centres of Excellence; the Alberta Heritage Foundation for Medical Research (AHFMR); National Institutes of Health (NIH); Juvenile Diabetes Foundation (JDF); the Howard Hughes Foundation; the Canadian Cystic Fibrosis Foundation, the Alberta Lung Association, the National Cancer Institute (NCI) and various pharmaceutical companies.

Individual staff research laboratories are well-equipped for research. In addition, there is a departmental transmission and scanning electron microscopy lab and a Level 3 biocontainment laboratory. The department also has access to confocal microscopy and fluorescence-activated cell sorting facilities, as well as laboratory animal services and microcomputer laboratories within the Faculty of Medicine. The department's research laboratories are located on the first floor of the Medical Sciences Building (which also houses the Departments of Biochemistry, Cell Biology, Medical Genetics, Pharmacology and Physiology) as well as on the sixth floor of the Heritage Medical Research Building. Additional research facilities for clinical microbiology and infectious diseases are located in the Walter C. Mackenzie Health Sciences Centre, which also houses the John Scott Health Sciences Library with its extensive biomedical collection.

1.1 Financial Assistance

Exceptionally qualified applicants who are Canadian citizens or permanent residents of Canada may be nominated for the University of Alberta PhD Scholarship, which provides a stipend and tuition fees for up to the first two years of graduate school or the University of Alberta MSc Scholarship which provides a stipend and tuition fees for the first year of

1. General Information

graduate school. Exceptional foreign applicants may be nominated by their department to receive the F.S. Chia award which pays a stipend and tuition fees for up to 2 years. PhD students may also be nominated for the Provost's Doctoral Entrance award (\$4,400 to Canadian and \$8,000 to foreign students). In MMI, students who win this award apply it towards tuition. To learn more about graduate student scholarships, please consult the Faculty of Graduate Studies and Research web page at: <http://gradfile.fgsro.ualberta.ca/awardsfunding/scholarships/recruitment/index.htm>. Entrance awards must be applied for early, so the earlier students apply, the better.

Students accepted into a graduate program are encouraged to apply for studentships through the Department to outside agencies such as AHFMR, NSERC or CIHR, etc. Admitted graduate students have the option of undertaking one or two laboratory rotations in separate supervisors' laboratories in their first term, financially supported by the department, before settling on a laboratory. In any event, all students must find a supervisor willing to financially support them from external operating grants or contracts awarded to the supervisor, and possibly students awards (see below), by January 1 (or May 1, depending on the entry date) of the first year to remain in the program. The current minimum annual stipend for all graduate students in the Department is \$19,000. Graduate student tuition fees for the duration of the student's program are paid by research supervisors, allowing students to make full use of their stipends to cover expenses other than tuition. In the case of those students who are successful in applying for scholarships from AHFMR, these studentships fund PhD students at \$20,000 and MSc students at \$18,000 per annum, renewable on an annual basis for up to five years (or three years for a MSc student), with an annual \$1500 research allowance.

In addition, there is a further incentive from AHFMR for students who are awarded a graduate studentship from another agency like CIHR or NSERC that can result in stipends of over \$25,000 for a PhD student. Students receiving major scholarships from NSERC and CIHR are also eligible to receive the Walter H Johns Graduate Fellowship (\$4435 per annum) from the Faculty of Graduate Studies and Research. If their awards are valued at \$30,000 or more, the Walter Johns award becomes honorary.

Each supervisor is responsible for finding financial support for the graduate student until completion of the degree unless the student is not making normal progress towards completing his/her degree. Examples of inadequate progress would include not maintaining the minimum grade average, unsatisfactory performance at two consecutive supervisory meetings and failure to pass the candidacy exam. The supervisor is required to support the student for up to three years for a MSc and up to five years for a PhD. The level of support should be consistent with that outlined in the CIHR guidelines (currently \$17,850) and should be paid through University-administered funds. Supervisors are also reminded that foreign students pay a 100% differential tuition fee which may be more than \$5,000 per year, depending on the number of courses taken, and should be supplemented accordingly. The supervisor will provide funds separate from the stipend amount listed above to cover the entire cost of tuition fees.

1. General Information

1.2 Scholarships

All students, if they are qualified to do so, are required to apply to outside granting agencies, such as the Alberta Heritage Foundation for Medical Research for funding as soon as it is appropriate to do so. Students with excellent academic records are encouraged to apply for NSERC awards prior to or at the initiation of the graduate program. They should also apply for any University-sponsored fellowships for which they qualify. The Department can make no commitment to the financial support of the graduate students beyond first term rotations and has no source of long-term funding for students.

Following are deadlines for some of the most commonly applied-for scholarships in the department. This is not a complete list and students and supervisors are advised to familiarize themselves with other scholarship possibilities.

AHFMR Studentships:	March 1 and October 1
CIHR MSc awards (direct)	February 15
MSc awards (through Univ.)	March 1
Doctoral Research awards	October 15
Canada Grad. Schol. Doctoral awards	October 15
NSERC awards	mid-October (must be ranked earlier)
Fac. of Medicine 75th Anniversary awards	mid-October
FGSR General awards	~ February 1 (must be ranked earlier)

2. Program Timing

2.1 MMI Student Milestones

Year One	<ul style="list-style-type: none"> • Rotating students must decide which lab to enter by December 31 or April 30 depending on the term in which they start the program. • First year students register in MMI 601 in their second term for credit. • Supervisory committee must be put in place and first meeting held some time within this year, (or at least by the anniversary date).
Year Two	<ul style="list-style-type: none"> • MSc students must make the decision to change to the PhD program by the 18 month mark (this decision must be affirmed by their committee). • PhD students (and MSc students planning to change programs) will normally register in MMI 605 in Fall term. • Students will fulfill their TAing commitment this year or next year • Candidacy exams must either be taken or scheduled by the 24 month mark.
Year Three	<ul style="list-style-type: none"> • Students who haven't yet TAed should do so this year. • Students who haven't yet taken their Candidacy exams must do by the 30 month mark. • Graduating MSc students will give a public seminar of their work prior to their thesis defense. • PhD students will normally give a mid-stream seminar in this year (can be tied to a committee meeting).
Year Four	<ul style="list-style-type: none"> • PhD students who haven't yet done so will give a mid-stream seminar early in the year (can be tied to a committee meeting). • Graduating PhD students will give a public seminar of their work prior to their thesis defense.
Year Five	<ul style="list-style-type: none"> • Graduating PhD students will give a public seminar of their work prior to their thesis defense.
Additional	<ul style="list-style-type: none"> • The university mandates that all graduate students must receive eight hours of ethics training before convocating. This should be completed through a student's program, preferably in the first couple of years. • Students wanting to complete the UTP program should take the required courses through University Teaching Services spaced throughout their programs and arrange for evaluation and videotaping while engaged in TAing and volunteer activities. • Students need to have a committee meeting at least once per year. Committee meetings can also happen more frequently and can be initiated by either student or supervisor. Students must also have permission from their committees to write up their theses. Supervisors should be prepared to call a committee meeting if after three months a MSc student, or after six months a PhD student, has not demonstrated significant progress on writing their theses.

2. Program Timing

2.2 U of A deadlines 2008 - 2009

2008—September

- 3 Classes begin
- 16 Fall Registration deadline
- 30 Fees Payment deadline

October

- 3 Last day for submission of unbound theses and Reports of Final completion for course-based Master's degrees to FGSR to ensure graduation at Fall Convocation

November

- 19-20 Fall Convocation

2009—January

- 5 Classes begin
- 16 Winter Registration deadline
- 30 Fees Payment deadline

February

- 2 Last day for submission of Graduate Studies award applications to FGSR

April

- 17 Last day for submission to FGSR of unbound thesis for students in thesis-based programs to ensure graduation at Spring Convocation

June

- 3-12 Spring Convocation

3. Guidelines for the Graduate Program

3.1 Course Requirements

To obtain a degree, a student must take at least two graduate-level courses for a MSc or three courses for a PhD. In addition, students in both the MSc and PhD programs must take MMI 601, a required seminar course that is taken for credit in their first year. In the case of PhD students, one of their three courses must be MMI 605 (MSc students may take this course but they are not required to do so). MMI 605 will generally be taken in the fall term of the second year. Students in both programs must maintain a GPA of 3.3 or more in these designated courses and in all courses taken for credit while in graduate school.

3.2 Ethics Training

All students are required to take a minimum of eight hours of ethics and academic integrity training as part of their graduate program. See Ethics form, Appendix I. (This applies to all students who entered the program from September 2004 onward.)

3.3 Selection of a Supervisor

Many students enter directly into a lab when they start their graduate programs. Those who choose to rotate should have selected a supervisor to direct the thesis project by the end of the first term. The supervisor can be anyone in MMI (or a cross-appointee who is permitted to supervise MMI grad students) and does not have to be anyone with whom rotations were done. This decision is made by mutual agreement between the student and staff member. No staff member is obligated to accept a student into their laboratory and a student must have a supervisor to remain in the program. Therefore, if a student has not found a lab in which to carry out their project by term end, they may not continue in the program.

Once selection of a supervisor is made the student must then, after consultation with the supervisor, design a suitable thesis project. This project is then presented to the student's supervisory committee for approval.

3.4 TAing Requirements

All MMI graduate students are required to serve as teaching assistants at least once. This should be undertaken in the second or third years (PhD students must be mindful of when they will be taking their candidacy exams so there is no time conflict). Students cannot TA in their first term and can do so only with permission during their second term. TAships are set up as 'teaching units'. Students may teach additional teaching units during their careers--up to two per term, but this teaching requires permission from their supervisor and it must not interfere with their work in the lab.

3. Guidelines for the Graduate Program

A teaching unit is considered to be approximately 3 hours per week X 17 weeks (one term) @ around \$30 per hour. The FGSR mandated pay for this is slightly different for MSc students than for PhD students, totaling \$1670 and \$1746 per unit respectively (2008/09 rates). Students will not be paid for the hours they spend attending the lectures for the course they are TAing, but they will have to attend so as to be aware of the material covered and where student questions may be coming from. Students will be paid for tutorial preparation, tutorial or lecture presentation time, and time spent answering student questions in person or by email. Some of the ~51 paid hours mapped to a TAship may also be spent in marking, depending on what the instructors' needs are. There will also be some money available to instructors who require marking help over and above the TA teaching unit time--this will be paid at a slightly lower hourly rate than for TAing proper and it will not count toward the mandatory TAing requirement. The 3 hours per week is an average and approximate--there may rather be a lot of intense work over a short period of time, fewer hours over two terms, or some other configuration needed for individual courses. Students will be asked their TAing preferences and where possible, they will be matched with these. However, where there is interest from several students in the same course, the coordinator will pick the student they think would be best suited to TA and therefore students won't necessarily get their first pick.

Instructors have a responsibility to provide TAs with a good experience--they must communicate expectations clearly at the beginning, give frequent feedback and provide a written evaluation for each TA at the end of the course (see form Appendix 1).

3.5 Graduate Appeal Committee

All decisions regarding the administration of graduate programs within the Department of Medical Microbiology and Immunology that impact **individual graduate students** (excluding funding issues and those issues for which there is a documented U of A appeal process, e.g.; Candidacy Examinations, Thesis Defenses and Course marks) made by the Graduate Training Committee can be appealed to the MMI Graduate Appeal Committee. It is anticipated that matters that could be referred to this committee include, but are not limited to, decisions regarding a M.Sc. to Ph.D. transition (or the time limit for this decision), the timing of a candidacy examination, selection of candidacy exam research proposal topic decisions, or exceptional requests for exemptions from or individual modifications to the Departmental Graduate Program requirements.

The Department of Medical Microbiology and Immunology Graduate Appeal Committee will consist of:

- Departmental Chair (Chair of the Committee)
- Graduate Student Representative of the Graduate Training Committee
- Chair of the Education Committee
- Member of the Graduate Training Committee

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The Chair of the MMI Graduate Appeal Committee shall be non-voting unless a deciding vote is required. In the event that one or more of the designated committee members has a perceived conflict of interest, then the Chair of the Department of Medical Microbiology and Immunology shall determine the composition of the appeal committee. The committee shall receive written submissions from the student and other interested parties and may elect to hear verbal submission from the interested parties. The Chair of the MMI Graduate Appeal Committee shall ensure that the written facts and any verbal presentations are duly received and discussed by the committee and then elicit a decision on the appeal by the committee by means of a secret ballot. The appeal will be determined to be successful by a simple majority vote. The Chair of the MMI Graduate Appeals Committee shall then minute the results with copies being forwarded to the Graduate Coordinator, Department Chair and the interested parties. The Graduate Coordinator and Graduate Training Committee shall then implement the decision of the committee.

4. Guidelines for Graduate Students and Supervisors

By undertaking supervision of a graduate student supervisors are agreeing to abide by the principles outlined in this document.

4.1 Qualifications of Graduate Student Supervisors

In the Department of Medical Microbiology & Immunology, the Graduate Training Committee recommends to the Department Chair (a) the suitability of individual Faculty members as graduate student supervisors, and (b) the suitability of individual Faculty members to sit on supervisory committees. The following are general guidelines for the qualifications of graduate student supervisors, which complement the FGSR Guidelines presented in the *Graduate Program Manual*.

1. The prospective supervisor should have a successful record of graduate supervision.
2. The prospective supervisor must have adequate time to supervise each prospective student.
3. The prospective supervisor must be capable of supervising the number of students proposed.
4. The prospective supervisor should normally have adequate research funding for the proposed project, of a type that ensures the academic freedom of graduate students.
5. The prospective supervisor must have the necessary facilities and resources available for graduate student research and provide an appropriate academic environment.
6. For prospective supervisors lacking experience in graduate supervision, a senior experienced supervisor will be appointed by the graduate training committee (with the consent of the proposed supervisor, the co-supervisor, the student and the department chair) to co-supervise the student for one year. The role of the senior co-supervisor is envisioned to be primarily one of a mentor who assists the new supervisor (when needed). Co-supervisors should have graduated at least one PhD student. It should be noted that a co-supervisor is not automatically a co-author on publications associated with the co-supervised student. As for all publications, co-authorship should reflect a significant intellectual contribution to the manuscript.

4.2 Graduate Student Financial Support

As outlined in the Financial Assistance section earlier, all supervisors are responsible for the financial support of graduate students under their supervision. It is the student's responsibility to apply for appropriate external funding and the supervisor's responsibility to facilitate those applications in a timely fashion. On the rare occasion that a supervisor has to let a student go because of financial exigency, they are not allowed to take on a

4. Guidelines for Graduate Students and Supervisors

new student for at least one calendar year. Supervisors must make students aware of their financial situation and their ability to support the student for their graduate career.

4.3 Graduate Student Supervisory Committee

At some point within a year of beginning graduate school, but certainly by the anniversary date, the student and his/her supervisor must convene a meeting of members of the student's supervisory committee. The committee is comprised of the supervisor, who acts as the chair, plus two or more academic members of the University (those who are members of the Faculty of Graduate Studies). At least one of the three should be a member of the Department. In order to keep the number of members of the candidacy examining committee and the thesis defense committee to a minimum, the Department recommends a supervisory committee consisting of the supervisor plus two members for a total of three. The choice of committee members is left to the student and supervisor, but usually members are chosen for expertise in aspects of the student's research project and must be approved by the Department and the Faculty of Graduate Studies and Research (FGSR).

The supervisory committee meets at least once yearly to review progress made both academically and in the thesis research. The student usually presents a review of research progress, courses taken and the grades obtained in these courses. Future plans, both research and academic, are then considered at the meeting. Decisions are also made for formal advancements within the program (promotion to provisional PhD status, setting the candidacy exam, approval for setting the thesis defense). Students are required to submit a progress report to committee members prior to each committee meeting; a copy of that report goes on the student's file and is available to the Graduate Training Committee.

If a student wishes to elevate from the MSc program to a PhD program (or change from the PhD program to an MSc), he/she must have permission from the supervisory committee to do so. In the case of elevating to the PhD, this decision must be made within the first 18 months of a student entering the program. If the decision is not made by that time a student will be expected to complete an MSc first, although he/she is welcome to enter the PhD program after the conclusion of the MSc.

4.4 Supervisory Committee Meetings

It is ultimately the responsibility of the supervisor to ensure that the student has annual supervisory committee meetings. Supervisors should record the events of the meeting using the departmental form "MMI Graduate Student Progress Report" (see Appendix 1). Once the form is complete and signed by the supervisor, it should be read and signed by the student and the other committee members. Both the student and supervisor should retain a copy of each committee meeting form. This will ensure that both the supervisor and the student have the same interpretation of the events of the meeting. This is

4. Guidelines for Graduate Students and Supervisors

particularly important when decisions such as when to write the thesis are made. Filling out the form can save the supervisor and student from potential conflicts later. The student should be made aware at each supervisory committee meeting whether they are making satisfactory or unsatisfactory progress. See the recommendations for supervisory committee meetings below:

1. Seven days prior to the meeting the student will provide all members of the supervisory committee with a short Progress Report. This report should be approximately four pages in length and deal succinctly with the following issues:
 - a. Background
 - b. Project objectives
 - c. Hypotheses being tested since the last meeting
 - d. Summary of research progress
 - e. Difficulties or issues that have impeded progress (if any)
 - f. Hypotheses to be tested in next 6-12 months
 - g. Append list of courses taken (or being taken) with grade attained
 - h. Copies of title page and abstract of any published papers, submitted manuscripts or abstracts written since last meeting.
2. The meeting format should generally follow the format described below:
 - a. Brief overview of student's progress by the supervisor (~5 minutes)
 - b. Student's presentation of research results (~20 minutes)
 - c. Questions and answers
 - d. Student presentation of hypothesis to be tested in the following 6-12 months
 - e. Discussion of the objectives and proposed approaches
 - f. Student presentation of proposed difficulties
 - g. Discussion of how best to deal with the issues raised above
3. The objectives of the meeting are:
 - a. Keep committee members apprised of progress
 - b. Assess the project results and progress
 - c. Define problems in the project and in a positive fashion find creative solutions
 - d. Review the project objectives and focus

4.5 Candidacy Exams and Final exams

Although supervisors cannot help students write their candidacy exam proposals, they are encouraged to advise students on good grant writing strategies and general approaches on how to select topics and how to define hypotheses. Supervisors should encourage students to talk to their other committee members, experts on and off campus and other students about their research proposal.

The thesis is a document that is also written by the student. Since a thesis may contain significant portions of manuscripts, students should have made a major contribution to the writing of the manuscripts. Supervisors are encouraged to allow the students to write

4. Guidelines for Graduate Students and Supervisors

the initial drafts of the manuscripts and the student should also be involved in the editing process. Supervisors should encourage and facilitate the completion of the degrees in a timely fashion. **It is the responsibility of the supervisor to schedule the exams and obtain appropriate rulings from FGSR.**

4.6 Equality and Respect

Supervisors should be reminded that students are fellow academics and should be treated with respect. Students should not be viewed as "a pair of hands" and supervised only on the technical aspects of their project. Students need time to study for courses, serve as teaching assistants, prepare for candidacy exams, write papers and read the literature. They should also be encouraged to participate in activities that enhance their academic experience such as attending seminars, meeting with seminar speakers, participating in the graduate student organization and attending conferences.

4.7 Expectations of Graduate Students

Students should read and follow the U of A Code of Student Behaviour found on the website at: <http://www.ualberta.ca/~unisecr/gfcPM.HTM>. MMI also expects that:

- Students will treat their colleagues in the laboratory with respect.
- Throughout their residency students will attend departmental activities such as the 601 seminar series, other research seminars, journal clubs and other activities recommended by their supervisors.
- Students will follow all safety regulations imposed by the University and supervisor.
- Students will take responsibility for meeting deadlines.

4.8 Graduate Student/Supervisor Conflicts

Because of the pressures on both supervisors and students, the relationship between them can become strained, particularly if open communication between the two is not maintained. Regular meetings between a graduate student and the supervisor, in addition to the annual supervisory committee meetings, may serve to circumvent a number of potential conflicts. Should problems arise, the first step is to sit down with the student and try to identify the source of the problem and create a solution. If this cannot be done then a supervisory committee meeting must be called and the committee should try to resolve the conflict—either the student or the supervisor may call a meeting. This should be done immediately after it is apparent that a problem exists, before it becomes unresolvable. A member of the Graduate Training Committee may attend this meeting to try to help resolve the conflict. If no decisions can be made, or if a decision is made that is not satisfactory to all those involved, the student and supervisor will then meet with Graduate Training Committee and the Department Chair to resolve the conflict. Students can also seek assistance from Student Counselling Services (www.uofaweb.ualberta.ca/counselling/) or the GSA ombudsman (www.gsa.ualberta.ca)

5. Guidelines for the Candidacy Examination

5.1 Candidacy Examination

In order to become a PhD candidate the student must pass the candidacy exam. The candidacy exam is comprehensive and addresses the qualifications of the student in terms of their ability to pursue and complete original research at an advanced level. The exam consists of two parts; 1) a written proposal and 2) an oral defense of that proposal. Thesis research is not the subject of examination. The written proposal forms the basis for the majority of the questions. The FGSR Manual provides further details on the timing and the composition of the examining committee (end of section).

All arrangements for the candidacy exam should be made by the supervisor or another designated faculty member. The candidacy exam will normally only be scheduled following approval by the student's supervisory committee documented in a committee meeting report. The supervisory committee meeting determines if the student is ready to take the exam and the general timing for the scheduling of the exam.

5.2 Timing

Students are required to take their candidacy exams within the first 30 months of entering the program. They are encouraged to take it within the first 24 months, however if the exam has not been taken at the 24 month mark, it must be scheduled at that time to take place some time within the next 6 months. The length of time that students need to write the proposal and prepare for the exam is decided between the student and the supervisor but is generally no longer than 6 weeks. Once the timing of the exam is set, a candidacy examination committee and the candidacy examination chair is selected, notice of the candidacy examination and examination committee composition is submitted to the Faculty of Graduate Studies and Research for approval at least 3 weeks prior to the proposed examination date. One week prior to the examination, it is the student's responsibility to meet with the exam chair to review the format of the exam.

5.3 Selection of Topic and Proposal

The written proposal is on a topic that is not directly related to the thesis project or any other projects currently being conducted in the laboratory or included in a grant proposal submitted by the supervisor (or co-supervisor) of the lab where the student is carrying out her/his research. The topic for the proposal is selected by the student; it can be in student's own general topic area so long as the preceding restrictions are met. After the student is approved to take the exam, his/her topic must be approved by the members of the supervisory committee. The student should submit the desired topic to the supervisory committee for approval before scheduling the exam. These should include a hypothesis and

5. Guidelines for the Candidacy Examination

only enough general background for the committee to understand the topic and the kinds of questions being addressed. It should be no longer than one page in 12 point. Committee members are to be reminded that they are just approving the direction of the project and the specific aims and methodologies are not to be approved before the examination. Specific aims need not be included since these will likely change as the student writes the proposal. If the committee feels that the first topic is either too close to the research going on in the lab or if the hypothesis is too open-ended, the student will be told to either revise the topic or select an entirely new topic. From a student's point of view, discussing the topics at a committee meeting should be of enormous value in that the discussion is the last input the student has from a core component of the examining committee about the topic before the exam itself. However, given that the timing may not allow for the approval to take place at a supervisory committee meeting, the topic can be approved by the committee through electronic discussions.

The supervisor cannot provide any input into the content of the proposal but may provide general help with grant writing skills and strategies. Although the supervisor(s) may not provide input into the experimental design of the proposal, students are encouraged to discuss their proposal with experts in the field.

Once a topic has been selected, the student will write a grant proposal consisting of a summary and a detailed research plan and should roughly follow CIHR guidelines, with the exception that it should be double-spaced. The proposal (about 20 pages, double-spaced) should include a literature survey, hypothesis, rationale, and experimental design and significance. The proposal should be realistic and should be able to be carried out by 3 people over three years (a budget need not be included). A short section on future directions should also be included. CIHR guidelines are available from your supervisor or the general office. The proposal should be submitted to members of the examining committee at least 2 weeks before the exam.

5.4 The Examination Committee

The candidacy exam committee consists of the supervisory committee plus two academic members of the University, at least one of which should be from outside the Department. The Chair of the Department nominates the extra-supervisory members of the candidacy committee (usually those recommended by the supervisory committee) by forwarding their names to the Faculty of Graduate Studies. To provide uniformity and continuity, all candidacy exams are chaired by the Departmental designated chair (or in the case of availability or timing issues, one of the two alternative designated chairs) who moderates discussion, keeps minutes of the exam, generally aids the student in completing a fair exam and files a report concerning the outcome of the examination. Since the chair is not a member of the examination committee, s/he does not vote. If not already a member of the examination committee, the Chair of the Department may participate in the exam as a non-voting member. The Dean or Associate Dean of the FGSR or the Dean's designate may attend and participate fully in the examination, but any other persons must have

5. Guidelines for the Candidacy Examination

permission of the Dean to attend the examination. The exam lasts from 2 to 5 hours, at which time a decision is made by the voting members of the committee.

5.5 The Examination

At the beginning of the exam, the chair introduces the student and explains to the student and committee how the exam will be run, specifying the sequence of the events, the number of rounds of questioning (generally two), the order of questioning (generally starting with the external examination committee member, followed by the departmental examination committee member who is not a member of the supervisory committee and followed by the committee members and finally the student's supervisor), and length of time of each examiner has for each questioning in each round. The candidate will then be asked to leave the room and the committee will review his/her undergraduate background and graduate coursework. (Note: There is no substantial input from the supervisor at this time—the discussion of the student's research progress to date will occur at the conclusion of the exam). The student is then asked to re-join the committee and the examination begins. The role of the examination chair is to moderate the examination, ensure a fair examination process, chair the discussion of the exam after the student has left the committee to its adjudication, and then record and report the results of the examination to the student and to the department. To start off the examination, the student will present a 10-15 min. summary of the proposal. The first round of questioning (about 15 min. per examiner) is usually related to the proposal. The subsequent round(s) of questioning can be related to the proposal or be more comprehensive in nature. With this type of exam, essentially all of the questions are often related in some way to the proposal. However, examiners are also invited to ask questions that they feel should be in the student's knowledge base. With this type of questioning, examiners are not trying to determine if the students are able to recite information but rather if they are able think "on their feet" calling upon their knowledge base when necessary. Students will not be given subject areas to study but are expected to be able to answer more general questions in their research area.

The goal of the examination is to determine if the student is able to identify important questions, generate hypotheses, propose experiments to test the hypotheses and interpret data. A certain amount of basic knowledge is required to do this effectively, but one need not be encyclopedic in their background information. This means that to prepare for the examination, one should not memorize the contents of textbooks, but instead read primary research papers and understand why experiments were done, what experiments might be done to better answer the question and what the next step might be.

5.6 Evaluation of the Examination

At the conclusion of the examination the candidate will be asked to leave the room while the examiners discuss the following questions in the context of the candidate's thesis research progress. The following are some of the expectations that should be met for students to proceed as PhD candidates.

5. Guidelines for the Candidacy Examination

- 1) The student should be able to identify an important question and formulate a testable hypothesis.
- 2) The students should have the ability to assess published data. The student should have based their proposal on solid data and not a single, poorly controlled paper. The student should be able to assess the quality of published data referred to in their proposal.
- 3) The student should be familiar with the references that they cite in their proposal. For references to methods, as well as unreferenced methods, the student should be aware of the technical requirements, strengths and weaknesses, and be able to defend the selection of method(s) in comparison to alternatives. Students should be aware that they should never cite a reference that they have never read.
- 4) The student should demonstrate experimental design capability. The majority of the experiments that the student proposes should be feasible and lead to interpretable results. The experiments should also address the proposed hypothesis and extend the knowledge of the field.
- 5) The student should be able to analyze data. They should also be able to predict possible outcomes of experiments and identify possible interpretations of these experiments.
- 6) The student should understand basic concepts in their field and display good breadth of knowledge.
- 7) The student should have effective communication skills.
- 8) Examiners always try to find the extent of the student's knowledge to determine if the student is able to "think on their feet". It is understood that the student will not know all of the answers to the questions, but they should be able to make predictions based on what they know about other related systems.

Students who are deficient in some areas but demonstrate excellence in other areas should be provided with specific recommendations for areas of improvement.

Following the discussion of the student's performance, the chair will poll the examiners by secret ballot to arrive at an initial outcome for the examination. This serves as a starting point for discussion. The ballots are then destroyed. In the event that the examining committee cannot reach consensus concerning the outcome of the examination, the chair will then conduct a second written ballot to decide the outcome. Normally, if all but one member of the committee agrees on a decision, the decision shall be that of the majority. In accordance with Faculty of Graduate Studies and Research regulations, if there are two or more dissenting votes, the matter is referred to the

5. Guidelines for the Candidacy Examination

Associate Dean of the Faculty of Graduate Studies and Research for determination of the appropriate course of action. If the examining committee considers the student's performance to have been satisfactory, it will recommend that the student be passed, in which case his/her status is changed from "Provisional Candidate for the Ph.D. Degree" to "Candidate for the Ph.D. Degree". The Chair of the Candidacy Examination Committee will submit a report on the examination to Graduate Coordinator and/or the Chair of the Department.

In the event that the student passes the examination the Graduate Coordinator and/or the Department Chair submits a Report of Completion of Candidacy or Final Oral Examination form to the Faculty of Graduate Studies and Research to change the student's category from provisional candidate to candidate for doctoral degree. The Faculty of Graduate Studies and Research will then act on the departmental request.

In the event that the student is deemed to have conditionally passed the Candidacy Examination, the Chair of the Candidacy Examination will submit the report to the Graduate Coordinator and the Department Chair and inform them in writing as to the basis for the decision, specific requirements, timeframe, the approval mechanism and the supervision and assistance the student will receive. Following a review of the Candidacy Examination Chair's report, the report will be submitted in writing to the Associate Dean of the Faculty of Graduate Studies and Research. The department will hold the Report of Completion of Candidacy or Final Oral Examination form until the committee agrees that the conditions have been met.

In the event that the student is deemed to have failed the Candidacy Examination, the Chair of the Candidacy Examination will submit the report to the Graduate Coordinator and the Department Chair and inform them in writing as to the basis for the decision.

The Graduate Coordinator, the Chair of the Department, and the student's supervisor in consultation with the Graduate Training Committee will establish the Department's recommendation concerning the student's program. The Departmental recommendation concerning the student's program will be submitted in writing to the Associate Dean of the Faculty of Graduate Studies and Research and the student. Normally, the Associate Dean will then meet with the student and departmental representatives before acting upon any departmental recommendation. A decision that affects the student's academic standing (i.e., required to withdraw or transfer to a master's program) can be appealed.

The following options are to be considered by the examining committee when the outcome of a candidacy exam is 'fail'. The student can be given the opportunity to repeat the Candidacy exam, if his or her performance and work to date indicate the ability to perform at the doctoral level. If a repeat Candidacy exam is recommended (and approved

5. Guidelines for the Candidacy Examination

by FGSR), the student must be informed of his/her exam deficiencies by the exam committee Chair and the second exam must be scheduled no later than three to six second months from the date of the first candidacy exam. In the event the student fails the exam, the examining committee should recommend either that 1) There be a Change of Category to a MSc. program (assuming the student has shown the potential to successfully complete such a program) or 2) The doctoral program be terminated

Following the deliberations, the candidate is invited back into the room and the Chair informs the candidate of the outcome of the examination. In the event that there are conditions or concerns raised by the examination committee, these concerns and/or will be communicated clearly to the student. Then following the examination, the Examination Chair will file the appropriate report on the examination with the department.

6. Guidelines for the Final Examination and Thesis Defense

6.1 The Final Examination and Thesis Defense

When a student has completed the research project and has a body of publishable data, the student should, after approval by the supervisory committee, begin writing the thesis. Students are strongly encouraged to have at least one publication or the data equivalent to one publication before the completion of a MSc and generally three publications before completion of the PhD. At a minimum, one of these PhD publications should be a first-author paper in press prior to the final examination.

The Faculty of Graduate Studies (FGSR) suggests that you write the thesis in one of two formats, traditional or paper-based, but FGSR requires both types to have a general structural format (structure of the thesis, paper, margins etc). These structural features will be checked by FGSR when you hand in your thesis and guidelines are available from FGSR. In addition, the MMI Department has a few other guidelines for both thesis formats that are more specific to this field. (1) We don't allow 'data not shown' to appear in the thesis. If a fact is important enough to cite data, the data should be shown for reviewers to examine. (2) The methods section of a paper-based thesis might have to be expanded to include all experimental protocols. (3) Since a result is often the efforts of several people, we would like to know who did what. This information should be added to the first page of a results chapter. (4) We would like a full bibliography with all names listed.

The Department encourages publications but recommends, essentially, a traditional thesis: one with an introduction, a hypothesis and approach chapter, a methods chapter, results chapters (with or without an introduction and a discussion) and a discussion and future directions chapter. If written in this manner, examiners will know that much of the writing is the student's and it allows easy evaluation, by external examiners, of the work carried out. It is more efficient in terms of paper because all the methods and all bibliographies are united and can be easily found.

The time line for convening the final examination committee meeting is important to consider: for a PhD thesis, a lead time of two months before the exam date should be allowed for the Faculty of Graduate Studies to approve of a prospective External Reader or Examiner (who is nominated by the Department Chair usually upon the recommendation of the supervisor). There is no external reader or examiner from outside of the University for a MSc thesis. The thesis should be distributed to the supervisory committee six weeks before the final exam so that revisions can be made before it is sent to the External Examiner (four weeks before the exam). Before the thesis is forwarded to the External Examiner, supervisory committee members must submit in writing (see Appendix 1 for form) that the thesis is of adequate substance to warrant a final examination; no date is to be set with FGSR until committee approval is received. The interpretation endorsed by the Department of Medical Microbiology and Immunology is that the thesis is of a textual quality equivalent to that of a manuscript being submitted for publication to a high quality journal and that the committee members are comfortable

6. Guidelines for the Final Examination and Thesis Defense

with the scientific content of the thesis (i.e., the signature on the departmental form attests that the committee members do not feel that major changes to the content of the thesis are necessary, thus a committee member would not sign a form approving the thesis if (s)he felt a chapter should be deleted or if (s)he felt that additional data was required). If the committee does not unanimously approve the thesis, the graduate student may appeal that decision to the Graduate Training Committee. The student should be aware of deadlines to be met for submitting the final document to the Faculty of Graduate Studies for spring or fall convocations. According to FGSR policy, the final PhD examining committee will consist of the supervisory committee, to which at least two members are added for a minimum total of five. For a MSc examining committee the minimum number of examiners is three. At least one member must be from another department and be at "arms length" from the thesis project or the supervisor's projects. The second extra supervisory member can be an External Examiner (from outside the University), or if an External Reader is chosen (an external examiner who does not attend the exam, but who submits comments to the committee), any other faculty member recognized by the Faculty of Graduate Studies. The External Examiner or Reader is initially identified by the student and supervisor. Supervisory committee members should then be consulted. The supervisor contacts the potential examiner to determine whether they would be prepared to act as an examiner for this thesis and determine approximate dates for the thesis defense. It is important that there is no direct contact between the student and External Examiner or Reader between the time that the External is identified and the defense. The Department of Medical Microbiology and Immunology then nominates the potential External Examiner or Reader to the Faculty of Graduate Studies and Research who approve the nomination and defense date. The nomination requires a CV of the potential examiner that documents the examiner's research competence and experience in supervising graduate students at the Ph.D. level. A lead time of two months before the exam date should be allowed for the Faculty of Graduate Studies to approve a prospective External Reader or Examiner. The department must submit to the Faculty of Graduate Studies and Research at least 3 weeks prior to the defense date a Notice of Approval of Oral Examination Committee form.

The final exam is chaired by a departmental designate who is not a member of the examination committee and who is present to moderate discussion and record the minutes of the exam. Since the chair of the examination is not a member of the Examination Committee, s/he does not vote. If not already a member of the examination committee, the Chair of the Department may be a non-voting participant. The Dean of FGSR may appoint a pro Dean who acts as the Dean's representative and is a full voting member of the examining committee. The main function of a pro Dean is to assure the proper conduct of the examination.

A candidate is required to present a public seminar based on the thesis, usually just prior to the final exam. MSc students will preferably present their seminars in the Friday noon MMI 601 time slot. Members of the examining committee must attend the public seminar and any member of the University community is free to attend the seminar and question the candidate on any aspect of the presented research during the question period

6. Guidelines for the Final Examination and Thesis Defense

following the seminar. The chair of the examination will moderate the question period so that it does not result in the discussion of material that is more appropriate for the examination. The presentation plus questions for a PhD seminar is generally approximately one hour long. Members of the examining committee (including the supervisor) must refrain from questions and comments during the presentation and question period.

Immediately after the seminar, the examining committee convenes for the examination which usually lasts two or more hours. Exam questions usually are concerned, but not exclusively so, with the thesis. The questions are set to enable the committee to form an opinion on the quality of the candidate's thesis work as well as his/her capability to comprehend its significance in the context of the field. Thus, both the document and the candidate are being examined. The supervisor usually does not participate in the questioning in the final exam. The committee can approve the thesis, approve the thesis with minor modification, adjourn, or reject the thesis. All modifications have to be completed within six months of the original examination date.

6.2 Teleconferencing and Attendance of Examiners at Thesis defenses

All examiners must be present at the thesis defense (for both the M.Sc. and Ph.D. defenses) and if they are unable to attend the defense, the defense cannot proceed and must be deferred until such time as all examiners can be present.

The presence of all examiners “in person” is however not necessary if prior arrangements are made to allow an examiner (frequently the External Examiner in the case of Ph.D. defenses) to participate in the defense through either teleconferencing or videoconferencing. Departmental experience with teleconferencing during thesis defenses is reasonably positive recognizing that the teleconferencing examiner does not have the opportunity to visually inspect diagrams or documents that are produced during the examination. However, it is generally recognized that the active participation of an examiner during the thesis defense is preferable to the function of an External Reader and the ability to be more flexible in scheduling defense dates can be a significant factor.

6.3 Results of Thesis Examinations

The committee can approve the thesis, approve the thesis with minor modification, adjourn the defense to a later date, or fail the thesis and defense. The thesis defense is adjourned in the case where the required revisions to a thesis are major (more research is required or a major re-structuring or re-stating of the thesis is required), the committee is dissatisfied with the candidate's oral presentation and defense (even if the thesis is acceptable with or without minor revisions) or there were exceptional circumstances such as a medical emergency during the examination. Normally, if all but one member of the committee agree on a decision, the decision shall be that of the majority. The dissenting committee member does not have to sign the thesis. If the defense is adjourned or the

6. Guidelines for the Final Examination and Thesis Defense

thesis is failed, or there are two or more dissenting votes, the Chair will provide the reasons in writing to the candidate, the Graduate Training Committee, Chair of the Department of Medical Microbiology and Immunology, and to the Faculty of Graduate Studies and Research. The guidelines established by the Faculty of Graduate Studies and Research will then be followed. In the event that the defense is adjourned the examination must be re-convened within 6 months and a final decision made by the Examination Committee. In all cases where the candidate encounters significant difficulties in the thesis defense, the situation will be reviewed closely by the Faculty of Graduate Studies and Research. The Faculty of Graduate Studies and Research will consult with the Department of Medical Microbiology and Immunology and the candidate before a final outcome is determined by the Faculty of Graduate Studies and Research. The final decision can be appealed through Faculty of Graduate Studies and Research procedures. (See following pages from the FGSR manual for further information).