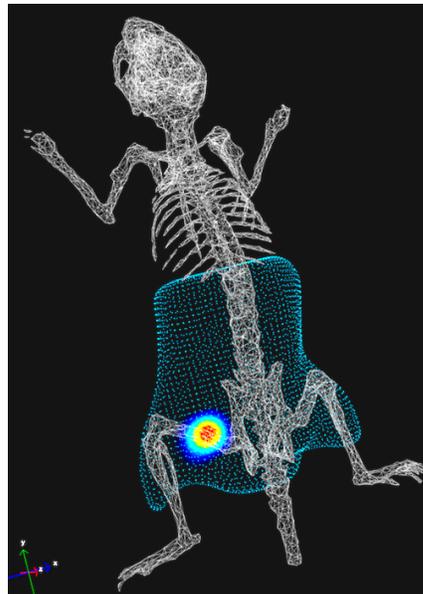
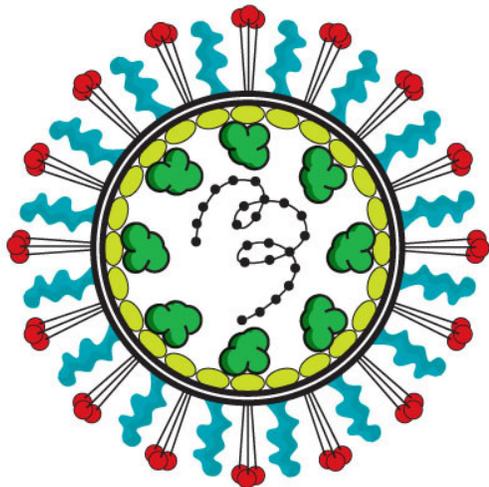


MICROBE-HOST INTERACTIONS GRADUATE PROGRAM HANDBOOK FOR STUDENTS

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INTRODUCTION

History

The Microbe-Host Interactions (MHI) Ph.D. program was conceived in 2016, with its inaugural class joining in 2017. MHI was born out of the former Microbiology and Immunology Ph.D. program, which operated since its founding in the early 1990s. The goal of the MHI program is to train aspiring scientists with interests in the area of the biochemistry and molecular and cell biology of microbes, including bacteria and viruses. While much of the research in faculty laboratories is on interactions of pathogens with their hosts, the program also encompasses research in microbiomes, including normal host flora. The program also trains students whose research interests include immune control of infections. Students interested aspects of immunology and pathology distinct from microbial infections are encouraged to undertake their training in our sister program, Molecular Pathology and Immunology (MPI).

Training Philosophy

MHI aims to maintain a high standard of student performance while providing an encouraging and supportive environment. Our goals are to help students master the information content in their specific research discipline (e.g. bacteriology, virology) and to foster development of skills necessary to make important scientific discoveries. As in all research, the latter requires curiosity, critical thinking, and creativity. We also desire that our students be highly productive (i.e. publish well).

MHI students spend their initial summer and fall terms learning in the classroom while working toward developing an original research project in the laboratory. In the subsequent Spring semester, students choose from a variety of modules tailored toward their own research areas while learning how to write a research proposal on a subject of their choosing. Following completion of the oral Qualifying Exam and approval of the written thesis proposal, students pursue full time research toward the degree with biannual committee meetings to assess their progress.

While the primary goal of the MHI program is to provide an environment that equips and encourages students to become independent researchers, the faculty understand that our graduates choose to pursue a wide variety of fulfilling careers outside of research. For this reason, we encourage our students to explore all career options available to Ph.D. scientists.

The Program's Graduate Education Committee and faculty monitor all components of our graduate program to gauge its effectiveness and make adjustments when deemed necessary. Consequently, our graduate program can be tailored to provide the optimal balance of didactic, literature-based, and technical training for each student.

ADMISSION TO THE PH.D. PROGRAM

Students enter the MHI program following completion of one year of studies in the Interdisciplinary Graduate Program or the Quantitative and Chemical Biology Program (QCB), or completion of 1-2 years of coursework in the Medical Scientist Training Program.

Most students enter The Graduate Program in Microbiology and Immunology (GPMI) via the Interdisciplinary Graduate Program (IGP) or Medical Scientist Training Program (MSTP) at Vanderbilt University. The GPMI recognizes the rotation guidelines of the IGP and MSTP and encourages students to select rotations that suit their needs, either in exploring the laboratory environment of a potential mentor or in gaining exposure to a technology or conceptual framework of interest. The main purpose of flexible lab rotations is to gain first-hand experience in state-of-the-art methodologies applied to the solution of research problems. In addition, students have the opportunity to gain insight into the working environment and personalities of potential Ph.D. thesis advisors so that a satisfactory match can be made between student and advisor.

After students complete the required rotations, they select an advisor's laboratory for their dissertation research by late spring or early summer of their first year. This is probably the most important decision made by a student at this stage of their professional education. The choice of a faculty mentor should be based on an informed analysis of the student's intellectual needs and preferences. This choice may therefore be discussed with the MHI Program (DGS), the Division Chief and Department Chair, and the IGP, QCB, or MSTP Director.

The final selection of a mentor for Ph.D. dissertation research must be approved by the Microbiology and Immunology Graduate Education Committee (GEC) in the Department of Pathology, Microbiology and Immunology (PMI). The proposed mentor must submit formal notification to the Director of Graduate Studies of his/her intention to train a graduate student. The notification letter should include: 1) the nomination of a specific student, 2) a proposed research project for the student (3-4 sentences), and 3) a source of funding for the student's stipend and tuition.

Another avenue exists for students to enter the GPMI. Faculty may recruit a student to enter his/her laboratory directly. Such students participate in the graduate program offered to each IGP student but may bypass the rotation period and enter the sponsoring faculty member's laboratory immediately upon the student's arrival at Vanderbilt. In this case, the mentor shall provide full financial support for the student's tuition and stipend costs.

Requirements for the Ph.D. in Microbiology and Immunology

24 didactic hours All Vanderbilt Ph.D. students must complete 24 didactic (coursework) hours and maintain a 3.0 or better GPA in order to take the Ph.D. Qualifying Exam.

72 total hours To be awarded the Ph.D. degree, students must complete total of 72 credit hours. This includes the total didactic hours with the remainder comprised of M&IM 8999 and 9999 (Non-Candidate Research and Ph.D. Dissertation Research, respectively).

Upon completion of 72 total credit hours, students register for 0 hours of Research (9999).

Required Courses

IGP Requirements (does not apply to MSTP)

IGP 300A Bioregulation I – Core Curriculum, FALL [8]

IGP 300B Modules and Electives [4-8]

MSTP Requirements

1-2 years of Medical School, with corresponding transfer credits

Year 2 M&I Coursework

MHI students must complete the following courses before taking the Qualifying Exam:

Summer of 1st year (**required course**):

M&IM 8332 Foundations in Microbiology and Immunology I, SUMMER [2] Cassat
(Not required for students entering via the MSTP)

The objective of this course is to familiarize learners with core concepts in immunology, microbiology, and virology. The course is divided into 10 week-long sessions in which a core component of mammalian immunity is introduced, followed by an examination of how microbial pathogens evade or dismantle the immune response.

Fall of 2nd year:

Students must complete one or both of the following courses:

M&IM 8328. Molecular Virology. FALL. [2] Ruley

This course focuses on interactions of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis is placed on current literature and methodology.

M&IM 8350. Bacterial Pathogenesis FALL. [2] Hadjifrangiskou

The objective of this course is to provide learners with in-depth knowledge on core concepts of bacterial physiology in the context of pathogenesis. Students will become acquainted with core bacterial processes and how these processes are engaged and altered during the course of infection, as well as changes in the environment (man-made and not).

Spring of 2nd year (**required courses**):

M&IM 8334 Foundations in Microbiology and Immunology III, SPRING [2] Aiken, Lacy
This course aims to equip learners with high level knowledge of their respective areas of research, with an emphasis on the primary research literature and experimental approaches. The course is organized in a series of topic modules from which the student selects to generate a learning plan that is tailored to their specific research interests. Self-directed study is emphasized.

M&IM 8335 Research Proposals: Preparation & Critical Review, SPRING. [2] (Ruley)
An essential skill for scientists in an academic setting is the ability to obtain extramural research funding through peer reviewed grant applications. This course will offer didactic sessions in which the process of preparing and reviewing grant applications is discussed. Each student will write a grant application using the NRSA format for postdoctoral fellowships. The student should propose research in one of the four major emphasis areas of the department: molecular pathology, virology, immunology, or microbial pathogenesis. A student and a faculty member will provide a written review for each of the final grants. The course will conclude with a mock NIH study section in which each grant is reviewed orally and scored.

Students who earn a grade lower than a B in a required course may be required to retake the course to be approved to take the Qualifying Exam. In this event, the student's mentor will meet with the Program Director to make this determination.

Students must review their didactic coursework hours with the Program Director prior to registration for the Fall semester. Students who have an insufficient number of credit hours from the IGP will be required to take additional electives to be approved to take the Qualifying Exam.

Elective Courses

Elective courses are chosen by the student and advisor to best fit their research program. Graduate level courses outside of the Department that fit the student's research program may fulfill the 24 didactic hour requirement. Please consult with your advisor and the Director of Graduate Studies prior to registration if you wish to take an elective course outside of the Department.

Reading List (due April 1)

Each student shall submit a mentor-approved reading list to the GEC by April 1 of his/her second year. This document shall list the authors, titles, and journal citations of at least 50 primary papers and reviews selected to enhance the student's understanding of their research project, related concepts, and relevant techniques. Papers on this list should be chosen in collaboration with the student's mentor, and the mentor should indicate by signature or email to the Director or Graduate Studies that s/he has approved the list. Students are highly encouraged to thoroughly study these papers in preparation for the Qualifying Exam. The scientific knowledge provided by a thorough reading of these papers on the list should significantly aid the student in the development of the Research Proposal and in the selection of faculty to serve on the thesis committee.

By **June 1**, students shall submit an **Annotated Reading List** in which the original list has been updated with a sentence or two describing the major findings and significance. The format of this should be similar to that used in reference lists in Current Opinions review articles.

Pre-Qual Meeting (August 1)

The Pre-Qual meeting should be held before August 1 of the second year of graduate studies. This meeting is intended to provide faculty feedback on the student's research prior to the Qualifying Exam and first Research-in-Progress seminar, and to encourage students to begin discussing their research projects with faculty other than their advisors. Students select two or three faculty in addition to their advisor and scheduling the meeting (checking with the Educational Coordinator to avoid departmental conflicts). At the meeting, the student will give a presentation approximately 30 minutes in length, allowing 30 minutes or so for discussion so that the meeting can be completed within one hour. **The focus of the presentation should be on the experiments the student has performed in the laboratory and possible Specific Aims for a Thesis Proposal.** The presentation should provide sufficient background information that the committee can understand the data and/or Specific Aims that are presented, but a heavy emphasis on background material is discouraged. The **Research Advisor** will serve as moderator of the meeting to ensure it runs smoothly and is completed in a timely manner. Although the Pre-Qual meeting is not an examination, the mentor should send a brief report of the meeting to the Director of Graduate Studies following the meeting, stating any concerns regarding the student's readiness to develop his/her research proposal. A template form is available for this purpose. Any apparent issue that may affect a student's ability to take the Qualifying Exam should be discussed with the DGS.

Ph.D. Committee (selections due by August 15)

Each student shall select a Ph.D. Dissertation Committee consisting of four or five graduate faculty members other than the student's research advisor. A form will be provided for this purpose. Two to four faculty members should have appointments in the Department of Pathology, Microbiology and Immunology (including the advisor). The Graduate School requires that at least one of the committee members not be a faculty

member who trains students in the student's home program (Microbiology and Immunology). However, such persons may be faculty in the Department of Pathology, Microbiology and Immunology. Clinical faculty may serve on committee meetings with approval from the DGS and the Graduate School. Faculty from other institutions may serve on the committee, but they must be approved by the GEC and be available to attend the Qualifying Exam, committee meetings, and Dissertation Defense. Unfortunately, the Program cannot support the travel expenses of such members.

Once approved, the Ph.D. Dissertation Committee functions to:

1. Conduct the Qualifying Examination.
2. Provide guidance during the development of the student's dissertation research via biannual Thesis Committee meetings.
3. Approve the subject of the dissertation.
4. Read and approve the written dissertation.
5. Administer the dissertation defense.

Each student must submit a list of proposed committee members (approved by the mentor) **and an Abstract/Specific Aims page describing the thesis project to the DGS by August 15** of the third year of graduate study. The format of the document shall be similar to that learned in the required Research Proposals course completed in the second year of graduate study. The GEC will evaluate the proposed committee for each student and may recommend substitutions or additions. The student may appeal this recommendation by writing a letter to the Director of Graduate Studies further justifying the original selections. Any real or potential conflicts of interest, such as committee members who are also collaborating with the mentor, or authority relationships between mentor and other committee members, must be disclosed to the Director of Graduate Studies and a plan for managing such conflicts provided by the mentor.

When the proposed Dissertation Committee is approved by the GEC, the student and mentor are notified, and the information is forwarded to the Dean of Graduate Studies and Research for official appointment of each member. At this juncture, the student shall distribute the proposed Abstract / Specific Aims to the committee members for consideration. It is strongly recommended that the student meet with each member of the committee to discuss the Aims prior to developing the Thesis Proposal. **Students should obtain evidence of approval of their Abstract / Specific Aims by each of their committee members by September 15** of the third year. **A date for the QE should be set by October 1 of the third year and the QE must take place by November 1** of the third year. As final preparations are made, **the date, time and location of the QE must be submitted to the Education Coordinator at least three weeks in advance of the examination.** If the student finds it impossible to schedule the Qualifying Exam by Nov. 1, the mentor shall inform the DGS of the reasons for this and request permission for late

administration of the QE.

Qualifying Examination

The purpose of the Qualifying Examination (QE) is to test: the student's knowledge in their field of specialization and critical thinking and analytical skills.

The examination is conducted by the student's Ph.D. committee. The exam requires the student to submit a written dissertation proposal, followed by an oral defense of the proposed thesis. One purpose of the examination is to ensure that the student, advisor, and thesis committee have well-defined concepts of what the dissertation project involves and how it will be conducted. This should prevent such unfortunate situations as: 1) The student floating from project to project for several months or years with only a vague notion of his/her objectives and 2) the dissertation committee belatedly recommending major changes in direction after one or two years of work by the student.

The major criteria employed by members of the Dissertation Committee while conducting the examination include the ability of the student to pose a scientific question, formulate hypotheses, develop reasonable strategies to test a hypothesis, anticipate experimental outcomes, and accurately interpret these potential outcomes. Acquisition of such skills is a crucial prerequisite for success in any scientific environment and must be developed and evaluated.

After the date for the QE is set, the Education Coordinator will communicate this information to the Graduate School (at least three weeks prior to the exam). **A copy of the proposal must be given to each member of the Committee at least one week in advance of the scheduled exam.**

Format of the QE

The QE is based on the written dissertation proposal submitted by the student and their understanding of the project and relevant scientific literature. The exam includes an oral presentation and discussion of the problem under study within the context of the specialized field of research (see next section). The student shall meet with their Committee Chair prior to the QE to discuss the expectations and process of the examination. Typically, the chairperson will ask the student to prepare a presentation of approximately 30 minutes in length. The committee will ask questions throughout this presentation for 90 minutes, about background, experimental approaches, protocol design, statistical analysis, anticipated outcomes and interpretations. Following the oral questioning, the student leaves the room while the committee determines the outcome of the QE.

If the student is passed at the QE, s/he becomes a Ph.D. Candidate. This is not an "automatic" step in graduate education. Rather, it is an objective of the formal examination to discern whether a student can go beyond a satisfactory performance in didactic course work (grade point average of 3.0 or better) and competently articulate hypotheses, outline research strategies, anticipate experimental outcomes, and provide well-reasoned and

accurate interpretations. Until the Thesis Committee is satisfied that these objectives have been met, candidacy will not be granted. Disapproval of the proposal or an inadequate performance by the student in the oral examination may necessitate a redrafting and second defense of the student's proposal. Failure by the student to pass the QE on the second attempt will result in dismissal from the Ph.D. program. Upon successful passage of the QE, the Ph.D. Dissertation Committee recommends the student for candidacy by forwarding the results of the QE to the Dean of the Graduate School. The Chairperson of the committee shall provide a signed copy of the exam outcome to the Educational Coordinator immediately following the QE.

Research Proposal

Before beginning work on the Abstract/Specific Aims page, the student and advisor should thoroughly discuss the direction that the thesis work will take and how the stated objectives will be achieved. The involvement of the advisor at this planning phase is essential, as it represents a critical component of the mentor-junior scientist dialogue that should continue throughout the dissertation research. Although a cooperative effort between student and advisor is strongly encouraged during the development of ideas, **it is the responsibility of the student to write and defend the thesis proposal. While the advisor may review the student's document prior to submission to the Committee, the document should primarily represent the work of the student, not the mentor.** Prior to the examination, the mentor will be asked to comment on the level of input provided to the student during the preparation of the proposal.

The written Research Proposal shall be no more than 10 pages in length (excluding references), single-spaced, with margins no smaller than 0.5 inch. The requirements below were adapted from the Instructions for PHS 416-1 (Application for the Ruth L. Kirchstein Individual NIH Postdoctoral Fellowship Application).

1. Title: Choose a descriptive title that is specifically appropriate.
2. Specific Aims (one page): List the broad, long-term objectives and the goal of the specific research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.
3. Background and Significance (1-2 pages): A brief sketch of background material pertinent to the proposal, a critical evaluation of existing knowledge, and identification of specific gaps that the project is intended to fill.
4. Preliminary Studies (1-3 pages): The student should summarize their preliminary results that are relevant to the thesis proposal. The significance of these results should be interpreted in the context of the student's hypothesis.
5. Research Design and Methods (4-6 pages): Describe the research design conceptual or clinical framework, procedures, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted, including the use of specific statistical tests

and power calculations, where appropriate. Describe any novel concepts, approaches, tools, or technologies for the proposed studies. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims. As part of this section, provide a tentative sequence or timetable for the project. Point out any procedures, situations, or materials that may be hazardous to personnel and the precautions to be exercised. If human subjects, vertebrate animals, or infectious agents are involved in the research, state whether the necessary institutional approvals have been obtained.

6. Literature Cited (no page limit): Use Endnote or another standard reference software to format this section. Each reference must include names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only bibliographic citations. Follow scholarly practices in providing citations for source materials relied upon in preparing any section of the application.

Biannual Thesis Committee Meetings

Within six months following passing of the Qualifying Exam, students must hold their first Thesis Committee meeting. It is the responsibility of the student to identify a date and time that the Committee members will be available, and to reserve a room for the meeting and to notify the Education Coordinator of the scheduled meetings. Scheduling can be difficult with faculty who are very busy and travel frequently, so students must be proactive to schedule the meetings well in advance of the six-month deadlines. A minimum of four committee members should be available for the Thesis Committee meeting. In preparation for the meetings, students should prepare a written Progress Report and distribute this to each Committee Member no less than 7 days prior to the meeting. During the committee meeting, the student should describe his/her accomplishments since the previous meeting and outline plans for the next six months of work. Following the meeting, the student will be informed of the Committee's opinion of their progress by the Committee Chair in writing, including any suggestions for improvement. The 9999 course grade will also be determined by the Thesis Committee, in collaboration with the Research Advisor. Students are encouraged to schedule committee meetings before the end of the Fall (Nov to mid-Dec) and Spring (April to early May) semesters, so that the 9999 grades for those terms can be determined at the committee meetings. Note: negligence or procrastination in scheduling committee meetings in a timely manner may result in an Unsatisfactory 9999 grade, which is recorded on the student's transcript.

Milestones for Student Development

MSD is a series of required tasks designed to encourage students to be proactive in career planning and development. Each activity should also be described in the corresponding biannual progress report and discussed at the committee meeting.

1st Committee Meeting: connect to committee members and the DGS via LinkedIn and develop a biosketch available for public view.

2nd Meeting: begin the meeting with a 3-minute elevator speech on their work (one slide permitted but not required). Students are encouraged to use this as an incentive to participate in the annual 3-Minute Thesis competition.

3rd Meeting: Student provides a list of 3 faculty members who have been asked to write letters of recommendation for the next stage of their career. Goal is to begin to develop relationships with the respective faculty early on.

4th Meeting: Student discusses one or more options being considered for the next step in their career.

5th Meeting: Student presents a detailed plan for approaching the next career following completion of the Ph.D.

Instructions for Research Progress Reports

The **Progress Report** should be a brief presentation of the accomplishments on the research project since the previous meeting, in language understandable to a biomedical scientist who may not be a specialist in the project's research field. Abbreviations and language that may not be known to the broader scientific community should be clearly defined. In the written report, use the first person singular (i.e. "I") wherever possible, and minimize the use of the pronoun "we."

The Research Progress Report, specifically items A-D, should not exceed two pages and should be distributed to the Thesis Advisory Committee at least one week before the scheduled meeting. (Consult your Chair regarding the length recommendation, as s/he may request an expanded report.) The report should follow the outline and numbering system shown below. Tables and figures that summarize key accomplishments are encouraged and may be provided as appendices.

A. Specific Aims

The aims, as currently formulated, may differ in scope from those stated in the original Research Proposal, because of specific findings or changes in priorities. If the aims have not been modified, restate them here in one-sentence form. If they have been modified, give the revised aims and the reason for the modification.

B. Studies and Results

Describe the studies directed toward specific aims since the previous meeting and the positive and negative results obtained. If applicable, address any changes to the innovative potential of the project. If technical problems were encountered in carrying out this project, describe how your approach was modified. *This section must be written so that it is clear exactly what you have accomplished since the previous committee meeting.*

C. Significance

Emphasize the significance of the findings to the scientific field and their potential impact on health.

D. Plans

State your specific research goals during the next six months of the project.

The two-page guideline applies only to items A-D. The following sections may be on additional pages:

E. Publications

List your manuscripts published, in press, submitted, or in preparation that are relevant to the Research Proposal.

F. Meeting Attendance and Presentations

List any scientific meetings you have attended, and whether you presented a poster or talk.

G. Teaching and Mentoring Activities

Briefly describe any of your activities related to teaching and mentoring, including classroom and laboratory teaching, training others in the lab, including visiting faculty, postdocs, graduate students, and undergraduates.

H. Collaborations

Briefly describe any collaborations you have engaged in that do not fall within the scope of your research project.

I. Milestones for Career Development

Describe your efforts toward accomplishing the Milestone corresponding to the particular committee meeting.

Grading Process for 9999 Research Course

Passing of the Qualifying Exam results in formal advancement to Ph.D. candidacy, after which the student is enrolled in 9999 research course each term (winter, spring, and summer). The Graduate College requires that a grade of Satisfactory or Unsatisfactory be assigned for the 399 course for each academic term prior to completion of the Ph.D. requirements. The grade is based on an assessment of whether a student has made sufficient progress toward the Ph.D. in that term, and is by nature subjective. To ensure that the grading is performed as fairly as possible, Microbiology and Immunology has established that 9999 grades are to be determined by the dissertation committee rather than the advisor alone. Although 9999 grades are not used to calculate the GPA, they are included on the transcript and thus remain part of the student's academic record.

Three U grades automatically result in dismissal from graduate school.

Teaching

Teaching is an important component of our training program and builds skills that are invaluable for careers of many kinds. To enhance the graduate education experience, all fourth-year MHI students are expected to participate as teaching assistants (TA's) in the laboratory section of the Medical School Microbiology and Immunology Course. This course is now offered to first-year medical students in the fall semester and involves a series of laboratory exercises. For each exercise, the student participates in a short preparatory session (one hour), followed by a three-hour commitment to the laboratory itself over the next two days. The total commitment is about 25 hours over 3 weeks in the Fall semester. A student who demonstrates outstanding teaching skills is selected as head TA for the course in a following year and provides critical assistance in the design and implementation of each exercise. Questions regarding the content or coordination of the laboratory sessions should be directed to the Laboratory Section Director (Dr. Chris Aiken).

Additional Teaching Opportunities

Senior graduate students (3rd-5th year) may be invited to give methodology-related presentations during the didactic sessions of the Foundations courses, and may participate as group discussion leaders in various modules offered to first year IGP students. Flextime directors will contact eligible students early in the spring semester. Participation is voluntary. Additional opportunities may be sought through the Center For Teaching at Vanderbilt University (www.vanderbilt.edu/cft).

Dissertation

In a way, the writing of the dissertation may begin the day a student chooses a topic for thesis research. Nonetheless, before the document is prepared, the student should obtain the current version of the Graduate School's official instructions for dissertations. During the development of the dissertation, the mentor and student must review and edit the text together on a chapter-by-chapter basis. In general, the dissertation should contain only the original research of the student. In instances in which some aspects of the work were performed collaboratively, experiments that were performed by other individuals should be clearly indicated with appropriate attribution. It is not acceptable to include entire bodies of work (e.g. from publications) in which the student played a minor part as chapters in the dissertation. To facilitate discrimination of which aspects of the work were performed by the student, appropriate use of the first-person singular pronoun (i.e., "I") is encouraged in the text of the dissertation. Each student must notify the Education Coordinator of the dissertation title, defense date, time, and place **at least three weeks** in advance of the defense to allow time for notification of the Graduate School. The scheduling of the defense must be done in communication with the mentor, committee members, and Educational Coordinator to avoid conflicts. Once both the mentor and the student concur that the dissertation is complete, a copy should be provided to each member of the Thesis Committee. The committee members should be asked to evaluate a document that the student and thesis advisor concur is the final draft. This final draft should be distributed to the committee **at least two weeks** before the defense. The Dissertation Defense includes the written dissertation and an oral

defense. Successful completion of both requirements, followed by approval of the dissertation by the Graduate School, results in awarding of the Ph.D. degree.

Oral Defense

The PhD Defense is divided into two parts. In the first part (Closed Defense), the student will submit their written dissertation to the committee two weeks before the scheduled meeting. The dissertation must be read and approved by the mentor prior to distribution. The Closed Defense (CD) must be scheduled such that a minimum of four committee members can attend. Upon receipt of the dissertation, the committee will immediately examine the document (within 1-2 days), and if it is incomplete or of poor quality, the Chair will notify the student that the meeting must be cancelled and the student will have to reschedule it *after submitting an improved version of the dissertation*. The Chair will communicate to the student the changes that are necessary.

If, after initially examining the dissertation, the committee decides to proceed with the CD, the committee will read the dissertation thoroughly with the goal of informing the changes of improvements that will be necessary for approval. These changes will be communicated at the Closed Defense meeting. At the CD, the student will also be examined orally on their understanding of the research and familiarity with the relevant literature. The student shall consult the committee Chair in advance for specifics regarding the format of the meeting, which may involve an oral presentation.

Permission to schedule the Open Defense (OD) seminar will be determined by a simple majority vote of the committee members at the CD, including the mentor. If the vote is a tie, permission will not be granted. If the dissertation is satisfactory (i.e. deficiencies are minor and the student can easily correct these) and the student demonstrates satisfactory knowledge of their research, permission to schedule the OD will be granted. In the event permission is not granted, the committee will communicate the deficiencies that must be corrected prior to scheduling the OD.

Two weeks prior to the OD, the student shall submit the final version of the dissertation to the committee, with the changes from the original version clearly indicated (e.g. via the “compare documents” or markup feature in MS word), and bring the title pages to the defense for signature. Following the OD there will be a brief meeting during which the committee signs the Graduate School form and, if approved, the Dissertation Title Page.

OVERVIEW OF THE Ph.D. PROGRAM					
Requirement	Year 1	Year 2	Year 3	Year 4	Year 5
IGP	■ ■ ■ ■				
Required Courses	■ ■ ■ ■ ■ ■ ■ ■				
Electives		■ ■ ■ ■			
Reading List		Due Apr. 1			
Annotated Reading List		Due June 1			
PreQual Meeting		By Aug. 1			
Selection of Thesis Committee and Submission of Specific Aims		By Aug. 15			
Approval of Abstract and Aims by Thesis Committee			Due Sept. 15		
Set Date for QE			By Oct. 1		
Take QE			By Nov. 1		
Give RIP			■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■	
Teach Med Micro				■ ■ ■ ■ ■ ■ ■ ■	
Thesis Committee Meetings			✓	✓ ✓	✓ ✓

Training Grants

Upon entry into the Department of Microbiology and Immunology, a student may be selected for appointment to an NIH training grant. Each student should meet with the Director of the corresponding training grant to be informed of any specific academic requirements. When the requirements of the specific Training Grant appear to be in conflict with the M&I Program requirements, the student should discuss the situation with the Director of Graduate Studies to resolve the conflict.

SEMINARS

Effective communication is essential for progress in science and nearly any scholarly endeavor. Seminars are the ideal forum for scientific debate and for the development and refinement of communication skills. Attendance and participation in seminars is essential for honing such skills, for becoming informed on important topics, and most importantly, for learning by example how to construct and test a hypothesis.

Graduate students in Microbiology and Immunology are expected to:

1. Attend and participate in the **Research in Progress (RIP)** seminar series. Department faculty and staff have carefully organized the RIP seminar series to provide students with a forum to present their research accomplishments. The experience is critical for learning to develop and present scientific seminars (25 45 minutes in length).
2. Attend and participate in **Departmental Retreats and Symposia**. The retreats provide an opportunity to develop skills for presentation of research at scientific meetings (both talks and posters).
3. Regularly attend seminars in areas related to their scientific interests. The PMI seminar series hosts speakers in both basic and clinical research disciplines. Students are also encouraged to attend the Discovery Lectures as well as lectures in other areas relevant to their research.

Students are also expected to fulfill all training requirements of the particular Training Grant to which they are appointed, including courses and seminars.

Research In Progress Seminar Guidelines

- **The student shall submit an abstract via email to Lorie Franklin two weeks prior to the scheduled date of presentation.** The Abstract must be reviewed and approved by the mentor prior to submission. Submission of the abstract is the student's responsibility and that he/she will not receive multiple reminder emails.
- **The format of the abstract should be approximately five simple, declarative sentences in Scientific American style.** As a general guideline, the Scientific American style is set-up as follows: **Sentence 1** should be a broad statement of the problem that includes its biological significance. **Sentence 2** should state the hypothesis that is tested. **Sentence 3** should state how the hypothesis was tested (this may include description of the technology used to address the problem). **Sentence 4** should state the major result(s) of the experiments. **Sentence 5** should state the conclusions drawn from the results and the implications in the context of the biological significance stated in sentence 1.

Below is a sample abstract:

Structural Analysis of *Clostridium difficile* Toxin A

The pathogenesis of *Clostridium difficile* is dependent on the secretion of two large homologous toxins, TcdA and TcdB. The actions of these toxins are mediated by four functional domains: receptor-binding, pore-forming, autoprotease, and glucosyltransferase domains. Crystal structures exist for a portion of the TcdA receptor-binding domain, the TcdA autoprotease domain, and the TcdB glucosyltransferase domain, but there is no structural information for the pore-forming domain or how the four domains interact with each other. We have visualized the native TcdA holotoxin by negative stain electron microscopy, determined its three-dimensional structure by random conical tilt, and mapped the organization of the TcdA functional domains within this structure. These data provide a structural framework for understanding the interactions TcdA and TcdB make with host cells and the role of these toxins in pathogenesis.

- **For the first RIP, students should prepare 25 minute talks, two of which may be given during the hour. A student's second RIP talk should be 45 minutes in length.** These time limitations permit questions during and after the seminar within the one-hour time frame. While the seminar should be moderated by the host (see below), it is also the presenter's responsibility to control the flow of his/her seminar. Thus, it is important to allow sufficient time for pertinent questions during the seminar, but the speaker should also minimize irrelevant tangents that are not pertinent to the seminar.
- **Speakers are to be hosted by the previous week's RIP speaker** (e.g., if John Smith is presenting in week 1 and I am presenting in week 2, it is John's responsibility to introduce me and moderate questions for my presentation.) Hosting duties include introducing the speaker (provide a brief background of the presenter's education, etc.), and regulating the flow of questions during the presentation and post-seminar session. A good moderator maintains the "flow" of the seminar and enhances the effectiveness of the presentation. Because some faculty may interrupt with questions, presenters and moderators are encouraged to designate stopping points for questions (particularly in 45-minute talks) and may postpone entertaining to some questions in the interest of time.

Graduate Student Association (GSA)

The PMI Graduate Student Association consists of students in the Microbe-Host Interactions and the Molecular Pathology and Immunology programs. The GSA executive council consists of the President, Vice President, Social Chairs (2-3), Student-Invited Seminar Coordinator(s), Treasurer, and a Graduate Student Council (GSC) representative. These officers are elected annually by graduate students in the Program. The primary goals of the GSA are to improve communication between the

student body and the program GECs, to help prepare students for their Qualifying Exams, and to foster communication and social interaction among our students.

The GSA works closely with the DGSs and the GECs to communicate student concerns and suggestions. The GSA executive council attends at least two GEC meetings annually to offer ideas on many aspects of departmental life, including coursework organization, the Qualifying Exams, and scientific retreats.

To assist students with the Qualifying Exam, the GSA administers practice exams in which the third year students present their thesis proposal to the student body and field questions from senior students.

Finally, the GSA works to maintain an enjoyable and supportive social atmosphere within the MHI and MPI Programs. Student-only gatherings with refreshments are held and student nights out are also organized. The GSA may also coordinate outreach events to improve departmental involvement in the greater Nashville community (e.g. Habitat for Humanity). Students are encouraged to participate in GSA-sponsored activities, but they should be careful to avoid participating in extracurricular activities to an extent that would undermine the effectiveness of their research training and progress.

Medical Science Training Program (M.D./Ph.D.)

A combined course of study leading to the M.D. and Ph.D. degrees is offered through the Vanderbilt School of Medicine and Vanderbilt Graduate School. The program facilitates the development of teachers and medical investigators in clinical and basic medical sciences. Six to eight calendar years are usually required for completion of the combined degree program. All candidates must meet both Medical School and Graduate School requirements and are admitted into the program by the Deans of the two schools upon the recommendation of the Medical Scientist Training Program Committee. M.D./Ph.D. students must pass the Qualifying Examination for the Ph.D. degree and present an acceptable dissertation within their field of study. Full-time study in the program usually begins after the second year in medical school and the student must complete their dissertation research before returning for the third year of medical study.

The Honor System

The essence of graduate studies in a professional school setting is the student's maturation into a scientist whose competence, creativity, critical thinking and collegiality are built upon a solid foundation of professional ethics and conduct. To this end, strict adherence to the Honor Code of Vanderbilt University is necessary.

The following information concerning the Vanderbilt University honor system was

excerpted from the Vanderbilt University Graduate Student Handbook:

Graduate and professional students are subject to the jurisdiction of the student body that implements the Honor System in the Graduate School and professional schools - Graduate Honor Council and Student Honor Council of the School of Medicine.

Students are required to acquaint themselves with the provisions of the Honor System. http://www.vanderbilt.edu/student_handbook/the-honor-system/

The Honor System presumes that all work submitted as part of academic requirements is the original work of the student unless credit is given with proper footnoting and bibliographic techniques or as prescribed by the course instructor.

Cheating, plagiarizing, or otherwise falsifying results of a study is prohibited, and may constitute grounds for dismissal from graduate school. The honor system applies not only to examinations, but all work handed in, such as papers, reports, solutions to problems, tapes, films and computer programs, unless accepted by the instructor. For graduate students, this especially applies to Research Proposals and Dissertations.

Students are responsible for obtaining from their professors an explanation of the freedom they may exercise in collaboration with other students or in the use of outside sources, including the student's own work prepared and submitted for another course. In the event that a student does not obtain a clear definition of the application of the Honor Code from a professor in any class, the student must assume that the Honor Council will follow the strictest interpretation of the Honor Code with respect to that class.

Faculty members do not routinely monitor tests and examinations to apprehend violators. Instructors who remain in examination rooms are there primarily to give assistance.

Breach of the Honor Code

Without the support and cooperation of the entire student body, the Honor System will not work. Students must insist on the absolute integrity of themselves and their fellow students. It is the obligation of every student who suspects an honor violation to take action in one of the following ways, determining the choice of action by the flagrancy and/or certainty of the violation.

If a student has reason to suspect that a breach of the Honor Code has been committed, he or she must:

1. Issue a personal warning to the suspect, or
2. Report the incident to the Honor Council for action by the president. An official warning will be issued by the Council to the suspect or a

hearing will be held by the Council, or

3. Inform the instructor in the course of the suspicions and identify, if possible, the person(s) suspected.

In addition, any Microbe-Host Interactions instructor, course, director, or thesis advisor having reason to suspect a student of breaching the Honor Code is expected to issue a warning or report the violation to the Honor Council.

Violations of the Honor Code

Violations of the Honor Code are cause for disciplinary actions imposed by the appropriate honor council. The following are included as violations:

1. Cheating on an exercise, test, problem, or examination submitted by a student to meet course requirements. Cheating includes the use of unauthorized aids (such as crib sheets, discarded computer programs, the aid of another instructor or any action designed to deceive a member of the faculty or a fellow student on a take-home exam, etc.); copying from another student's work; soliciting, giving, and/or receiving unauthorized aid orally or in writing; or similar action contrary to the principles of academic honesty.
2. Plagiarism on an assigned paper, theme, report, or other material submitted to meet course requirements. Plagiarism is defined as using concepts or words from an outside source, whether in the form of a direct quotation or of a paraphrase. Credit must be given to the original source for each idea by footnote or other technique acceptable to the instructor. For example, should the student forget to note on research cards the source of material and then fail to footnote the source when the paper or report is prepared, use of texts or papers prepared by commercial or noncommercial agents and submitted as a student's own work the student is still committing a plagiaristic act. Not knowing how or when to footnote is not considered a sufficient excuse.
3. Falsification of results of study and research.
4. Failure to report a known or suspected violation of the Code in the manner prescribed.

The Honor Code Applied to Preparation of Papers

- Papers are to express the original thoughts of the student. If a topic for a paper has been discussed fully among students prior to an assignment, then the students should consult the instructor about writing on that particular topic.
- Failure to indicate the source of ideas, expressions, phrases, or sentences constitutes plagiarism.
- A student may not submit papers substantially the same in content for credit in more

than one course, without specific and prior permission of all instructors concerned.

Students often have trouble distinguishing between privileged information and common knowledge. An idea may be considered common knowledge if it is encountered at least three times in separate sources during one's research into a particular subject. (Reprints of one source do not constitute separate sources).

Students are expected to follow the general rules of footnoting for each discipline. One footnote is not sufficient if additional material from the same resource is included in a work. Footnotes should express the extent of ideas or expressions of others that are used. All direct quotes must be in quotation marks or in block quote format. Simply providing a footnote without using quotation marks or block quote format is a violation. For further information about footnoting, refer to [A Manual for Writers](#) by Kate L. Turabian, or the *MLA Style Sheet*.

A general rule is: **when in doubt, always cite!**

The written pledge (refer to "Undergraduate Honor Pledge" in the Student Handbook) signifies that the work submitted is the student's own and that it has been completed in accordance with the requirements of the course as specified by the instructor. In addition, each student and faculty member is expected to establish a clear understanding of the requirements in each course. Any student uncertain about the application of the pledge in a particular course requirement should always consult the instructor. The Honor System pledge, or an abbreviation, should be included in all written work completed by the student and submitted for a grade. Any work handed in for credit, however, will be considered pledged unless otherwise accepted by the professor.

Vacation/Leave Policy

Graduate study is a mentally challenging and physically demanding pursuit that requires a student's full dedication. Intensive study and research on the part of a student naturally requires vacations so that students can relax and reconnect with loved ones and family members. Students should establish an understanding of the policies and expectations of his/her research advisor when deciding to join a particular laboratory. Faculty members are likewise encouraged to establish clear and equitable vacation policies for students in their laboratories. In general, students should be permitted a minimum of two weeks of vacation time per year, which should be scheduled in cooperation with the research advisor.

When you need help

The MHI policy regarding leave of absence is that set by the Graduate School as described in the Vanderbilt University Graduate Student Handbook. If a student is experiencing serious physical or emotional difficulties, s/he is strongly encouraged to share these struggles with the research advisor, the Director of Graduate Studies, or the MP Division Chief.

Psychological counseling is freely available via the BRET office, and students are encouraged to utilize this service when needed:

David Sacks, Ph.D. *Licensed Psychologist*
(615) 343-0714 [office]

mistie.d.germek@vanderbilt.edu

<https://medschool.vanderbilt.edu/bret/psychological-services>

Vanderbilt's Psychological and Counseling Center at (615) 322-2571

For urgent psychiatric concerns: Crisis Line (615) 244-7444

For concerns related to sexual harassment or intimate partner violence:

Project Safe

24-Hour Crisis/Support Hotline: (615) 322-SAFE (7233)

<https://www.vanderbilt.edu/projectsafe/>

Vanderbilt Project Safe staff are available at the Project Safe Center, 304 West Side Row, Monday – Friday, 8 a.m. – 5 p.m

For emergencies:

Vanderbilt University Police

911 or 615-421-1911

Suicide Prevention Lifeline:

1-800-273-TALK(8255)

Additional Information for Students

Information for current Vanderbilt graduate students can also be accessed through the Graduate School catalog or online at https://gradschool.vanderbilt.edu/current_students/index.php. The website and catalog also provide information regarding Thesis and Dissertation guidelines, Graduation Forms, Registration Instructions, Honor Council information, Travel Grant Application, Change of Address, and additional helpful information.