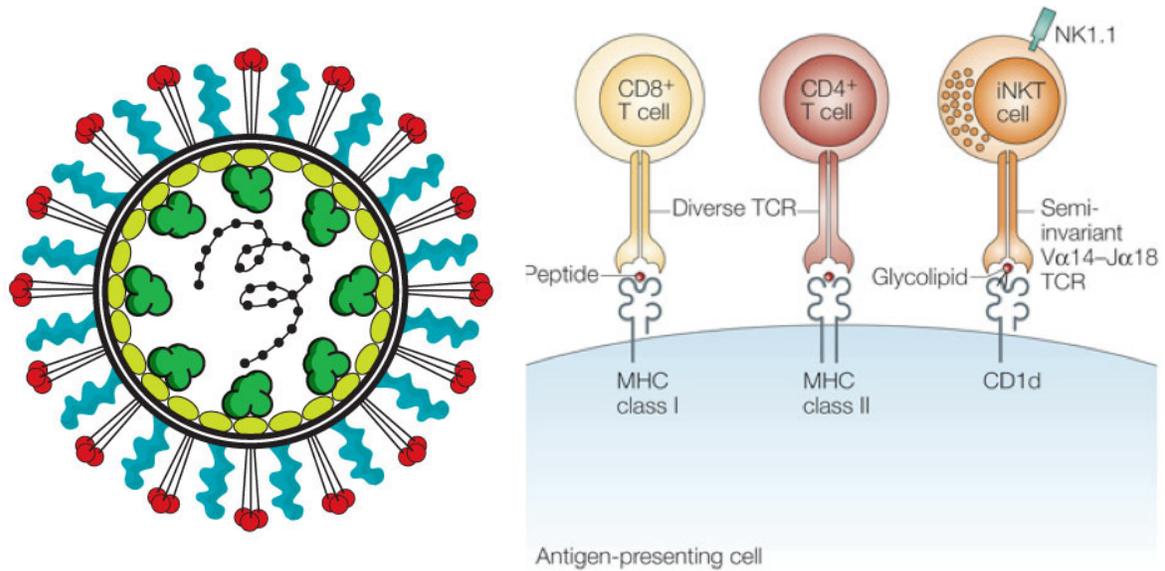


# **GRADUATE PROGRAM IN MICROBIOLOGY AND IMMUNOLOGY HANDBOOK FOR GRADUATE STUDENTS**



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## **Introduction**

The overall objective of our graduate program is to promote the maturation of students into independent scientists who will make significant contributions to our understanding of the molecular mechanisms involved in microbial and immune diseases. The specific goals listed below are designed to train scientists whose creativity will be aided by informed critical thinking and the ability to solve important problems using state-of-the-art technologies.

Before students can make discoveries and generate new knowledge, they must:

1. Attain a broad knowledge base in the biomedical sciences, coupled with more specific knowledge regarding the biologic mechanisms employed by microbial agents and the immune system. This goal is accomplished by gaining "first hand" knowledge of scientific advances in the particular research front selected for dissertation work.
2. Acquire the ability to formulate a rational hypothesis evolving from critical analysis of existing scientific facts.
3. Learn how to apply the scientific method to test a hypothesis.
4. Learn how to apply existing techniques or develop a new methodology to solve the problem under study.
5. Obtain in-depth training with techniques that are particularly applicable to their chosen research front.
6. Acquire an ability to communicate research findings to the scientific community.
7. Develop and practice an acute appreciation of the professional and scientific ethic.

The Program's Graduate Education Committee and faculty continually 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.

Our graduate program continues to evolve as new faculty members join our department and as new educational concepts are incorporated. We are confident that the intellectually and technologically rich Graduate Program in Microbiology and Immunology will be a fertile ground for training new scientists who will make an impact on the prevention and treatment of microbial and immune diseases that threaten millions of lives throughout the world.

## **Admission to the Ph.D. Program in Microbiology and Immunology**

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 are expected to 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 GPMI Director of Graduate Studies (DGS), the Department Chair, and the IGP 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** ----this includes the required courses listed below with credits from IGP or Medical M&I (for MSTP students). Students must maintain a grade point average of 3.0 or better to remain in the graduate program.

**72 total hours** ----this includes the 24 didactic hour requirement, with the remainder comprised of M&IM 8999 and 9999 (Non-Candidate Research and Ph.D. Dissertation Research, respectively).

## Required Courses

### **IGP Requirements (does not apply to MSTP)**

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

IGP 300B SPRING MODULES [Variable credit 4-8]

### **MSTP Requirements**

2 years of Medical School, with corresponding transfer credits

### **Year 2 M&I Required Coursework**

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

M&IM 8333 Foundations in Microbiology and Immunology II, FALL [6]

M&IM 8334 Foundations in Microbiology and Immunology III, SPRING [2]

M&IM 8335 Research Proposals: Preparation & Critical Review, Spring [2]

**Foundations in Microbiology and Immunology (M&IM 8332-8334)** and “Research Proposals” (M&IM 335) are the only courses **required** of second year graduate students. This course series has been recently redesigned. Foundations I will meet three hours per week in the summer, with each session dedicated to a topic in the field of Immunology, Virology, or Bacterial Pathogenesis. Foundations II will cover the three major areas of Immunology, Bacteriology, and Virology in depth and will conclude with a final exam assessing the student’s knowledge in the three areas. Passing this exam is a prerequisite for advancement in the program. Foundations III, held in the Spring semester, will facilitate emphasize learning in the student’s particular focus area, with a focus on assimilating scientific research papers relevant to students’ specific interests.

Major objectives of the “Foundations” course are as follows:

1. Develop a solid knowledge base in the areas of Microbial Pathogenesis, Virology, and Immunology.
2. Enable students to comprehend, in depth, research publications in a self-directed manner.
3. Apply methods of scientific logic to a critical analysis of the scientific data presented in published articles and to identify gaps in our current knowledge.
4. Facilitate the process of connecting data in an article to other research in

## Microbiology and Immunology.

At the end of the Foundations course series, a student should be able to understand seminars and scientific papers on any topic in the field of Microbiology and Immunology, and ask relevant questions about the research.

**Research Proposals: Preparation and Critical Review (M&IM 8335)** is offered in the spring semester. An essential skill for scientists in an academic setting is the ability to obtain extramural research funding through peer-reviewed grant applications. This one credit hour course will offer didactic sessions in which the process of preparing and reviewing grant applications will be discussed. Each student will write a grant application using the NIH format for postdoctoral fellowships. The student should propose research in one of the four major emphasis areas in the Program: Microbial Genetics, Virology, Immunology, or Microbial Pathogenesis. The initial grant submission is reviewed by a faculty mentor. The student then revises the application according to the reviewer's comments and submits a final version. Procedures for reviewing grant applications are then discussed. Two students and the original faculty mentor provide a written review of the final proposal. The course concludes with a mock NIH peer review study section in which grants will be discussed and scored.

### 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. 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). Each student should 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 1.5 hrs, about background, experimental approaches, protocol design, statistical analysis, anticipated outcomes and interpretations. Following the 90 minute exam, the student leaves the room while the committee determines the outcome of the QE.

If the committee deems the written proposal performance satisfactory, he/she is officially designated 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 truly 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 compile and defend the written 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: *Do not exceed 81 characters, including the spaces between words and punctuation.* 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. Describe any new methodology and its advantage over existing methodologies. 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.
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.

*The references should be limited to relevant and current literature.* While there is not a page limitation, it is important to be concise and to select only those literature references pertinent to the proposed research.

### **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 399 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 399 grades for those terms can be determined at the committee meetings. Note: negligence in scheduling committee meetings in a timely manner may result in an Unsatisfactory 399 grade.

A new feature of the M&I Program is the **Milestones for Student Development** component of the biannual committee meetings. This 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.

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

2<sup>nd</sup> Meeting: begin the meeting with a 3 minute elevator speech on their work (no slides)

3<sup>rd</sup> 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.

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

5<sup>th</sup> 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. *Please write this section in such a way to make it clear exactly what you have accomplished since the last 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 third-year 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. Students who demonstrate outstanding teaching skills are selected as head TA's for the course in subsequent years and provide 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 (currently Dr. Chris Aiken) or the Course Director (Dr. Luc Van Kaer).

### **Additional Teaching Opportunities**

Senior graduate students (3<sup>rd</sup>-5<sup>th</sup> 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 either the Microbial Pathogenesis or

Immunobiology 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](http://www.vanderbilt.edu/cft)).

### **Dissertation**

In some sense, the writing of the dissertation may begin the day a student begins a topic for thesis research. Nonetheless, before the document is prepared, the student should obtain a copy 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 one week** before the final 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**

Students must obtain approval to defend from the Thesis Committee. The new procedure is as follows: No less than 30 days prior to the defense, students must have a committee meeting at which a draft dissertation (delivered to the committee two weeks prior to the meeting) will be considered by the committee. At the meeting, the student will receive in-depth questioning regarding the dissertation and feedback regarding the document, thereby effectively replacing the closed oral exam that has traditionally followed the student's oral defense seminar. If the committee is satisfied that the student is ready to schedule the defense, they will sign a form granting approval to schedule the defense. This decision will be made by a simple vote of the committee members, including the mentor (no absentee voting). In the case of an even split vote, the outcome will be "not ready to schedule defense," in which case another meeting will be required at a later date.

The oral defense should be scheduled such that at least four members of the student's committee can attend. The Defense consists of a seminar given by the student on the dissertation research, after which the committee meets privately with the student for final questions and discussion. The seminar shall consist of a 45-minute talk followed by questions from the audience. Acknowledgements should include all customary scientific contributions, including collaborators, reagents, and funding. Personal acknowledgments of friends and family should be limited to one single slide (without "popups") and should be handled professionally and with emotional restraint.

<b>OVERVIEW OF THE Ph.D. PROGRAM</b>					
<b>Requirement</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
IGP					
Foundations					
Research Proposals					
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 a position on one of several NIH training grants. Each student should meet with the director of their training grant to clarify any specific academic requirements. In cases in which the requirements of the specific Training Grant appears to 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 required to:

1. **Attend and participate in** the Microbiology and Immunology Graduate Program **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 (45 minutes in length). The RIP guidelines are presented in detail below. The Sidney P. Colowick Award is also presented each year to the graduate student who makes the most significant progress in their research.
2. Attend and participate in **Departmental Retreats**. The retreat provides an opportunity to develop skills for presentation of research at scientific meetings (usually 10 minutes in length). This event is well publicized to allow ample time for each student to coordinate his/her attendance.

Students are also expected to fulfill all training requirements of the particular Training Grant to which they are appointed, including courses and seminars. There are also numerous regular or special seminars conducted by all of the basic science and clinical departments. If these seminars are related to Microbiology and Immunology research areas, students are encouraged to attend when beneficial. The student should consult the research advisor in such cases.

### **Research In Progress Seminar Guidelines**

- **The student shall submit an abstract via email to Lorie Franklin at least two weeks prior to the scheduled date of presentation.** The deadline also ensures there is sufficient time to review and amend the proposed abstract. Please note that 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 five simple, declarative sentences in Scientific American style.** The student must consult with his/her mentor regarding each abstract prior to submission. 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.

- **RIP talks should be 45 minutes in length.** This time limitation permits 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 and may postpone entertaining to some questions in the interest of time.

### **Graduate Student Association (GSA)**

The Graduate Student Association (GSA) of the Microbiology and Immunology Ph.D. Program was established in 1997. The six-member GSA executive council consists of the President, Vice President, Student Invited Speaker Coordinator (2), Social Chairs

(2), Biomedical Research Interdisciplinary Student Committee (BRISC) representative, 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 GEC, to help prepare students for their Qualifying Exams, and to foster communication and social interaction among our students.

The GSA works closely with the DGS and the GEC 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 Exam, and retreats.

The GSA also conducts lunchtime reviews of papers by seminar speakers. This increases the students' familiarity with the work to be presented in an upcoming seminar.

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 improve the social atmosphere within the Program. Student-only gatherings with refreshments are held and student nights out are also organized. The GSA coordinates several outreach opportunities each year to improve departmental involvement in the greater Nashville community (e.g. Habitat for Humanity). Students are encouraged to participate in GSA-sponsored activities, but should be careful to avoid participating in extracurricular activities to an extent that would limit research training and effectiveness.

### **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 through the information in the Vanderbilt Graduate Student Handbook. Further Information can be obtained from the office of the Dean of their school or college or at 402 Sarratt Center.

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. 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.

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 Microbiology and Immunology 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. We encourage students to 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.

The GPMI 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, Director of Graduate Studies, or Department Chairman. Psychological counseling is freely available via the BRET office, and students are encouraged to utilize this service when needed:

Mistie Germek, Ph.D. *Licensed Psychologist*

(615) 343-0714 [office]

[mistie.d.germek@vanderbilt.edu](mailto: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

### **Additional Information for Students**

Information for current students can also be accessed through the Graduate School catalog or online at <http://www.vanderbilt.edu/gradschool/> The website and catalog also provide information regarding Thesis and Dissertation guidelines, Intent to Graduate Forms, Registration Instructions, Honor Council information, Travel Grant Application, Change of Address, and other very helpful facts.

### **Epilogue**

The overall objective of the Ph.D. program is to guide students through their progression from the "student phenotype" to the "scientist phenotype." This extremely important passage is needed not only to receive a Ph.D. degree but also to assure that graduates will be competitive for fellowships and positions. To accomplish this requires a well-designed graduate program with dedication on the part of the students and faculty. Our program is based on a firm commitment to help students achieve a high level of understanding of the contemporary problems of virology, molecular pathogenesis, molecular genetics, and biotechnology, and to equip them with the skills to tackle the most important of these problems. Our faculty members are poised to meet these educational objectives in an effective and efficient way. Graduate students are our partners in an exciting journey of research excellence.