

UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE

GRADUATE PROGRAM IN

IMMUNOLOGY

FACULTY/STUDENT HANDBOOK

**The Immunology program Internet site is:
<http://www.immunology.pitt.edu/graduate>**

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A. ORGANIZATION OF THE INTERDISCIPLINARY BIOMEDICAL GRADUATE PROGRAMS

A.1. Office of the Dean

Associate Dean of Graduate Studies: John Horn, Ph.D.

A.2. Graduate Council:

University Committee consisting of the Associate Dean of Graduate Studies, each Graduate Program Director, Director of the MD/Ph.D. program, and one student representative.

A.3. Graduate School Committees

Admissions Committee

Recruitment Committee

Curriculum Committee/ Student Evaluation and Progress Committee

Comprehensive Examination Committee

Steering committee

A.4. Graduate Programs

Molecular Genetics and Developmental Biology

Director: Kyle Orwig, Ph.D.

Cell Biology and Molecular Physiology

Director: Donna Beer Stolz, Ph.D.

Cellular and Molecular Pathology

Director: Wendy Mars, Ph.D.

Immunology

Director: Robert Binder, Ph.D.

Molecular Pharmacology

Director: Patrick Pagano, Ph.D.

Molecular Virology and Microbiology

Director: Carolyn Coyne, Ph.D.

A.5. Biomedical Graduate Student Association (BGSA)

President: Aliyah Weinstein

B. GRADUATE DEGREE REQUIREMENTS

B.1. Requirements for a Ph.D.

The Interdisciplinary Biomedical Graduate Programs are comprised of formal course work and original laboratory research, which is designed to allow attainment of a Ph.D. in 4-6 years. The University requires students seeking the Ph.D. degree to engage in a minimum of one term of full-time doctoral study that excludes any other employment except as approved by their departments. The Ph.D. degree work must be completed within a period of 10 years from the student's initial registration for graduate study. If the student has received credit for a master's degree appropriate to the field of study, then all requirements for the Ph.D. degree must be completed within eight years.

A minimum total of 72 credits is required to satisfy the Ph.D. requirement. Of this, 32 credits must come from approved courses, not including laboratory rotations, Directed Study credits, or Dissertation Research credits.

Students are graded by the A-F letter grading system for most courses. An "I" (incomplete) grade must be made up according to the stipulations of the faculty director of the course, Program Director, and University policy.

It is strongly recommended that graduate students not fluent in English take a University Course in conversational English, to allow active and full participation in the program. This course does not have to be taken for credit and does not contribute to the student's Quality Grade Point Average (QPA).

University policy dictates that the student have a cumulative QPA of at least 3.0 for graduation. The Immunology program requires that students obtain a minimum grade of B in all required courses and in those elective courses counted toward the 32-credit requirement, and maintain a minimum 3.0 QPA. If a student fails to maintain the minimum grade requirement, the Immunology faculty will decide whether to dismiss the student from the program or allow the student to retake any required course for which a grade less than a B was received. Such students will be placed on probation.

B.2. Requirements for a Master's Degree.

Students are not admitted to the Immunology graduate program to attain a M.S. degree. In certain cases, however, it may be necessary that a student in the Ph.D. program be transferred to a terminal M.S. degree. Students pursuing a M.S. degree in Immunology will be required to complete the same course work as described for the Ph.D. program and to prepare and successfully defend a Master's Thesis.

C. THE FIRST YEAR OF THE INTERDISCIPLINARY BIOMEDICAL GRADUATE PROGRAMS

All students admitted to the Ph.D. program in the School of Medicine join the Interdisciplinary Biomedical Graduate Programs (IBGP). The IBGP committees supervise the first-year curriculum, oversee student research rotations, and evaluate students until they join one of the specialized programs at the end of the first year. The IBGP is designed to facilitate the matching between students and their areas of research interest, and to encourage the timely progression of students through the process of matriculating at the University of Pittsburgh School of Medicine. The activities of the IBGP are governed by the Graduate Council. In addition, there are four sub-committees responsible for directing admissions, recruitment, curriculum and student evaluation and progress (STEP). The key elements of the IBGP are advising and evaluation, curriculum, research, and facilitating the process of transferring into a specialized program. These processes are described briefly below.

C.1. Advising and Evaluation

After students are admitted to the IBGP they are assigned a mentor, one of the individual IBGP Program Directors. The first-year mentor will provide advice on research and academic requirements and choices, as well as assist in the decision regarding entering a specialized program. The mentor also will represent the student's interests at meetings of the IBGP steering committee should there be concerns about academic progress. The mentor's role officially terminates when student moves from the IBGP to a specialized program and chooses a thesis advisor.

Students will be continually evaluated by the steering committee with respect to grade point average and grades from research rotations. Students will be assessed based on coursework and laboratory rotations. Successful completion of the first year curriculum allows students to transfer into a specialized program. If a student is not performing at a satisfactory level, remedial action may be suggested, or the student may be dismissed from the program.

C.2. Curriculum

The Foundations of Biomedical Science is the IBGP core course, which is required of all first year IBGP students. It meets for two hours per morning for the first semester, and is supplemented by small group sessions twice a week in the afternoons. This course is designed to provide an overview of the fundamental elements of contemporary biomedical science that should be common to all students, regardless of their interests. Courses in biomedical statistics and in biomedical ethics, offered in the summer at the end of the first year, are also required. Finally, students may elect to take Survival Skills and Ethics for Emerging Scientists. This class meets approximately once per month on a Saturday, and incorporates a discussion of ethics into a series of career development presentations. Students are encouraged to attend all lectures in this course within their first two years in the program.

After the first semester there is considerably more flexibility in the choice of classes. Each program offers one or more classes in the second semester; these classes are generally scheduled in the morning to allow time for laboratory rotation work in the afternoon, and the schedules for the classes generally do not overlap. Students should choose second semester classes based on their own interests and the requirements of the programs they anticipate joining. Consultation with their mentor is required prior to enrolling in classes for the second semester.

In unusual cases, a student's educational background may preclude the need to take one or more of the courses offered by the IBGP. In this situation, the student should meet with the appropriate course director who may recommend that requirements be waived or that the student take an exam to place out of the course.

If a student fails to achieve a passing grade in any course, make-up exams may be offered. This is entirely at the discretion of the course director, and students concerned about performance in a course should discuss this with the director at the earliest opportunity.

There are a wide range of graduate classes offered by the School of Medicine. The most current list of courses is available from the web site (http://www.gradbiomed.pitt.edu/affairs_curr3.asp).

C.3. Research

Laboratory research is the major component of any biomedical Ph.D. program. The IBGP supervises the process of research rotations during the first year. Students are expected to complete three research rotations during the first year. At the end of each rotation, the student is required to complete a written report prepared according to the style suggested for contributors to the Journal of Biological Chemistry. When the written report is complete, the rotation mentor will review the performance of the student and assign a letter grade for the rotation. In addition, students are required to make an oral presentation of one of their first year rotations as part of their preliminary evaluation. Failure to maintain satisfactory laboratory performance will result in dismissal from the program.

It is generally expected that the three rotations will be performed in different laboratories of members of the IBGP training faculty. This will provide the student with an adequate opportunity to identify an area of research interest and to establish a relationship with a potential dissertation advisor. It is possible for students to take a fourth rotation if necessary. There are several circumstances where the requirement for three rotations or laboratories might be relaxed. For example, if a student has completed a Master's degree thesis based on original research, a report of this project may be submitted in place of a rotation report. Alternatively, students may want to do a second rotation in the same laboratory if they have already identified a dissertation advisor, or may even want to rotate in a laboratory outside of the IBGP. Requests to modify the rotation requirements should be made, in writing, to the STEP committee.

C.4. Graduate Stipends

Students receive a monthly stipend provided by the School of Medicine for the first year. After that, the Dissertation Advisor is responsible for the stipend. Graduate school tuition is also covered by the School of Medicine and the Advisor.

If you have any questions about the IBGP or any of the procedures described above you should direct them to your mentor or to the Graduate Office, 524 Scaife Hall (648-8957).

D. TRANSFERRING FROM THE IBGP TO THE IMMUNOLOGY PROGRAM

At the end of the first year and after successful completion of the first year curriculum, students may transfer into the Immunology Program. The choice of program is likely to be dictated by the choice of dissertation advisor. The process of moving into a specialized program should occur as follows:

- i) Identify a dissertation advisor. This decision is based on rotation experiences, particular research interests, exposure to faculty during classes, and talking with other graduate students.
- ii) Receive permission from the advisor to join the laboratory. Most of the training faculty will welcome students into their laboratories. However, certain circumstances may prevent a student from joining the lab of choice. If a laboratory is already full, if there is not sufficient funding available to support an additional student, or if the rotation work was not sufficient, a faculty member may decline to take a student.
- iii) Identify the Immunology Program as the desired program. Many of the training faculty have appointments in two programs, so a student may choose the program that best fits his/her interests.
- iv) Petition the program director in writing for admission into the Immunology program by submitting the appropriate form obtained from the Graduate Office. The Curriculum Committee will determine whether the student has met the course requirements for the program, and may suggest second year classes to take. First year students should meet with directors of programs in which they are interested near the end of the first semester to determine which classes are recommended for students in the second semester of the first year.
- v) The program director informs the Graduate Office in writing of the acceptance of a student into the Immunology training program.

E. THE IMMUNOLOGY GRADUATE TRAINING PROGRAM

E.1. Introduction

The University of Pittsburgh has a long tradition of excellence in immunology, which began with Jonas Salk and the development of the polio vaccine and continues with the development of vaccines for cancer and HIV. The Immunology program faculty includes 40 active members, trained at the most prestigious universities and research institutes. Members' research labs are funded by grants from the National Institutes of Health and many private foundations.

Because immunology intersects so many facets of health and disease, program faculty members have appointments in many departments of the Medical School, including Molecular Genetics and Biochemistry, Pathology, Pharmacology, Medicine, Surgery, Ophthalmology, Dermatology, and Pediatrics. Many program members are also members of the University of Pittsburgh Cancer Institute, the Thomas E. Starzl Transplantation Institute, and other graduate training programs, which strengthens the program's cohesion and promotes opportunities for cutting-edge research in immunology.

Tumor immunology, transplantation immunology, the immunology of infectious diseases, autoimmunity, and studies of underlying immunologic mechanisms currently form the focus of Immunology program members' research efforts. Many recent clinical breakthroughs have been achieved at the University of Pittsburgh that are directly derived from the research of Immunology program laboratories. These include the development of dendritic cell-based vaccines for the treatment of melanoma, and the treatment of rheumatoid arthritis via gene therapy. Graduate student members in program labs contribute directly to the success of these important projects. Most critically, the research of current and future graduate students will lead to the next generation of immune-based therapies of human disease.

The Immunology program Internet site is: <http://www.dean-med.pitt.edu/biomed/immunology/>.

E.2. Administrative Structure of the Immunology Program

Program Director:	Robert Binder, Ph.D.
Representatives to the Recruitment Committee:	Jon Piganelli, Ph.D. Robert Binder, Ph.D.
Representatives to the Admissions Committee:	Greg Delgoffe, Ph.D.
Curriculum and Evaluations Committee:	Robert Binder, Ph.D. Chair Joanne Flynn, Ph.D. Lawrence P. Kane, Ph.D. Robert Hendricks, Ph.D. Sarah Gaffen, Ph.D.
Comprehensive Examination Committee:	Walter Storkus, Ph.D., Chair Penelope Morel, M.D. JoAnne Flynn, Ph.D. Lawrence Kane, Ph.D.
Steering Committee:	Robert Binder, Ph.D., Chair Lisa Borghesi, Ph.D. Olivera Finn, Ph.D. JoAnne Flynn, Ph.D. Adrianna Larregina, M.D., Ph.D. Christine Milcarek, Ph.D. Penelope Morel, M.D.

Karen Norris, Ph.D.
Jon Piganelli, Ph.D.
Lawrence Kane, Ph.D.
Angus Thomson, Ph.D., D.Sc.
Abbe de Vallejo, Ph.D.

Student Representatives to BGSA: Augustin Cruz
Jo Erika Narciso

E.3 Responsibilities of Program Representatives listed above

Program Director: The director will oversee the program, administer program activities as needed, serve on the graduate council and interdisciplinary program steering committees, serve as a mentor to assigned first year graduate students, and participate in the evaluation of the incoming class. The director's term will span a period of five years and is renewable upon subsequent nominations and elections.

Recruitment Committee: The representative will attend regular meetings of the school wide committee, which deals with issues such as increasing the quality of applicants applying to the IBGP Program, competing successfully with other top level graduate programs, and coordinating the poster session for the Annual Recruitment Day.

Admissions Committee: The representative will attend scheduled meetings of the school wide committee, evaluate applicants to the IBGP Program, participate in selection of members of the incoming class, and represent the interests of the Immunology Program.

Curriculum and Evaluations Committee: Members of the committee will meet on a regular basis to evaluate the content and quality of the Program Course Offerings, and annually to evaluate the progress of each student in the Program. The format of this evaluation will be determined by the committee. The chair of the committee will be responsible for scheduling meetings.

Comprehensive Examination Committee: The committee will be responsible for overseeing the Comprehensive Examination required of each student in the latter half of the second year. The Chair will receive proposals from students and convene a committee for each student, as described in more detail in section G of this document. Remaining committee members will participate in the examination process by serving on the committees of individual students.

Steering Committee: Members of the committee will meet frequently to discuss time-sensitive Program issues such as the nomination and election of the Program Director and the processing of faculty membership applications. The chair of the committee will be responsible for scheduling meetings on an as-needed basis.

Student Representative to the BGSA: This individual will represent the Program within the BGSA, and coordinate student-sponsored events as needed.

E.4. Immunology Program Faculty Membership Criteria

- 1) Graduate Faculty status
- 2) Extramural research funding: current or recent history
- 3) Independence: space and funding
- 4) Experience mentoring graduate students: past and present
- 5) Appropriateness of research program for immunology graduate student training
- 6) Participation in the teaching of immunology and/or other graduate students
- 7) Participation in other immunology graduate program activities: journal clubs, seminar series, graduate thesis committees, examination committees

E.5. Immunology Program Faculty

A comprehensive list of Immunology Graduate Program faculty is available at <http://www.immunology.pitt.edu/graduate/faculty>

E.6. Immunology Program Students

A comprehensive list of Immunology Graduate Program students is available at <http://www.immunology.pitt.edu/graduate/students>

E.7. Immunology Program Graduates

Mark Alter, Ph.D., 1998

Thesis Advisor: Dr. Olivera Finn

Tumor-Specific TCR: Identification and Cloning for Use in Immunotherapy

Ira Bergman, M.D., Ph.D., 1998

Thesis Advisor: Dr. Olivera Finn

Antibody Treatment of Meningeal Neoplastic Xenograft

Ronna Campbell, Ph.D., 1999

Thesis Advisor: Dr. Michael Lotze

Relationship Between Spectrin-Based Cytoskeleton and Lymphocyte Function

Huei-Wei Chan, Ph.D., 1999

Thesis Advisor: Dr. Russell Salter

Genetic and Functional Analysis of KIR Molecules

Esi Lamou  -Smith, Ph.D., 1999

Thesis Advisor: Dr. Susan McCarthy

Phenotypic and Functional Characterization of a Novel Subset of CD8+ Anti-CD8 Resistant Cytotoxic T-Lymphocytes

Robert Berman, Ph.D., 2000

Thesis Advisor: Dr. Michael Lotze

Interleukin-10 in the Induction of Anti-Tumor Immunity: Strategies and Mechanisms

Natalya Serbina, Ph.D., 2000

Thesis Advisor: Dr. JoAnne Flynn

Role of CD8+ T cells in Mycobacterium tuberculosis infection

Jayakar Nayak, Ph.D., 2001

Thesis Advisor: Dr. Louis Falo

Promoting Tumor-Specific Immune Responses through Antigen Delivery and Targeting to Dendritic Cells

Henry Kao, Ph.D., 2001

Thesis Advisor: Dr. Olivera Finn

Characterization of New Breast Tumor-Specific Antigens Using a Novel Antigen Discovery System

Melina Soares, Ph.D., 2001

Thesis Advisor: Dr. Olivera Finn

Enhancement of the Immune Response to the Tumor Antigen Mucin (MUC-1)

Ana Cecilia Vasquez, M.S., 2001

Thesis Advisor: Dr. Penelope Morel

Utilizing Genetically Transformed Dendritic Cells to Induce Tolerance to Diabetogenic Autoantigens in NOD Mice

Hongmei Liang, Ph.D., 2001

Thesis Advisor: Dr. Joseph Ahearn

A Novel Strategy for Influenza Vaccination: Shaping Acquired Immunity with Complement Ligands

Lori Spencer, Ph.D., 2002

Thesis Advisor: Dr. Louis Falo

Skin Genetic Immunization: Role of DCs in Immune Response induced by Genetic Immunization

Paul Hu, Ph.D., 2002

Thesis Advisor: Dr. Timothy Wright

Analysis of the Topoisomerase-1-Specific Autoimmune Response in Scleroderma Patients and Healthy Controls

Anda Vlad, Ph.D., 2002

Thesis Advisor: Dr. Olivera Finn

Modulation of MUC-1 Antigen Processing for Elicitation of a T Helper Cell Response

Grace Olshansky, M.S., 2003

Thesis Advisor: Dr. Anuradha Ray

Jessica Kettel, Ph.D., 2003

Thesis Advisor: Dr. Olivera Finn

De novo expression and function of the epithelial mucin MUC1 on T cells

Nehad Alajez, Ph.D., 2003

Thesis Advisor: Dr. Olivera Finn

The safety, efficacy and tumor rejection potential of immunotherapy with MUC1-specific T cell receptors

Kamal Khanna, Ph.D., 2004

Thesis Advisor: Dr. Robert Hendricks

Active Immunosurveillance by CD8+ T Lymphocytes During Acute and Intermittent Herpes Simplex Virus-1 Infection

Bridget Colvin, Ph.D., 2004

Thesis Advisor: Dr. Angus Thomson

Murine CD8a+ Dendritic Cell Migration

Dominic Warrino, Ph.D., 2004

Thesis Advisor: Dr. Walter Storkus

Identification and Functional Analysis of HPV-16 E7 HLA-DR Restrictive Epitopes in Patients with Cervical Neoplasia or Cancer

Kathryn Board, M.S., 2004

Thesis Advisor: Dr. Karen Norris

Characterization of the Host Immune Response to a Pneumocystis carinii Infection in an SIV-infected Rhesus Macaque Model System

Christopher Herrem, Ph.D., 2004

Thesis Advisor: Dr. Walter Storkus

Characterization and Immune Targeting of a Novel Tumor Antigen, EphA2

Timucin Taner, Ph.D., 2005

Thesis Advisor: Dr. Angus Thomson

Dendritic Cells, Rapamycin and Transplant Tolerance

Rafael Flores, Ph.D., 2005

Thesis Advisor: Dr. Penelope Morel

The Regulation of Dendritic Cell Function in Autoimmune Prone and Wild Type Mice

Andrew Lepisto, Ph.D., 2005

Thesis Advisor: Dr. Robert Hendricks

The Dr. Jekyll and Mr. Hyde of the Immune System Following Ocular HSV-1 Infection

Casey Carlos, Ph.D., 2005

Thesis Advisor: Dr. Olivera Finn

The Human Tumor Antigen MUC1 as an Inducer of Dendritic Cell Chemotaxis and Distorted Maturation

Vilma Decman, Ph.D., 2005

Thesis Advisor: Dr. Robert Hendricks

The Dual Role of Gamma Interferon during Herpes Simplex Virus Type 1 Infection

Aklile Berhanu, Ph.D., 2005

Thesis Advisor: Dr. Walter Storkus

Combinational Cytokine Therapy of Cancer: Pleiotropic Impact within the Tumor Microenvironment

Scott Shell, Ph.D., 2005

Thesis Advisor: Dr. Christine Milcarek

Regulation of the 64-kDA Subunit of Cleavage Stimulatory Factor Activity in Macrophage and B Lymphocyte mRNA 3'-end Processing

Jian Huang, Ph.D., 2005

Thesis Advisor: Dr. Walter Storkus

Modulation of Tumoricidal Function of Dendritic Cells to Enhance Antigen Uptake and Cross-presentation

Michael Turner, Ph.D., 2005

Thesis Advisor: Dr. Olivera Finn

Regulation of MUC1-specific Immunity by CD4+ T Cells

David Hokey, Ph.D., 2005

Thesis Advisor: Dr. Louis Falo

Polarized Dendritic Cells for Tumor Immunotherapy

Yuk Yuen Lan, Ph.D., 2006

Thesis Advisor: Dr. Angus Thomson

Manipulation of Dendritic Cell Migration and Function in Relation to Alloimmune Reactivity and Transplant Outcome

Audrey Lau, Ph.D., 2006

Thesis Advisor: Dr. Angus Thomson

Ethanol Exposure and Dendritic Cell Function

Lazar Vujanovic, Ph.D., 2006

Thesis Advisor: Dr. Walter Storkus

Promoting Type-1 CD4+ T Cell Immune Responses against Tumor-associated Antigen MAGE-A6

Pamela Beatty, Ph.D., 2006

Thesis Advisor: Dr. Olivera Finn

MUC1 in the Relationship between Inflammation and Cancer in IBD

Kavitha Rao, Ph.D., 2006

Thesis Advisor: Dr. Scott Plevy

IL-12 p40 Gene Expression: Inhibitory Pathways and Inflammatory Bowel Disease

Shaival Davé, Ph.D., 2006

Thesis Advisor: Dr. Scott Plevy

Exogenous and Endogenous Danger Signals in Inflammatory Bowel Disease

Russell Traister, Ph.D., 2006

Thesis Advisor: Dr. Raphael Hirsch

AAV-Mediated Gene Transfer to Synovium: Enhancing Effects of Inflammatory Cytokines and Proteasome Inhibitors

Brendan Pillemer, Ph.D., 2007

Thesis Advisor: Dr. Anuradha Ray

Modulation of Regulatory T Cells by Cytokines

Anjali de Souza, Ph.D., 2007

Thesis Advisor: Dr. Lawrence Kane

Tim-1 and Tim-2 as Regulators of T Cell Activation

Payal Watchmaker, Ph.D., 2007

Thesis Advisor: Dr. Pawel Kalinski

Feedback Interactions between Dendritic Cells and CD8+ T Cells during the Development of Type-1 Immunity

Stephen Goding, Ph.D., 2008

Thesis Advisor: Dr. Per Basse

Induction of antitumor responses via adoptively transferred, cytokine-gene transduced A-NK cells

Jared Knickelbein, Ph.D., 2008

Thesis Advisor: Dr. Robert Hendricks

Noncytotoxic lytic granule-mediated maintenance of HSV-1 neuronal latency

Nandini Moorthy, Ph.D., 2008

Thesis Advisor: Dr. Prabir Ray

Novel Mechanisms in Dendritic cells that promote Th2 and Th17 but not Th1 responses in the lung

Rekha Rapaka, Ph.D., 2008

Thesis Advisor: Dr. Jay Kolls

*Mechanisms of antibody-based defense against *Pneumocystis Carinii**

Brian Sheridan, Ph.D., 2008

Thesis Advisor: Dr. Robert Hendricks

The presence of latent virus influences the maintenance and phenotype of the HSV-specific CD8 memory population

Hillarie Plessner Windish, Ph.D., 2008

Thesis Advisor: Dr. JoAnne Flynn

*Regulation of Immunopathology in *Mycobacterium tuberculosis* infection*

Laura Vella, Ph.D., 2008

Thesis Advisor: Dr. Olivera Finn

Cyclin B1: Abnormal Self/Tumor Antigen

Christopher Crowe, Ph.D., 2009

Thesis Advisor: Dr. Jay Kolls

Critical Role of Interleukin-17 Receptor Signaling in the Immunopathology of Influenza Infection

Sherrie Divito, Ph.D., 2009

Thesis Advisor: Dr. Robert Hendricks
Recipient Dendritic Cells Dictate Allograft Fate

Mayumi Kawabe, Ph.D., 2009

Thesis Advisor: Dr. Walter Storkus
Developing Combinational Immunotherapies Targeting Tumor Receptor Tyrosine Kinases

Michael Lipscomb, Ph.D., 2009

Thesis Advisor: Dr. Walter Storkus
The Role of T-Cell-Associated Transcription Factors in Dendritic Cell Priming of T-Cells towards Immunity or Tolerance; Role of T-bet or Foxp3 Ectopic Expression in Dendritic Cells

Sean Ryan, Ph.D., 2009

Thesis Advisor: Dr. Olivera Finn
Immunity and tolerance to the tumor-associated antigen MUC1

Martha Sklavos, Ph.D., 2009

Thesis Advisor: Dr. Jon Piganelli
Redox Modulation protects from antigen-independent and antigen-dependent injury in islet transplantation

Jeremy Tilstra, Ph.D., 2009

Thesis Advisor: Dr. Paul Robbins
Evaluating the role of NF- κ B Suppression in Ameliorating Mammalian Disease: An examination of Inflammatory Bowel disease and Diseases associated with aging

Gregory Frank, Ph.D., 2009

Thesis Advisor: Dr. Robert Hendricks
Dendritic cells and CD4⁺ T cells: Dual roles in the clearance and pathogenesis of herpes simplex viral infection

Marianne Bryan, Ph.D., 2009

Thesis Advisor: Dr. Karen Norris
T. cruzi parasite-specific humoral immunity versus polyclonal activation

Brian Janelsons, Ph.D., 2010

Thesis Advisor: Dr. Adriana Larregina
Role of Neurokinin 1 Receptor in Modulating the Immune-Stimulatory Function of Dendritic Cells

Jessica Chu, Ph.D., 2010

Thesis Advisor: Dr. Russell Salter
Innate immune sensing of a bacterial pore-forming toxin: The role of the NLRP3 inflammasome

Timothy Shipley, Ph.D., 2010

Thesis Advisor: Dr. Karen Norris
Pneumocystis Colonization and Chronic Obstructive Pulmonary Disease in a Simian Model of HIV Infection

Terri Thayer, Ph.D., 2010

Thesis Advisor: Dr. Clayton Matthews
Critical role of superoxide production in the initiation and pathogenesis of autoimmune diabetes

Michael Leibowitz, Ph.D., 2010

Thesis Advisor: Dr. Robert Ferris
Regulation of antigen processing machinery component expression in head and neck cancer by signal transducers and activators of transcription and src homology-2 domain-containing phosphatase

Yvonne Mburu, Ph.D., 2010

Thesis Advisor: Dr. Robert Ferris

Inflammatory Mechanisms of CCR7 Expression in Metastatic Squamous Cell Carcinoma of the Head and Neck (SCCHN)

Angela Pardee, Ph.D., 2010

Thesis Advisor: Dr. Walter Storkus

Cancer Immunotherapy Targeting T Cell Costimulatory Molecules

Mingjian Fei, Ph.D., 2011

Thesis Advisor: Dr. Anuradha Ray

Mechanisms Underlying Pulmonary Neutrophilia Versus Eosinophilia in Fungal Allergy

Ee Wern Su, Ph.D., 2011

Thesis Advisor: Dr. Lawrence Kane

Tim-3 and Galectin-9 Regulation of Effector T cell Activation and Function

Louis Michael Thomas, Ph.D., 2011

Thesis Advisor: Dr. Russell Salter

P2X7 Activation of non-primed myeloid cells promotes the shedding of stimulatory materials within microvesicles

Brendan Giles, Ph.D., 2011

Thesis Advisor: Dr. Ted Ross

Development of a broadly reactive vaccine for highly pathogenic H5N1 influenza

Stephanie Poe, Ph.D., 2012

Thesis Advisor: Dr. Anuradha Ray

STAT1-Regulated Lung MDSC-like Cells Aid Resolution of Inflammation After Bacterial Pneumonia

Benjamin Matta, Ph.D., 2012

Thesis Advisor: Dr. Angus Thomson

Plasmacytoid dendritic cells are key regulators of immune tolerance

Aparna Rao, Ph.D., 2012

Thesis Advisor: Dr. Walter Storkus

Integration of HSP90 inhibition in combinational immunotherapies targeting receptor tyrosine kinase EphA2

Erik Berk, Ph.D., 2012

Thesis Advisor: Dr. Pawel Kalinski

Dendritic cells regulate the induction of effector and memory CD8+ T cells

Deanna Schmitt, Ph.D., 2012

Thesis Advisor: Dr. Gerard Nau

Role of Innate Host Defenses in Acute and Vaccination Models of Pneumonic Tularemia

Anthony St. Leger, Ph.D., 2012

Thesis Advisor: Dr. Robert Hendricks

Expanding the functional CD8+ T cell repertoire reduces HSV-1 reactivation from latency in sensory ganglia

Nydiaris Hernandez-Santos, Ph.D., 2012

Thesis Advisor: Dr. Sarah Gaffen

Interleukin-17-Mediated Adaptive Immunity to Candida Albicans in Oropharyngeal Candidiasis

Judong Lee, Ph.D., 2013

Thesis Advisor: Dr. Lawrence Kane

Mechanisms of Tim-3 Signal Transduction in the Modulation of Downstream TCR Signaling

Dawn Reichenbach, Ph.D., 2013

Thesis Advisor: Dr. Olivera Finn

The effects of host response and vaccine design on early signaling profiles of MUC1-specific T cells

Jeffrey Walch, Ph.D., 2013

Thesis Advisor: Dr. Fadi Lakkis

Mechanisms of T cell migration to vascularized organ transplants

Samantha Slight, Ph.D., 2013

Thesis Advisor: Dr. Shabaana Khader

CXCR5 expressing T helper cells mediate protective immunity against tuberculosis

Jeffrey Wong, Ph.D., 2013

Thesis Advisor: Dr. Pawel Kalinski

CXCR5 expressing T helper cells mediate protective immunity against tuberculosis

Lauren Frazer, Ph.D., 2013

Thesis Advisor: Dr. Toni Darville

Characterizing the role of innate and adaptive immune responses in the pathogenesis of Chlamydia genital tract infection

Brian Rosborough, Ph.D., 2013

Thesis Advisor: Dr. Angus Thomson

Manipulation of regulatory myeloid cell differentiation and function and its therapeutic implications

Nina Chi-Sabins, Ph.D., 2013

Thesis Advisor: Dr. Walter Storkus

Engaging the Immune Response to Normalize the Tumor Microenvironment

Lu Chen, Ph.D., 2013

Thesis Advisor: Dr. Walter Storkus

Immunotherapeutic action of T-bet gene modified dendritic cells

Adam Farkas, Ph.D., 2013

Thesis Advisor: Dr. Olivera Finn

Dendritic cells are both targets and initiators of peripheral immune tolerance to self

Jiayao Phuah, Ph.D., 2013

Thesis Advisor: Dr. JoAnne Flynn

Elucidating the Role of the Humoral Response in Mycobacterium tuberculosis infected Cynomolgus Macaques

Michelle Messmer, Ph.D., 2013

Thesis Advisor: Dr. Robert Binder

Analysis of cellular sentinels for extracellular heat shock protein-peptide complexes

Michelle Heid, Ph.D., 2013

Thesis Advisor: Dr. Russell Salter

Dissecting the mechanisms of NLRP3 inflammasome activation in individual cells: The role of reactive oxygen

species and organelle damage

Uzoma Iheagwara, Ph.D., 2013

Thesis Advisor: Dr. Olivera Finn

Exposure to abnormal self antigens during non-malignant inflammatory events provides immunological defense against tumors

Sophia Jeon, Ph.D., 2013

Thesis Advisor: Dr. Robert Hendricks

The role of Programmed Death Ligand-1 (PD-L1) in Regulating the Immune Responses Against Herpes Simplex Virus-1 (HSV-1)

Douglas Marvel, Ph.D., 2013

Thesis Advisor: Dr. Olivera Finn

Regulation by IL-10 of innate immune responses to MUC1 as a self-antigen in MUC1 transgenic mice

Patricia Santos, Ph.D., 2013

Thesis Advisor: Dr. Lisa Borghesi

The Role of the E47-p21 Pathway in Long-Term Hematopoietic Stem Cells During Homeostasis and Under Repopulation Stress

Yu Zhou, Ph.D., 2014

Thesis Advisor: Dr. Robert Binder

The role of heat shock protein receptor CD91 in initiation of tumor-associated immunity

Abhishek Garg, Ph.D., 2014

Thesis Advisor: Dr. Sarah Gaffen

Feedback Inhibition of IL-17 Signal Transduction

Philip Vernon, Ph.D., 2014

Thesis Advisor: Dr. Michael Lotze

HMGB1, RAGE, and the Myeloid Response to Pancreatic Cancer

Kristia Hamilton, Ph.D., 2014

Thesis Advisor: Dr. Lawrence Kane

Identification of Novel Signaling Pathways in T Cells Mediated by Protein Kinase C, Carma1, MALT1 and Bcl10

Leticia Monin, Ph.D., 2015

Thesis Advisors: Drs. Shabaana Khader and Jay Kolls

T cell plasticity and co-infections in mycobacterial diseases

Mahesh Raundhal, Ph.D., 2015

Thesis Advisor: Dr. Prabir Ray

Characterization of Immune Response in Corticosteroid-refractory Severe Asthma in Humans and Mice

Kristine-Ann Buela, Ph.D., 2015

Thesis Advisor: Dr. Robert Hendricks

The role of dendritic cells in the cornea in the adaptive immune response following Herpes Simplex Virus – 1 (HSV-1) ocular infection

Waleed Elsegeiny, Ph.D., 2015

Thesis Advisor: Dr. Jay Kolls

The Effects of Anti-CD20 Therapy on Susceptibility to Pneumocystis Infection and the CD4 Signals that Mediate Clearance

Jing Zhao, Ph.D., 2016

Thesis Advisor: Dr. Paul Robbins

A causal role of ATM/NEMO-dependent NF- κ B activation in DNA damage-induced senescence and aging

F. IMMUNOLOGY PROGRAM DEGREE REQUIREMENTS

F.1. Immunology Program Course Requirements—PhD Track

<u>COURSE TITLE</u>	<u>CREDITS</u>
Foundations of Biomedical Science (AM)	8
Foundations of Biomedical Science (PM)	4
Survival Skills, Ethics courses	1-2
Introduction to Statistical Methods I	3
Comprehensive Immunology	2
Experimental Basis of Immunology	2
Contemporary Topics in Immunology	4
Immunology and Human Disease	2
TA: Medical Microbiology	2
Immunology Seminar	2
Electives (at least two courses)	<u>4-6 (or more)</u>
	34 (or more)

Students interested in the Immunology Program will typically take Comprehensive Immunology and Experimental Basis of Immunology in the Spring semester of their first year, along with one or two elective courses. In the Fall semester of their second year, Immunology students will begin taking Contemporary Topics in Immunology (which they will take for two to three years, depending on their course credit requirements) and may take an elective course(s) as needed or desired. In the Fall semester of their second year, Immunology students will take Immunology and Human Disease, and may take an elective course(s) as needed or desired. Students who do not take Immunology program courses in their first year can still join the Immunology program; they will take the above sequence of courses beginning in the Spring semester of their second year, and will therefore complete their electives before their required courses in most cases. MD/PhD students will be given credit for the Foundations of Biomedical Science lecture course.

F2. Immunology Program Course Requirements—MD/PhD Track

Admission into the PhD program in Immunology to medical students who wish to pursue the degree is subject to prior approval by the Director of Graduate Studies in Immunology and the thesis mentor who is a member of the graduate faculty in the Immunology program. This will apply to students who matriculate directly into the combined MD/PhD Program (MSTP) and also to medical students who apply to join the MSTP during or after year 1 or year 2 of medical school.

As per University of Pittsburgh guidelines, a minimum of 72 credits is required for the PhD in Immunology over a minimum of 6 full-time terms. 9 to 14 credits constitute full-time study in the fall and spring terms and 3 credits is considered full-time for the summer term. A minimum of 32 of those credits will come from coursework while a minimum of 40 credits must be earned for dissertation research, acquired after passing the doctoral comprehensive examination.

For MD/PhD students, 16 credits are granted toward the coursework successfully completed during the first 2 years of medical school at the University of Pittsburgh. A minimum of 17 credits of remaining coursework will be constituted by the following courses:

<u>COURSE TITLE</u>	<u>CREDITS</u>
Transfer credits from medical school curriculum	16
Molecular Medicine	1
Lab Rotations (3)	3
Comprehensive Immunology	2
Experimental Basis of Immunology	2
Contemporary Topics in Immunology	4 (1 credit each term taken in the 2 nd and 3 rd years)
Immunology and Human Disease	2
Immunology TA	2 (1 credit in the Spring Terms of the 2 nd and 3 rd years)
Immunology Seminar	2
*Electives (at least one course)	<u>2</u> (or more)
	36 (or more)

*Electives may include the Molecular Medicine course, the Professional Development course, and/or non-required courses offered by medical school graduate programs

Students will be subject to maintaining the same GPA requirements and ethical standards as are applied to graduate students as described in the Graduate Student and the MD/PhD program Handbooks. Comprehensive exams may be taken as early as the end of the first year in residence in the Immunology Graduate program, typically after most formal course work is completed.

F3. Immunology Program Course Descriptions

MSIMM 2210 Comprehensive Immunology (2.0 Cr)

This is a second-tier lecture and discussion course that will introduce the students to the fundamental concepts of modern immunology. The course will cover cells, tissues and organs of the immune system. Furthermore, in depth analyses of the development, activation, effector functions, and regulation of immune response will be presented in this course.

MSIMM 2230 Experimental Basis of Immunology (2.0 Cr)

This is a second-tier course that will expose the students to classical and contemporary literature in modern immunology. Emphasis will be on paper analysis and critical evaluation of primary data. This course will parallel the topics presented in Comprehensive Immunology lecture course, which must be taken before or simultaneously with Experimental Basis of Immunology.

MSIMM 2240 Intro to Immunobiotherapeutics (2.0 Cr)

This course provides a comprehensive overview of the principles and the technology upon which immunobiotherapeutics are based. The course focuses on the overall aims of using small molecules, antibodies, genes and cells as immunotherapeutic agents. It covers the use of viral and non-viral agents as gene delivery vehicles, cells as therapeutic agents and small molecules as delivery and therapeutic vehicles. The course also covers diseases and disorders in which immunobiotherapy has proven safety and demonstrated successful outcomes

like cancer, mendelian disorders and autoimmunity. Lectures and student presentations cover: Genes and cells as drugs, peptides, antibodies and small molecules as therapeutics and delivery vehicles, viral and non-viral vectors, stem cells, and specific diseases where immunotherapy has shown safety and efficacy. Students may also be educated on bioethical issues and existing laws governing biotechnology and molecular medicine approaches.

MSIMM 2250 Immunology Teaching Assistant (1.0 Cr)

Microbiology Course

The purpose of this course is to introduce graduate students of the Integrated Biomedical Sciences Graduate Program to the principles of teaching. The students will be trained in basic teaching techniques as well as provided material for teaching students specific concepts. As part of this course, students will participate in teaching first-year medical students the fundamentals of microbiology, in conjunction with the Laboratory and Problem Based Learning sections of the Molecular Pathogenesis of Infectious Disease course of Basic Science Medical School block. Each student will be responsible for 8-10 medical students in a laboratory setting. The student will present basic laboratory techniques, explain concepts of microbiology and infectious disease, including diagnostic tests, interpretation of results, and data management. In addition, the student will assist the Faculty Facilitator in the Problem Based Learning Sessions where they will review laboratory findings with the students.

Undergraduate Immunology Course

This course will provide Immunology graduate students with the opportunity to serve as teaching assistants in the undergraduate Immunology course. The curriculum is designed to provide valuable teaching skills to the professional scientist. Students will attend all BIOSC 1760 lectures, prepare problem sets and session content for recitation periods, conduct a one-hour recitation period each week, assist with the preparation and grading of exams, and proctor exams.

MSIMM 3220 Contemporary Topics in Immunology (1.0 Cr)

This is a third-tier course in which students will read, present, and evaluate the primary literature in immunology. Each semester will feature an integrated set of papers addressing a current issue of interest to modern immunologists. The course may be taken more than once, since the topic addressed will change each semester. The prerequisite is Comprehensive Immunology or permission of the course director.

MSIMM 3230 Immunology and Human Disease (2.0 Cr)

This is a third-tier course that will apply modern immunological principles to develop our understanding of the causes or treatments of human disease. The course will consist of a series of lecture and discussion blocks. Background reading will be required and the course will rely heavily on the reading of original articles. Classes will regularly be devoted to paper discussions, and each student will be responsible for introducing one paper. The prerequisite is Comprehensive Immunology or permission of the course director.

MSIMM 3280 Immunology of Infectious Diseases (2.0 Cr)

This course examines the immune responses to pathogens, as well as on immune evasion of microbes. The organisms studied include bacteria, parasites, and viruses. Topics focus on host-pathogen interaction and include innate immunity, modulation of antigen processing and presentation, pathogenic strategies for subversion of immune responses, effector functions of immune cells, and immunopathology.

Additional Immunology program courses can and will be developed, as dictated by student and faculty interests and needs.

MSIMM 3220 Contemporary Topics in Immunology (1.0 Cr)

Fall 1997

Cytolytic Effector Mechanisms of Lymphocytes

Drs. William Chambers and Chau-Ching Liu

Spring 1998

T Lymphocyte Cytokine Signaling Pathways

Drs. Michael Lotze and Angus Thomson

Fall 1998
Interaction of Pathogens and the Host Immune System
Dr. JoAnne Flynn

Spring 1999
Structural and Functional Relationships in Immune Receptors
Drs. Michael Cascio and Olivera Finn

Fall 1999
Development and Function of Dendritic Cells
Drs. Louis Falo and Walter Storkus

Spring 2000
Cellular Trafficking and Homing in the Immune System
Drs. Per Basse and Timothy Carlos

Fall 2000
Protein Phosphorylation and Cell Signalling in Immunology
Drs. Seth Corey and Baskaran Rajeskar

Spring 2001
Immune Evasion
Drs. William Chambers and Michael Corb

Fall 2001
Molecular Mechanisms in B cell Development
Dr. Christine Milcarek

Spring 2002
Mucosal Immunity
Drs. Scott Plevy and Rosemary Hoffman

Fall 2002
Autoimmunity
Drs. Massimo Pietropaolo and Nick Giannoukakis

Spring 2003
Inflammation and Tumorigenesis
Drs. Anthony Brickner and Robert Ferris

Fall 2003
Tumor Antigens and T Cells
Dr. Hassane Zarour

Spring 2004
Vaccinology
Drs. Michael Murphey-Corb and William Chambers

Fall 2004
Combined with Immunology Journal Club
Course director: Dr. Lawrence Kane

F.4. Publication Requirement

Publication of novel findings is an important part of being a research scientist and the principal way that scientific findings are disseminated. Students are therefore required to publish at least one first-author paper of original research, for completion of the Ph.D. in Immunology. Exceptions to this requirement must be approved by the thesis committee.

F.5. Additional Immunology Program Activities

The Immunology Journal Club benefits from graduate student, post-doctoral fellow, and faculty participation. This weekly meeting, in which participants discuss the background, data, interpretation, and relevance of selected current journal articles, allows students to develop essential critical reading habits as well as presentation and group leadership skills. In addition, students make important contacts with faculty and post-doctoral fellows from other program labs and disciplines. For second and third year graduate students, participation in the journal club is mandatory to fulfill the requirement for the Contemporary Topics in Immunology course (MSIMM 3220).

The weekly Immunology Seminar series, co-sponsored by the UPCI, allows graduate students, post-doctoral fellows, faculty, and guest speakers to present their most exciting current research results. Graduate students are required to present their research progress once per year beginning in the third year (second year in the Immunology Program). Graduate students meet with guest speakers at special lunches, so that the students can begin to form contacts for collaborations and future post-doctoral opportunities. Attendance each week is required for all Graduate Students. Attendance at the weekly presentations is required of all graduate students in the Program.

G. IMMUNOLOGY PROGRAM COMPREHENSIVE EXAMINATION

G.1. Introduction

Students enrolled in the Ph.D. program should take the Comprehensive Examination within one year of completing their first year curriculum requirements. The Comprehensive Examination will be administered after the student has completed most course work and has chosen a major advisor. Early in the Spring semester in which proposals are to be submitted, students will meet with the chairperson of the Examination Committee to discuss these guidelines.

The student will be required to submit a proposal in the format of a research grant to the Comprehensive Examination Committee chairperson, who shall establish a panel of faculty members to evaluate each student's proposal and to conduct an oral examination of the student if the written proposal is acceptable. The student is graded pass/fail, with a simple majority vote of the panel deciding the grade. In the event of a failure, the student shall be given one opportunity to retake each failed component of the examination. In the event that a student fails either component twice, the action of the faculty shall be dismissal of the student from the program or recommendation of a plan for completion of a terminal M.S. degree.

G.2. Comprehensive Examination Proposal (written component)

The Comprehensive Examination is based on the student's thesis research area (see below). Unless an exception is granted, the student must submit an Abstract describing the planned research project by May 1, and the full written proposal by June 1. Preparation of the written documents should follow the guidelines below and can be further clarified by the Chair of the Comprehensive Examination committee if required. The examination will require that the student submit and defend a proposal in the format of a research grant, with the following guidelines:

a. **General Guidelines.** The proposal is expected to be conceptually well-founded and adequately documented. The student is responsible for preparing an original research proposal. Dissertation advisors and others may be consulted on specific scientific issues, but the document must be prepared exclusively by the student. Advisors may not discuss the proposal with the student, or edit the written proposal for style or content, or coach the student for the oral defense. Attribution to published and unpublished sources must be comprehensive. The written proposal must be original to the student, although the project may have been outlined previously in the advisor's grant. The written proposal must include well-defined hypotheses and rationale, as well as the significance of the proposed experiments. Overall significance to the field of research also should be discussed.

b. **Format.** The proposal shall be single spaced, with one-inch margins on all sides. The font used shall be **11 pt. Arial**, although smaller type may be used in figures and legends. The written research proposal must adhere to the following page guidelines:

- Title Page
- Abstract (1-2 paragraphs)
- Specific Aims: not to exceed one page
- Background and Significance: not to exceed two pages
- Preliminary Data (optional): not to exceed three pages
- Research Plan: not to exceed four pages
- Tables, figures and other data (optional): not to exceed four pages.
- Literature Cited: not to exceed four pages; must include complete citation with all authors, year, title, journal, volume, inclusive pages (see e.g. Journal of Experimental Medicine).

c. **Policy on consultation.** Students are encouraged to seek feedback on the written proposal from other students, but not faculty members. Those whose written English skills are considered weak may wish to consult the Writing Center in the Cathedral of Learning (ext. 46556), which provides individualized help with writing skills.

G.3. Administration of the Comprehensive Examination

a. **Submission of the proposal.** Students shall take no more than **four weeks** from their laboratory work in the writing of their Comprehensive Examination proposal. Upon completion, an electronic (**PDF only**) copy shall be submitted to the chairperson of the Examination Committee. An electronic copy of the Specific Aims of the Advisor's grant(s) on the specific area should also be submitted at the same time.

b. **Examination committee.** As soon as possible (PREFERABLY WITHIN ONE WEEK OF SUBMISSION OF THE PROPOSAL), the Examination Committee, with the advice of appropriate faculty members, shall establish for each student's proposal, a panel of faculty members (and its chairperson) competent to evaluate the subject of the research proposal. Each panel shall consist of three members, at least two of whom are members of the Immunology Program. At least two members of the panel will have served previously on a comprehensive examination panel. The chairperson of the Examination Committee will distribute the proposal to members of the selected panel within one week of its submission. The student's thesis Advisor shall not serve on a panel established to evaluate one of his/her students.

c. **Evaluation of the proposal.** The written proposal should be assessed mainly for clarity, scientific accuracy and internal consistency. The proposal should not be evaluated like an R01 proposal, i.e. significance and innovation should be given less weight than the above criteria (although the student should still be able to explain the significance and novelty).

i. **Comments.** Committee members should forward to the Chair of the committee specific written comments on the proposal within two weeks of receipt, including a recommendation on which level of revision (if any) is necessary (see ii – below). The Chair will compile these comments and forward them to the student, along with a decision on the written document.

ii. **Initial assessment.** Three initial outcomes are possible: provisional pass (small factual or stylistic comments, which can be quickly revised), minor revision (e.g. one sub-Aim in need of significant revision) or major revision (seriously flawed hypothesis and/or approach). The student will submit a revised proposal, including a brief response (one-page limit) to the original critiques within 2 weeks (provisional pass), 4 weeks (minor revision) or 6 weeks (major).

iii. **Pass/Fail.** The Committee will reach a decision about the suitability of the revised proposal (i.e. responsiveness to the critiques) within **one week**. If the revised document is still judged to be inadequate, the student will be judged to have failed the written component. A second unacceptable written exam performance shall constitute a second failure, and the student will be subject to dismissal or other action as noted in section 1, above.

d. **Oral examination.**

i. **Logistics.** The oral examination for each student should be scheduled within three weeks after submission of a sufficient written proposal. At the beginning (in the absence of the student) the Examination Committee chairperson (or a representative) will briefly address the committee, communicating the ground rules for the examination. The oral examination will be held in a closed session, with only the student and three members of the examination panel in attendance. The student will begin the examination with an oral presentation (not to exceed 15 minutes). Slides depicting Specific Aims or figures/tables from within the proposal may be used. The oral examination shall not exceed two hours, inclusive of the student's opening presentation. The research proposal shall be the sole document available to the student during the oral examination.

ii. **Standards.** It will be the panel's task to evaluate the student's understanding of both the contents of the research proposal, and the basic concepts underlying them. The oral examination should not be used as an opportunity to correct serious flaws with the written proposal. At the end of the oral examination, the panel will vote in private to pass/fail the student. A simple majority shall prevail. There shall be no conditional pass/fail decision. The panel chair will immediately notify the student of the decision and evaluation of performance. A critique written by the comprehensive examination panel chairperson, evaluating the exam performance and the pass/fail decision, shall be submitted to the chairperson of the Examination Committee, who shall distribute copies to the Director of the Immunology Graduate Program, the student, and the student's Advisor.

iii. **Failure/re-examination.** In the event of failure of the oral exam, a student will have one opportunity to re-take that component of the exam, and will be advised by the exam committee whether it would be appropriate to revise the written component (only if no previous revision was required prior to the first oral exam) before re-taking the oral component. The re-examination committee will consist of three faculty, at least two of whom will be from the Immunology Program. The committee should consist of one original committee member and two replacement members, at the discretion of the Program Director. A second unacceptable oral exam shall constitute a second failure, with the student subject to dismissal or other action as noted in section 1, above.

h. A "pass" of the comprehensive examination shall be accomplished when both of the following conditions are met:

(i) the written proposal is considered sufficient as presented, and (ii) the student has performed knowledgeably in the oral defense of the proposal.

H. ADVANCEMENT TO CANDIDACY AND FORMATION OF A DISSERTATION COMMITTEE

Following completion of course work and passing the comprehensive examination, the student undertakes the steps required for advancement to candidacy for the Ph.D. degree, outlined below.

Students should form a dissertation committee within one month of passing their Comprehensive Examination. The committee shall consist of at least five faculty members. The Dissertation Advisor is included in the committee and may act as Chair, although another faculty member may be designated Chair of the committee. The majority of the members must be from the Immunology program faculty, and the majority of the members must have Graduate Faculty status. At least one member must not be a member of the Immunology program, and at least one of these outside members must have Graduate Faculty status. The student is not limited to faculty from the School of Medicine. The Director of the Immunology program will review the committee, sign the necessary forms and forward the completed documents to the Graduate Office and to the Immunology Program Administrator. Final approval of committee membership rests in the hands of the Associate Dean for Graduate Studies.

The thesis committee should meet within two months of formation. Prior to the meeting, a written thesis proposal should be provided to each committee member. At this meeting, the dissertation research project is presented in detail to the committee; if the committee approves the proposal, the student should make certain that all required graduate school forms are completed for advancement to candidacy for the Ph.D. degree.

Every time a thesis committee meets (including the first meeting), a brief report of this meeting, signed by both student and advisor, must be sent to all thesis committee members, and to the Immunology Program Administrator, so that this information can be included in the student's academic file.

Following the initial thesis committee meeting, additional meetings must be held at six month intervals. The student must submit one week prior to the scheduled committee meeting a brief written summary of their research progress since the previous committee meeting.

I. DISSERTATION AND FINAL ORAL EXAMINATION

When a determination has been made by the thesis committee that the student is nearing completion of their degree, the committee may give the student permission to begin working on their written dissertation. This generally occurs about six months from the anticipated graduation date. As the student approaches this date, and is ready to schedule their oral defense (see below), they will complete a form, to be signed by the thesis advisor and Program Director, indicating that they have met all other requirements for the PhD, apart from the oral defense. This includes the necessary coursework and publication (or acceptance) of at least one peer-reviewed manuscript of original research (see F.4). This form is to be presented to the Office of Graduate Studies when arranging a date for the oral defense. Copies of the form are to be retained by the student, thesis advisor, Program Director and Office of Graduate Studies.

The student's dissertation must provide evidence of original scholarly research of sufficient quality to be published in a leading scientific journal. Laboratory work for which a student receives wages (for example, work performed when the student was employed as a technician) is not eligible for any part of the dissertation research. The student's dissertation committee will meet at the time that the student's research is nearly complete and will authorize the student to begin writing the dissertation. The style and format of the dissertation must conform to the standards set forth by the Graduate Council. The dissertation advisor and one or more members of the dissertation committee will read preliminary drafts of the dissertation and will approve the final copy for submission to the dissertation committee. The final copy must be submitted to the dissertation committee at least two weeks prior to the dissertation defense date.

The dissertation defense consists of a formal, public seminar on the subject of the dissertation. This is followed by

an examination of the student by the Thesis Committee members. If the decision of the committee is not unanimous, the case is referred to the Dean for resolution. The degree, in Immunology, will be granted by the School of Medicine.

A student must be on active status (must be registered for a minimum of three credits during a 12 month period) and must register for at least one credit during the term in which they are graduated. Students who complete all the degree requirements in one term but are graduated the next term may petition the dean for a waiver of this requirement. A student who is on inactive status must be readmitted and registered for three credits in order to be graduated.

The School of Medicine stipulates that the following requirements must be met before the last day of the term in which the student has applied for graduation. Students apply for graduation through the Graduate Studies Office.

At least one month prior to defense, the student must make arrangements with the Immunology program Administrator for the final defense. This information will be relayed to the Office of Graduate Studies in letter form, stating the student's name, program, degree sought, title of dissertation, date, time and place. This information will be forwarded to the University Times for publication and an announcement will be sent to the Graduate Faculty Members of the School of Medicine.

After the final defense, the following should be delivered to the Graduate Office as one package:

One copy of the final approved dissertation (unbound, final corrected version on acid-free paper), with title page signed by all thesis committee members.

Three additional copies of the abstract (350 word maximum double-spaced), initialed in the upper right hand corner by the student's advisor

A letter from the Program Director giving official notice that the candidate has fulfilled all the academic requirements (change of status and grade cards should accompany this letter).

Forms required:

Survey of Earned Doctorate (used by National Research Council)

Agreement form to permit publication of the dissertation by University Microfilms, Inc.

An official receipt from University Cashier (G-7 Thackeray Hall) for payment of dissertation binding/microfilming fees.

Please also note that students are required to submit an electronic version of the thesis using the ETD submission process (<http://www.pitt.edu/AFShome/g/t/graduate/public/html/etd/>) as required by University Policy.