PATHOBIOLOGY

Graduate Student Handbook

2018 - 2019

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University of Washington

INTRODUCTION

The faculty and staff would like to take this opportunity to welcome all incoming students to the Interdisciplinary Pathobiology Graduate Program. We hope you are looking forward to a year of exciting opportunities to learn and experience the challenges associated with research. This Handbook has been made available to assist you in answering some of the basic questions regarding the graduate program and administrative services. It is not intended as a substitute for official University publications such as the *University of Washington Handbook* and Graduate School *Memoranda*.

As a discipline, Pathobiology ties together the fundamental concepts of biology, medicine, and public health, particularly as applied to global health issues. The program applies a multidisciplinary approach as well as the latest research technologies to the study of global health problems such as viral, bacterial, and parasitic diseases, as well as other conditions such as cancer. Investigating the mechanisms underlying multifactorial diseases emphasizes the preventive as well as the curative, and a broader view of disease etiology. The program applies the research tools of immunology, molecular biology, pathology, and genetics to the detection and characterization of cancer, sexually transmitted diseases, and respiratory and parasitic infections.

The Pathobiology Graduate Program offers research and training programs leading to the Doctor of Philosophy and Master of Science degrees. Coursework includes basic courses in Pathobiology, with additional courses required in epidemiology and molecular biology. Students may also choose electives from other basic medical sciences, such as microbiology, biochemistry, pathology, and genetics. The Program places equal emphasis on research and training for both graduate students and postdoctoral fellows.

The graduate program is geographically dispersed. The business office is located on the third floor of the Harris Hydraulics building (HHL) in room 310d. Faculty offices are at a number of locations around the Seattle area and the UW campus. Faculty are located in the Health Sciences Building, Center for Infectious Disease Research, Seattle Children's Research Institute, Fred Hutchinson Cancer Research Center, Harborview Medical Center Research and Training Building, the Brotman Building (South Lake Union), Infectious Disease Research Institute, Institute for Systems Biology, and Western Fisheries Research Center. Please see the list of faculty in Appendix P for the location of each researcher.

The administrative home of the Interdisciplinary Program in Pathobiology is the Department of Global Health. The Chair of the Department of Global Health is Dr. Judith Wasserheit. The Program is guided by a Steering committee, chaired by Dr. Lee Ann Campbell, head of the graduate program. Other members include Drs. Jennifer Lund, Marilyn Parsons, and David Sherman. Dr. Wasserheit serves *ex officio* on the committee, and Jill Fulmore, the Pathobiology Program Manager, staffs the committee.

Please read and use this book!

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1.0 Course Work

1.1 The PhD Program

Time to completion: ~ 5 years
TOTAL CREDIT REQUIREMENT: 90 CREDITS
MINIMUM: 18 GRADED CREDITS

The Pathobiology Graduate Program has established learning objectives for its doctoral program. Upon completion of the program, the student will be able to:

- Explain and apply a fundamental understanding of basic cellular and molecular processes and techniques important in the application of basic biomedical research to diseases of global public health interest. Specifically, this includes the ability critically analyze the paradigms for control, prevention, and treatment of diseases of public health importance, an understanding of the epidemiology and processes of diseases of national and international importance, an understanding of how biomedical research can approach such diseases, and basic methodologies used in this type of research, including relevant areas of immunology, molecular biology, epidemiology, and biostatistics. Students are also expected to develop familiarity with the major classes of pathogens.
- Conduct independent research leading to the expansion of knowledge of Pathobiology. This includes having the skills to approach an unfamiliar experimental system, and to identify and explore important questions concerning pathogenesis and infection.
- Collect, analyze, interpret, and use data for solving problems in Pathobiology.
- Utilize advanced research approaches and expertise in the area of their research concentration.
- Communicate research findings to scientific audiences through publications and oral presentations.

The course of study outlined below will fulfill University of Washington regulations. In this handbook, those requirements will not be covered exhaustively. Students should consult the Graduate School website and other memoranda concerning those requirements. Ultimately, it is the student's responsibility to ensure that s/he meets the UW and program requirements and proceeds through the program in a timely fashion.

REQUIRED COURSES		**CREDITS**	**GRADED OR C/NC**
PABIO 550	Diseases and Issues in Global Health	2	Graded
PABIO 551	Biochemistry and Genetics of Pathogens and Their Hosts	4	Graded
PABIO 552	Cell Biology of Human Pathogens and Disease	4	Graded
PABIO 553	Survival Skills for Scientific Research	2	C/NC
PABIO 580*	Pathobiology Seminar	1	C/NC
PABIO 581**	Current Literature in Pathobiology	1	C/NC
PABIO 582**	Critical Thinking and Research Design in Pathobiology	1.5	C/NC
PABIO 591**	Pathobiology Minicourse Series	1	C/NC
PABIO 598	Didactic Pathobiology (teaching)	2-3	C/NC
PABIO 500	Rotation	3	C/NC
PABIO 600	Research	Variable	C/NC
PABIO 800	Doctoral Dissertation	Variable	C/NC
EPI 511^	Introduction to Epidemiology	4	Graded
EPI 527^	Vaccines	3	Graded
PHI/HSERV 579***	Structural Racism and Public Health	1	C/NC
	Plus one of these courses:		
IMMUN 441	Introduction to Immunology	4	Graded
IMMUN 532	Advanced Immunology	4	Graded

UCONJ 510	Introductory Laboratory Based Biostatistics	2	

Notes on Courses for Degree Progress

* Students are required to attend Seminar (PABIO 580) every Winter Quarter, and to attend the presentations of dissertation research in the Final Exam of students completing the Pathobiology PhD program. Students in the writing stage of their dissertation are exempted from PABIO 580 for that quarter.

** Students are required to enroll in Lit Review (PABIO 581) every Autumn Quarter for the first three years, Critical Thinking (PABIO 582) every Spring Quarter until they complete their General Exam, and a minicourse (PABIO 591) every Spring Quarter for the first four years in the PhD program.

*** Required for student who entered the program Autumn 2017 and later.

^Pathobiology students are required to take either Epi 511 or Epi 527 to fullfill the Pathobiology PhD program's epidemiology requirement (or obtain permission from the head of the Pathobiology program to get credit for an epidemiology course elsewhere). Epi 511 is a 4-credit graduate level introductory course that fulfills this requirement. Alternatively, Epi 527 (Vaccine Epidemiology) is a 3-credit graduate level option that focusses on vaccines and can also be used to fulfill this option. However, students who opt to take Epi 527 should be aware that they may need to do remedial introductory work on their own to succeed in this class and that Epi 511 may be a better choice for students who have not gained familiarity with basic concepts in epidemiology in other settings.

Biostatistics Competency

Given the importance of understanding biostatistics, the Pathobiology Program requires students entering the PhD program in Autumn 2016 or later to have formal coursework in biostatistics. To allow for maximum flexibility, this requirement can be fulfilled in a number of ways. Doctoral students must complete one of the items below by the end of the third year to demonstrate competency.

1. UCONJ 510: Introductory Laboratory Based Biostatistics (2 credits, offered in Summer Quarter)*
2. Either BIOST 508: Biostatistical Reasoning in the Health Sciences (4 credits) or BIOST 511: Medical Biometry (4 credits) or BIOST 517: Applied Biostatistics (4 credits)
3. Previous coursework in Biostatistics or Statistics – must be approved by Program Director
4. Alternate approach to be discussed with the Program Director

*If taking UCONJ 510 in summer, students should register for no more than 2 credits total

PhD Electives

You must take at least two electives of your choice. Recommended options for elective courses is listed below, however you are not limited to the listed options. Note that PABIO 536 (Bioinformatics) is strongly recommended as an elective for all students. Please consult with your advisor and your committee regarding your selection and schedule of electives. Your Doctoral Supervisory Committee may advise you to take additional electives. If the latter occurs, this should be documented in your file in the program office. Some electives are more suitable for students with advanced backgrounds. Students should consult a current catalog to verify course offerings. See list of electives on page 12.

1.2 MSTP Coursework

The curriculum for Pathobiology PhD Students in the MSTP Program is identical to the PhD program described above except that:

1. The rotation requirements have been waived since these are fulfilled during the first years in Medical School.
2. The Didactic Teaching requirement may be waived if they have served as a TA during Medical School prior to joining the Pathobiology Program. In that case, they are exempted from taking PABIO 598.
3. Immunology 441 or 522 are recommended but not required.

Pathobiology Rotation Program

First year students in the PhD program participate in the laboratory rotation program. This program is designed to provide research experience in various projects and experimental systems that are being investigated in the program. It will give students the opportunity to interact with faculty, students, postdoctoral scientists, and staff in different research groups and facilities, and assist students in deciding in which laboratory they wish to conduct their dissertation research. Students rotate through three labs, one quarter each for their first three quarters.

Laboratory assignments will be the responsibility of the Graduate Program Director, Dr. Lee Ann Campbell. Prior to the start of Autumn Quarter, students will be asked to provide their top choices of laboratories in which they would like to rotate. **Students are strongly encouraged to contact faculty members with whom they are interested in rotating** in Autumn (and other quarters, if desired) to discuss research opportunities and solidify a rotation for Autumn Quarter. Rotation plans for Winter and Spring Quarters should be solidified no later than the end of Autumn and Winter Quarter, respectively. If any difficulties arise in identifying a laboratory rotation for any of the quarters, the Program Director will assign a laboratory rotation. Assignment of laboratory rotations is based on 1) the preferences of the student and 2) the ability of labs to support the student's research (financial, space, and mentor time considerations) both in the short term and if possible in the longer term. The students will work on experiments related to the goals of funded projects within the labs. The Program Director will attempt to match students and labs according to interest, but may need to make rotation assignments other than those listed by the student for reasons such as space, funding, and reasonably equitable distribution of students. It is strongly encouraged that students do rotations at more than one site. Students will not be allowed to remain in one lab for more than one quarter or to do more than three rotations. All rotations must be approved by the Program Director (Appendix K).

Students are expected to identify a faculty mentor who agrees to provide funding support for their doctoral research typically by the ninth week of the third quarter or by the date specified by the Graduate Program Manager. In the fourth quarter (Summer), if the student enters a laboratory in which they have not rotated, funding is provided by the faculty mentor and formalization of continuous support for the Student's doctoral research is contingent on sufficient research progress during this quarter. The inability to identify a laboratory that accepts the Student for their dissertation research by the end of the fourth quarter will lead to dismissal from the Interdisciplinary Doctoral Program in Pathobiology (see Academic Progress, page 21).

Students will enroll in PABIO 500 for three credits for each rotation, and list the corresponding faculty member as the professor. This faculty member will be responsible for providing a credit/no credit grade for the student. In general, students are expected to work approximately 20 hours per week on their project and are expected to attend lab meetings. To receive credit for the rotation, all students are expected to give a presentation to the host lab on their work, write a written report on their rotation (1-2 pages single spaced), and receive a written evaluation from the professor using the form in Appendix L. A copy of this evaluation and the student report will be provided to the Program Director to be placed in the student's file.

Students are expected to complete all three rotations. However, third rotations may be waived at the discretion of the Program Director if the following conditions are met: 1) the student has rotated with a faculty member who would agree to be their mentor and 2) the Program Director deems a third rotation unlikely to provide an additional option for permanent mentor selection.

On rare occasions, students may petition to be exempted from the rotation program. The written request should state the basis for the request and should be accompanied by a letter of support from the potential advisor. Comparable experience or compelling reasons of funding is generally required for exemption. The petitions will be submitted to the Program Director, and the decision to approve or not approve will rest with the Graduate Student Advisory Committee (GSAC). Students will receive a written confirmation of the exemption.

Didactic Teaching Requirement

Teaching experience is an essential part of the education for a doctoral degree. Therefore, it is a requirement for doctoral Pathobiology students to obtain training in teaching at the University level through enrollment and participation in one quarter of PABIO 598: "Didactic Pathobiology".

This type of teaching experience is a learning opportunity for university credit and not a paid Teaching Assistantship. It does not have a service expectancy, and therefore does not receive DGH funding. The didactic teaching requirement should be completed by the end of the fourth year.

Note that Teaching Assistantships (offered by other departments) cannot substitute for the Pathobiology Didactic Teaching requirement.

Didactic Pathobiology learning objectives:

At the completion of Didactic Pathobiology, students are expected to:

1. Understand and design key elements of a college or graduate level course
2. Prepare and present lectures and active learning sessions
3. Design appropriate evaluations to measure student learning

To ensure fairness in assignments, the Program Manager will distribute an expectations form prepared by the instructor(s) of each course eligible for didactic training and request a list of the top two-three choices from each student at the end of their second year of classes. The Program Director will then allocate didactic teaching assignments for the next year.

The courses that offer opportunities for didactic training include:

- PABIO 550: Diseases and Issues in Global Health
- PABIO 551: Biochemistry and Genetics of Pathogens and Their Hosts
- PABIO 552: Cell Biology of Human Pathogens and Disease
- PABIO 536: Bioinformatics and Gene Sequence Analysis
- G H 410: Advanced Biologic Principles of Global Diseases

Policy for conversion to the MS degree and admittance into the PhD program

PhD students may, if they wish, switch to the MS program. In so doing, they in effect resign from the PhD program. If they later wish to continue to a PhD, they must re-apply for that program. Students wishing to pursue this option should consult with the Program Director.

Procedure for Dismissal from the Doctoral Program Prior to Formation of Committee

Students who enter into the Pathobiology Graduate Program to pursue doctoral studies, but demonstrate unsatisfactory progress (e.g. poor progress in courses) may be required to address deficiencies by specific actions (e.g., take additional coursework, write a research paper), may be required to switch to the MS Program, or may be dismissed from the Pathobiology Graduate Program. In deciding among these options, the Program Director and members of the Graduate Student Advisory Committee (GSAC) will gather input from faculty involved in coursework, the rotation and current mentors, and from the student. The input will be considered by an ad hoc committee (comprised of the Program Director, the GSAC, and one additional faculty member with

direct knowledge of the student and core course instructors) in their assessment of the student's past performance and potential for future performance. The goal is to determine the best option for the student and program, considering that poor early progress may indicate that this career track is not optimal for the student.

1.3 The MS Program

Time to completion: 2 years
TOTAL CREDIT REQUIREMENT: 60 CREDITS
MINIMUM: 18 GRADED CREDITS

The Pathobiology Graduate Program is not currently accepting students directly into the MS Program. However, the MS Program remains an option under specific circumstances, such as failure to pass the General Exam or changes to academic goals.

The following learning objectives are the basis for the Master's degree in Pathobiology. The student will be able to:

- Discuss and apply fundamental aspects of basic biomedical research to diseases of public health interest. Specifically, this includes developing an understanding of the applications of molecular biology to public health, epidemiology, and cellular or antigenic analysis, and microbiology or immunology.
- Collect, analyze, interpret, and use data for solving problems in Pathobiology.
- Demonstrate competency in basic research skills and understanding of the scientific method.
- Communicate research findings through oral and written presentations.

The course of study outlined below will fulfill University of Washington regulations. In this handbook, those requirements will not be covered exhaustively. Students should consult the Graduate School website and other memoranda concerning those requirements. Ultimately, it is the student's responsibility to ensure that s/he meets the UW and program requirements and proceeds through the program in a timely fashion.

REQUIRED COURSES		CREDITS	GRADED OR C/NC
PABIO 550	Diseases and Issues in Global Health	2	Graded
PABIO 551	Biochemistry and Genetics of Pathogens and Their Hosts	4	Graded
PABIO 552	Cell Biology of Human Pathogens, Disease, and Public Health	4	Graded
PABIO 553	Survival Skills for Scientific Research	2	C/NC
PABIO 580*	Pathobiology Seminar	1	C/NC
PABIO 581**	Current Literature in Pathobiology	1	C/NC
PABIO 582**	Critical Thinking and Research Design in Pathobiology	1.5	C/NC
PABIO 591**	Pathobiology Minicourse Series	1	C/NC
PABIO 500	Rotation	3	C/NC
PABIO 600	Research	Variable	C/NC
PABIO 700	Master's Thesis	Variable	C/NC
EPI 511***	Introduction to Epidemiology	4	Graded
EPI 527***	Vaccines	3	Graded

MS Electives

Additional courses in Pathobiology or the biomedical sciences may be taken to fulfill the graded course requirement, to encompass the interests of the student, or to fulfill any additional requirements set forth by the student's committee.

Notes for Degree Progress

* MS students are required to attend Seminar (PABIO 580) every Winter Quarter and to attend the presentations of dissertation research in the Final Exam of students completing the Pathobiology doctoral program.

** MS students are required to enroll in Lit Review (PABIO 581) every Autumn Quarter, Critical Thinking (PABIO 582) every Spring Quarter, and a minicourse (PABIO 591) every Spring Quarter in each of the first two years in the MS program. Three credits each of Seminar and Lit Review (PABIO 581) may each be counted towards your degree. If a master's student decides to continue studies in the Pathobiology PhD program, additional years of PABIO 581/582/591 will be required commiserate with the PhD requirements.

*** Pathobiology students are required to take either EPI 511 or EPI 527 to fulfill the Pathobiology MS program's epidemiology requirement (or obtain permission from the head of the Pathobiology program to get credit for an epidemiology course elsewhere). EPI 511 is a 4-credit graduate level introductory course that fulfills this requirement. Alternatively, EPI 527 (Vaccine Epidemiology) is a 3-credit graduate level option that focusses on vaccines and can also be used to fulfill this option. However, students who opt to take EPI 527 should be aware that they may need to do remedial introductory work on their own to succeed in this class and that EPI 511 may be a better choice for students who have not gained familiarity with basic concepts in epidemiology in other settings.

Schedule for Coursework

To progress in a timely manner, students should anticipate taking 1-2 graded courses a quarter, plus Seminar, Lit Review, and research (PABIO 600) or thesis (PABIO 700) credits for a total of 10 credits per quarter. Students are required to complete 9 credits of PABIO 700 for the MS degree. Students desiring to enroll in more than 10 credits per quarter need approval from the Program Director. All formal coursework should be completed by the end of the second year. Please consult with your advisor or a member of the Graduate Student Advisory Committee (GSAC) regarding your specific program. Individual students are likely to need different sets of electives and may want to take required courses at different times.

For offerings of other Pathobiology courses, see the listing under the PhD program. Please check with your GSAC advisor or a member of the Curriculum Committee, as well as a current catalog, to verify course offerings.

MS Advisory Committees

Your progress in the MS program will be followed by several individuals. Among these are your advisor, members of the Graduate Student Advisory Committee (GSAC), and your MS Advisory Committee. In the event that you perceive you are having problems with your academic or research program, please discuss this with a faculty member on one of these committees.

The GSAC will monitor your progress until the MS Advisory Committee is formed in the third quarter of your first year. Once you choose an advisor and form the MS Advisory Committee, you must submit the Advisor Confirmation Form to the Program Manager to be placed in your permanent file. A copy of this form may be found in Appendix M. Please bring questions concerning course offerings and curriculum to them. Current members of the GSAC are Drs. Campbell (chair), R. Katzenellenbogen and D. Sodora. One of the faculty members will be assigned as your GSAC advisor.

The MS Advisory Committee consists of three members including your research advisor. At least one of the two other members of the committee should be from the Pathobiology Graduate Program. The MS Advisory

Committee meets every six months. For each committee meeting, the student should prepare a brief oral presentation documenting their progress. The committee will complete a brief report regarding your progress after each meeting (Appendix N). You, your advisor, and the GSAC will receive a copy of that report. If you do not receive a copy, please contact the Program Manager.

MS Thesis Research Proposal

The MS thesis research proposal should be done by the end of the fourth quarter of the first year. The proposal should contain the following, in this order:

I. A brief synopsis of background relevant to the project.
II. A summary of preliminary experiments.
III. A description of experiments planned for the next year.

Students are encouraged to consult with their advisor and research advisory committee during the preparation of the proposal. The experiments should be designed such that they will form the basis of the student's thesis. Appropriate references should be cited, although the list does not need to be exhaustive. This proposal should be 3-4 single spaced pages, excluding references. It is turned in to the student's research advisory committee. The committee in turn will discuss the proposal and experimental options with the student. A copy of the proposal should be provided to the Program Manager for the student's file.

The MS Thesis

The thesis must be provided to the MS Advisory Committee two weeks prior to the oral presentation. Corrections should be made following their review before submission of the document to the Graduate School.

The thesis is to be an original study of such quality as to be accepted by a reputable journal. The requirement for a thesis of publishable quality implies a substantial research commitment by the student. It is expected that the thesis work will be promptly submitted for publication, if that has not been done already.

The thesis should be written in the format suggested by the Graduate School. The format is specified at http://www.grad.washington.edu/students/etd/req-sections.shtml.

MS Oral Presentation and Defense

All students are required to give a formal seminar prior to the completion of the MS program. The research presentation given during the Graduate Research Symposium is not a substitute. The actual thesis presentation will consist of a concise verbal summary of the background, results, conclusions, and significance of the thesis project. Following this presentation, each committee member will question the student on any aspect of his or her research endeavors. The Oral Presentation and Defense is advertised campus wide and other Pathobiology students are encouraged to attend.

1.4 Electives (for PhD)

You must take at least two electives of your choice. Recommended options for elective courses is listed below, however you are not limited to the listed options. Note that PABIO 536 (Bioinformatics) is strongly recommended as an elective for all students. Please consult with your advisor and your committee regarding your selection and schedule of electives. Your Doctoral Supervisory Committee may advise you to take additional electives. If the latter occurs, this should be documented in your file in the program office. Some electives are more suitable for students with advanced backgrounds. Students should consult a current catalog to verify course offerings.

List of recommended electives:

- IMMUN 532: Advanced Immunology
- IMMUN 537: Immunological Methods
- IMMUN 538: Immunological Based Diseases and Treatments
- EPI 520: Epidemiology of Infectious Diseases
- EPI 524: Epidemiology of Cancer
- EPI 529: Emerging Infections of International Public Health Importance
- EPI 530: AIDS: A Multidisciplinary Approach
- EPI 532: Epidemiology of Infectious Diseases of Third World Importance
- MICROM 444: Medical Mycology and Parasitology
- MICROM 540: Graduate Virology
- MICROM 553: Molecular Mechanisms of Bacterial Pathogenesis
- MICROM 555: Advanced Clinical Microbiology
- CONJ 531-549, 557: Select Modules from the Molecular Conjoint Series (varies)
- GENOME 576: Genetic and Genomic Analysis of Bacteria
- MCB 532: Human Pathogenic Viruses

2.0 Yearly Program Events

2.1 Annual Retreat

The annual Pathobiology retreat occurs at either at Pack Forest, a casual location near Mount Rainier, or at the Center for Urban Horticulture in Seattle each October or November. A subset of faculty members summarize their research in 10-15 minute presentations (approximately one third of the faculty present each year). This assists the first year graduate students in selecting a research laboratory and fosters collaborations between laboratories. Each graduate student (except for new first year students) and postdoctoral fellow is expected to present a poster at the retreat. In addition, time is allocated for a discussion of significant issues important for faculty and graduate students/postdocs. Separate discussions of programmatic and training issues by the faculty and by the students and postdocs are followed by a combined discussion with everyone in attendance. The retreat also provides the opportunity for an evening social gathering, often including costumes and a Halloween theme. The Program also uses social functions throughout the year to foster interactions between students and faculty at different sites, including a September gathering to meet the new students, a winter party, and receptions following the Research Symposia.

2.2 Seminar Series

All Pathobiology seminars are at 4 p.m. on Thursdays during Winter Quarter and open to the public. For room locations see individual seminar dates.

*Please note, in order to receive credit for Pathobiology Seminar (PABIO 580), students are also required to attend Winter Quarter CFAR Seminars.

2.3 Winter and Spring Student Research Symposia

A Graduate Research Symposium is held Winter and Spring Quarters. The purpose of the symposium is to provide an opportunity for students to practice giving formal research presentations and to familiarize the faculty, as well as other students, with the research areas and progress of individual students. All students are expected to attend the symposium. All students, except first year students and students who will be presenting their MS or PhD seminar within one quarter, are required to present talks. General Exams should not be scheduled at a time that would compromise a student's ability to participate in the symposium.

The presentations are approximately 15 minutes and are followed by a five minute discussion period. It is critical to stay within the time period allotted. The quality of these talks is similar to those given at national meetings. Therefore, the preferred format is a PowerPoint presentation. As with most scientific talks, the talk should include a brief introduction that explains the significance of the research problem to the audience, as well as the approach taken. We encourage students to discuss their presentation with their research advisor, both before (for planning purposes) and after the symposium (to obtain feedback). Written feedback will also be provided by several other faculty members. It is helpful to practice the talk before other members of the lab, to gain their input prior to formal presentation. See Appendix O for a copy of the evaluation form.

3.0 Program Policies/Guidelines for Success

3.1 Mentoring

One of the main objectives of any PhD program is to train individuals to go from assimilating information to creating new knowledge through research methods. One of the traditional and proven ways to make this transition is through a strong network of mentors.

There are many opportunities for students to find mentors in the Pathobiology Program. You can consider all Pathobiology faculty potential mentors. It is not necessary to limit your mentoring experience to your principle investigator. The program encourages students to approach any of the Pathobiology faculty regarding their research and progress through the program.

For additional resources on how to form mentoring relationships with faculty and others on campus there is a suggested list of resources in Appendix Q. It is by no means an exhaustive list of all resources but meant to get you started on the right foot in forming contacts with faculty.

The Program does require one formal mentoring relationship to ensure success in the program. You are required to find a Principle Investigator to advise you on your dissertation research and thesis. You can also expect to carry out your dissertation research in their lab.

The Pathobiology Program is driven by your experience in the lab. Beginning with your three rotations during your first year of the program, you can expect to be exposed to several different styles of leadership from each Principle Investigator (our faculty) who runs their lab. By the end of Spring Quarter in your first year of the program, you are expected to have identified a mentor for your dissertation research and thesis.

Role of Rotations

The first year rotation experience is meant to give students an opportunity to see a variety of labs and give you exposure to different faculty prior to choosing where you will complete your dissertation research. It is suggested you treat each rotation as a networking opportunity to make an impression on a possible future employer and eventual colleague. The Graduate School has a series of mentoring memos which includes one on "how to get started in a lab". The link to this memo is http://grad.uw.edu/for-students-and-post-docs/core-programs/mentoring/mentor-memos/getting-started-in-a-lab.

The rotation experience is also a time for you to see if you work well with a specific faculty member. It is an audition for a possible slot to complete your dissertation research. It is suggested you treat all rotations in a professional manner to meet this goal.

Selection of the Dissertation Advisor

The Program Director will request first year students identify their dissertation advisor at the end of the third quarter. Thus, first year students should begin discussions with potential advisors in early May of their Spring Quarter. The selection of the dissertation advisor is a joint decision of the student and the faculty member, who should discuss the options together. Once a student has identified his/her dissertation advisor, s/he must submit the Advisor Confirmation Form to the Program Manager to be placed in his/her permanent file. A copy of this form may be found in Appendix M.

Changing Advisors

A student who already has a permanent advisor and wishes to change the advisor because of personal or research reasons should first discuss the matter with a member of the Graduate Student Advisory Committee (GSAC). If the issues cannot be resolved, that GSAC member will then serve as a neutral party to obtain an understanding between the student and the new and old advisors and facilitate a smooth transition. After a faculty member is identified as the student's new advisor, the steps below are to be followed.

1. The student will inform the old advisor in writing of his/her plan to leave the lab at least one month prior to the end of the quarter and provide a copy of the letter to the Program Director and the GSAC.
2. As soon as possible after the student informs the old advisor of the change, and at least two weeks before the end of the quarter, the student, old advisor, and the GSAC member will meet to discuss and agree upon items that need to be completed in the old lab before the switch is made at the end of the term.
3. The student will consult the Administrator who will provide a written letter regarding the requirements of their specific funding vehicle and appointment.
4. The change must be approved by the Program Director who will officially notify all parties regarding the effective date of the change. If the student resigns from the research assistantship before the end of the quarter, the student will be liable for the full amount of tuition for that quarter.

Changes are made effective at the end of that quarter. Requests for deviation from this timeline must be presented in writing to the Program Director for approval.

3.2 Doctoral Supervisory Committee

Your progress in the PhD program will be followed by several individuals. The Graduate Student Advisory Committee (GSAC) will monitor your progress until you select an advisor and your Doctoral Supervisory Committee is formed. Please bring questions concerning course offerings and curriculum to them. Current members of the GSAC are Drs. Campbell (chair), R. Katzenellenbogen, and D. Sodora. One of these individuals will serve as your primary GSAC advisor. In the event that you perceive you are having problems with your academic or research program before you have a formal mentor, please discuss this with your GSAC advisor or Dr. Campbell.

Formation of the Doctoral Supervisory Committee

The Doctoral Supervisory Committee, which should be formed by the end of the Autumn Quarter, second year, will consist of your research advisor (usually serving as chair), at least two other faculty members (two must be from the Pathobiology Program), and the Graduate School Representative (GSR). This last individual is selected by the student and research advisor, and is formally appointed by the Dean of the Graduate School. Please refer to http://grad.uw.edu/policies-procedures/doctoral-degree-policies/graduate-school-representative-gsr-eligibility for information concerning GSR eligibility. The Doctoral Supervisory Committee can also include **one** member who has not been appointed to the graduate faculty. All members have voting privileges. For both the General Examination and the Final Examination (Dissertation Defense), at least four members of the committee (including the Chair, GSR, and one additional Graduate Faculty member) must be present. The composition of the committee should be sent to the Program Director for approval via email. Once the Doctoral Supervisory Committee is approved the Program Manager will enter the committee into MyGrad. The committee must be formed at least four months prior to the oral part of the General Examination.

Committee Meetings

This committee meets with the student at least once a year (the committee may request to meet more often). It is the responsibility of the student to arrange these meetings. For each committee meeting, the student should prepare a brief oral presentation documenting his/her progress. The committee will complete a brief report (Appendix N) regarding your progress after each meeting. The student should bring this form to the meeting to ensure documentation of progress and to indicate issues for amelioration. Once the form is filled out please return the form to the Program Manager. You, your advisor, and the GSAC will all receive copies of this report. If you do not receive a copy, please contact the Program Manager.

The program expects the following with regards to committee meetings:

1. Students are expected to have formal committee meetings at least once a year. While we encourage you to meet with any member of your committee or any faculty member at any time to discuss research, this does not substitute for or replace a committee meeting. The intent of these meetings is for you to update your

research progress and receive critical evaluation of your work, help in problem solving, and advice on current and future research directions. This forum should also provide a consensus of the committee on your progress and expectations so that everyone is on the same page and there is no ambiguity.

2. When the decision is made to defend your dissertation, there should be a formal committee meeting where committee members agree that the student is ready to do so. This agreement should be documented in the Report of Graduate Student Committee Meeting (Appendix N), which all committee members should sign.

3.3 Program Committees

The Pathobiology Graduate Program has five committees that deal with various student-related activities and issues. They are the Steering Committee, the Graduate Student Advisory Committee, the Student Affairs Committee, the Curriculum Committee, and the Admissions Committee. The latter three committees have student members. The process to choose students for these positions varies with the committee. For both the Curriculum and Admissions Committees the process is exactly like the process to choose faculty; the committee nominates individuals and gets approval from the Steering Committee. Subsequently, an invitation is extended to the student to join the committee. For the Student Affairs Committee, the Student Representative holds an election.

Student Committee Members

There are also three opportunities to serve on program committees for students. The purpose of these appointments is to give students a professional development experience. Committee work is part of working for a university and/or many other organizations. The expectations for students who serve on these committees are the same as what is expected of faculty who are appointed to a committee.

The Student Affairs Committee has three slots for students. The representatives are appointed directly by the students in the Pathobiology Program. The students serve a one year term. The elections occur during the summer before Autumn Quarter each year.

The Admissions and Curriculum Committees each have one slot for a student member. The individual committees determine their student member. Interested students should direct their inquiries to the chair of each committee for consideration.

3.4 General Examination

The General Exam should be completed no later than the end of the third year and is administered by the Doctoral Supervisory Committee. The Doctoral Supervisory Committee must be formed at least four months prior to the oral examination. The student will reserve a room for the exam for a period of three hours. Once the room and Doctoral Supervisory Committee member's attendance is confirmed, the student will enter the General Exam date, time, and location into the MyGrad system. The Program Manager conveys this information to the Graduate School once the exam has been approved. The student and their mentor will receive an electronic copy of the exam warrant via email once the exam is approved. All committee members will also receive an email confirmation regarding the exam once the information has been conveyed to the Graduate School. The examination should not be scheduled at a time that would compromise the student's participation in the annual Graduate Research Symposium.

Content of the Oral Examination

The oral exam will cover the following areas:

- The student's research area. In depth knowledge, including familiarity with both background literature and current research is required. This would include knowledge of specifics as well as generalizations. It would encompass an understanding of research findings and their importance, as well as critical questions that are unresolved. The student should be able to critically evaluate this body of work. **The student's Dissertation Research Proposal will form the basis of this portion of the General Exam, and must be submitted to the committee members at least two weeks prior to the examination.**
- Areas related to the student's research. A moderate level of knowledge regarding this body of work is required. Familiarity with literature, current research and important questions is expected, but the depth of specific knowledge is not expected to be as complete as for the directly related areas.
- Areas not directly related to the student's research, but covered in Pathobiology coursework. It is generally considered that these areas will have been covered by the written examination and will not comprise a significant portion of the oral examination.

The students are encouraged to meet with committee members to gain input on general emphasis areas for the oral exam. However, by Program policy, students are not to be provided with questions or the definition of specific areas of questioning in advance. Committee members may wish to suggest certain readings, although the examination is not restricted to those readings.

Dissertation Proposal

Prior to the oral examination, the student must provide (at least two weeks before their exam) a copy of their dissertation proposal to their committee members. This proposal should be focused on the student's thesis research.

It is written in a similar format used for NIH grant proposals. See Appendix T for an outline of the format.

Format of the General Examination

In order for the General Exam to proceed, the advisor and Graduate School Representative (GSR) must be present with at least two other committee members. If a committee member fails to appear for the exam, please follow the following procedures as outlined by the Graduate School:

1. If the Chair is not present, wait 15 minutes (or longer if appropriate) then adjourn the exam and reschedule to a later time/date.

2. If the GSR is not present, wait 15 minutes then notify the Graduate School at 206-685-2630 or 206-543-5900. *The student's department may ask a member of the graduate faculty outside its department and the Chair's department to serve as a replacement. Once the replacement GSR is present, the exam may proceed.*

3. If a general member is not present and the quorum of four members (as stated above) is not intact, the exam should be adjourned and rescheduled to a later time/date, **OR**, the exam may adjourn momentarily until another field-specific faculty member can be found as a replacement.

4. If a general member is not present but the quorum of four members is intact, the exam may proceed.

In all cases, an attempt must be made to contact the absent member before taking any action.

5. The exam cannot proceed unless a warrant has been obtained and brought to the oral examination.

6. Prior to the start of the oral examination, the student's advisor will meet with the committee to give an evaluation of the student's academic performance, research performance, and potential. The evaluation should include an assessment of the student's motivation, creativity, independence, laboratory skills, knowledge of the literature, ability to design and execute experiments, and oral and written communication skills.

7. A member of the Supervisory committee other than the advisor or the GSR will chair the oral exam. The Chairperson will be responsible for maintaining objectivity in the conduct of the examination. The advisor will refrain from volunteering information (or answering questions) but may provide comment or clarification, if this is requested by the committee. The advisor may be requested by the chairman of the committee to ask one or more questions of the student. The advisor is a voting member on the oral exam. The advisor is the chair of the student's doctoral supervisory committee, and signs the warrant as such.

8. At the beginning of the oral examination, the student should give a brief presentation (15-20 min) on the thesis research project including background, experimental results and projected future experiments. This part of the examination is open to the general public and the student will answer any questions from the general audience. Subsequently, the general public is dismissed (Pathobiology faculty may remain but only committee members may ask further questions) and the committee will continue the exam. Sufficient time will be provided for each committee member to pursue a line of inquiry that may focus on the student's specific research area or general knowledge of Pathobiology. It is expected that the entire exam will entail up to three hours.

9. At the end of the exam, both the student and the advisor will leave the room. This allows the committee to discuss the exam performance in the absence of the advisor. The committee will vote on the outcome of the exam in the absence of the advisor.

10. The final decision must be one of the following: Pass, Re-examine, or Fail. If the committee feels that there are deficiencies that need to be corrected, the Re-examine option is appropriate.

11. Following the decision, the Committee will recall the advisor to discuss the outcome, including soliciting the advisor's evaluation and vote on the student's performance. At this point, the student will be recalled to be informed of the committee's decision. Regardless of the outcome, the advisor and the committee members should provide specific feedback to the student; this may be done partly at the meeting and, if detailed input is appropriate, partly in later individual meetings. This may include suggestions for additional coursework or reading. If the student needs to be re-examined, the committee will outline those areas that require attention and provide recommendations to enable the student to address the perceived deficiencies.

12. If a student fails the exam a second time, it can only be retaken with approval of the Dean of the Graduate School.

13. Successful completion of both components of the General Exam results in the admission of the student to candidacy for the doctoral degree.

3.5 Dissertation/Thesis

Format: Writing and defending the doctoral dissertation is the final requirement for a PhD. Your Supervisory Committee determines if you have completed a body of work meeting the standards of the program. Students should follow the Graduate School's Style and Policy Manual for formatting at http://grad.uw.edu/for-students-and-post-docs/thesisdissertation/final-submission-of-your-thesisdissertation/required-sections-for-your-document.

Dissertation: The dissertation must be of such quality that at least one published article (with the student as the first author) results. At least one article must have been submitted for publication before the Final Examination.

Appointment of the Reading Committee: When the Doctoral Supervisory Committee determines at a formal committee meeting that the student is ready for the Final Examination and documents this decision with each committee member signing the Committee report (Appendix N), the Reading Committee should be appointed. To setup the Reading Committee, the student or their advisor must email the Director and Program Manager to obtain approval for the members. Upon approval from the Director, the Program Manager will enter the Reading Committee information in MyGrad. This will generate a confirmation email to all Reading Committee members. The student will then be able to request their Dissertation Defense/Final Examination in MyGrad.

3.6 Dissertation Defense

After the Reading Committee is officially established, a request for approval to conduct the Final Examination will be submitted to MyGrad. This request should be submitted at least three weeks prior to the Final Examination date. The dissertation presentation will be advertised and is open to the public. Following this presentation, the PhD candidate will meet with the Supervisory Committee. Each member will question the student on any aspect of the dissertation. If the Final Exam is passed, the warrant is signed and returned to the Program Manager who will convey the result to the Graduate School. The student has until the end of the quarter in which they defend to submit their written dissertation.

3.7 Academic Progress

Required Progress in Year 1 for Program Continuation: In the first year of the Program, the student must formalize an agreement with a mentor, who will guide and financially support their doctoral research studies. Failure to achieve this agreement by the end of the fourth quarter in the Program will result in dismissal from the Program (see page 7 under Pathobiology Rotation Program).

Academic Progress in all other Programmatic Requirements: The procedure follows the University's general guidelines. The judgment will take into consideration an individual student's situation and magnitude of deficiency. Evaluation of student performance includes: 1) maintenance of a minimum GPA of 3.0, cumulatively and for each quarter of coursework, 2) satisfactory progress in fulfillment of program requirements and expectations, and 3) satisfactory research progress and performance.

Unsatisfactory progress in any of these areas may result in the following actions:

First time	Warning
Second time	Probation
Third time	Final probation
Deficiency not corrected after final probation	Drop

It should be noted that a warning is documented by the Program, but is neither reported to the Graduate School nor appears on the student's transcript. All other recommended actions are transmitted to the Graduate School.

1. **Unsatisfactory grades**

Grades will be monitored on a quarterly basis by the Graduate Student Advisory Committee (GSAC).

2. **Failure to demonstrate mastery of core competency. Students must demonstrate competency in four subject areas (molecular biology/biochemistry, cell biology, immunology, and public health).**

   This is done in one of three ways,

1) Obtaining a 3.0 or better in the core courses (G H 580, PABIO 551, PABIO 552, PABIO 553, IMMUN 441 and/or IMMUN 532);

2) Successful completion of a competency exam and;

3) Fulfillment of requirements stipulated by the first year student committee if competency exam is not passed.

Failure to demonstrate competency in one of these ways is considered a demonstration of unsatisfactory academic progress.

If a student is unable to demonstrate mastery of a core course through meeting the grade requirement and/or passing a competency exam, a special committee is assembled which includes members of the GSAC, core curriculum instructors, and the newly assigned faculty advisors for the students. Their role is to identify areas of weakness early and get support for remediation of these areas. They will provide the student with a list of items to accomplish to demonstrate mastery of the core area.

3. Unsatisfactory research progress

It is the responsibility of the thesis, research, or dissertation Supervisory Committee to evaluate research progress of students under their supervision and take proper action accordingly, e.g., failing General or Final Examination. Failure to progress will be recorded in the Report of Graduate Student Committee Meeting and the report kept in the student's file.

4. Unsatisfactory progress on the PhD General Examination

It is the responsibility of the Dissertation Supervisory Committee of each student to evaluate the performance of the student on the General Examination. The Committee has three options that it may utilize in grading the General Examination:

1. The Committee may pass the student in which case the student confers PhD candidacy and progresses toward conferring the PhD degree.
2. The Committee may decide to re-examine the student after a further period of study. The Dean of the Graduate School will approve at most two re-examinations.
3. The Committee may decide not to recommend the student for further work toward the PhD degree. The effect of this recommendation is termination of the student's enrollment in the doctoral program. If this occurs, a Pathobiology student may choose to establish a Master's Thesis Committee, write a thesis, and give an oral presentation on the thesis. If the Committee approves the thesis and all Graduate School requirements are met, the MS degree will be conferred.

<u>Examples of scenarios of unsatisfactory progress</u>

1) Core competency example one

First Time - Warning	Student earns a 2.7 in PABIO 551, a core competency class, during Autumn Quarter.
Second Time - Probation	Student has a GPA less than 3.0 Winter Quarter.
Third Time - Final Probation	Student has a GPA less than 3.0 Spring Quarter.

Fourth Time - Dismissal	Student fails competency exam.

2) Core competency example two

First Time - Warning	Student earns a 2.9 in PABIO 552.
Second Time - Probation	Student has a GPA that falls below 3.0 the next quarter.
Third Time - Final Probation	Student takes core competency exam and fails. First year committee meets with the student and a specific list of tasks for remediation by the student to meet core competency requirement is outlined.
Fourth Time - Dismissal	Student fails to meet these requirements.

3) Academic/ Research competency example

First Time - Warning	Student has GPA less than 3.0 in Spring Quarter of Year 1.
Second Time - Probation	Student has a GPA less than 3.0 in Winter Quarter of Year 2.
Third Time - Final Probation	Student meets with Doctoral Supervisory Committee who determines that research progress is unsatisfactory and sets specific goals that must be met within six months.
Fourth Time - Dismissal	Student meets with Doctoral Supervisory Committee in six months and has not met the goals outlined by the Committee.

3.8 Grievance Procedure

Occasionally major difficulties arise during a student's tenure at the University. We recommend that the student first talk with members of their advisory committee and/or with the GSAC. If the situation cannot be resolved, specific grievance procedures are outlined in the Graduate School Memo 33: http://grad.uw.edu/policies-procedures/graduate-school-memoranda/memo-33-academic-grievance-procedure.

3.9 Scientific Ethics and Appropriate Behavior

Scientific integrity is a vital issue involving all participants in scientific endeavors. A number of concerns are included within this area. Most importantly, falsification or misrepresentation of data and plagiarism, whether of written documents or ideas, in class or in publications, are extremely serious offenses against the entire scientific community. Accuracy in record keeping and appropriate citation of others' work are crucial. Appropriate

personal interactions are also important. An air of mutual respect among members of your lab and with other colleagues will produce both a more pleasant and a more productive atmosphere. Compliance with rules governing safety and health issues will benefit both you and those who work around you. Compliance with human subjects and animal welfare regulations is similarly important. Failure to follow health and safety regulations or human subject and animal regulations has serious legal, as well as ethical, consequences. The National Institute of Health regulations state that original laboratory notebooks should stay in the lab. Students may take photocopies with them.

Deliberate ethical misconduct in science appears to be rare, but ethical questions sometimes do not have simple answers. You are encouraged to consider and discuss ethical issues. There are a number of formats for this. PABIO 553 includes case-based discussions of a number of ethical issues, and ethical issues are discussed within several other required courses. The School of Public Health presents seminars on ethics in science, which you are strongly encouraged to attend. The School of Medicine also presents a biomedical research integrity series on this subject (http://depts.washington.edu/uwbri) , and all students are strongly encouraged to attend these lectures and discussions. Informal discussions with faculty, staff, and other students also provide a forum for investigating these ideas. Students are required to follow the guidelines for appropriate behavior specified by the University (http://apps.leg.wa.gov/WAC/default.aspx?cite=478-120) and by the site at which they conduct their graduate research.

3.10 Mandatory Training

All Pathobiology students must receive safety training relevant to their laboratory research. Such training may be obtained through Environmental Health & Safety (EH&S), and lists of available training opportunities are on their website: http://www.ehs.washington.edu. A two-day series of training programs are held each Autumn; these are ideal for incoming students. Many of the required trainings are also available online and can be completed prior to the start of the Pathobiology Program.

Persons working with human tissues or blood products must take training in Bloodborne Pathogens.

All students who work with radioactive materials must have radiation safety training. In addition, Pathobiology students must attend a chemical safety class. They must read, understand and comply with the chemical hygiene plan in their laboratory.

Students who will be working with animals must attend the appropriate classes given by the Department of Comparative Medicine. These classes are given at regular intervals throughout the year.

Similarly, all students whose research involves human subjects (or samples derived from human subjects) must attend training provided by the Human Subjects Division.

Each off-campus program site has specific training requirements that students must follow. Consult with your advisor or safety officer at that site for details.

3.11 General Information for Pathobiology Students

Mailing Address
Pathobiology Graduate Program Office
Box 357965
Harris Hydraulics
1510 San Juan Road #310d
Seattle, WA 98195

Phone: (206) 543-4338
Fax: (206) 685-8519

Student Mailboxes
Most students have a mailbox at their lab location. To request a mailbox in the Pathobiology Program office, please contact the Program Manager.

Telephones and Copying
Personal phone calls should be kept to a minimum to facilitate research use of phones. Personal long distance calls cannot be made from laboratory phones. If you need to make a long distance call pertinent to an order or your research, check with your faculty advisor. Copy machine codes may be required depending on your location. Check with your faculty advisor.

Supplies and Equipment
It is important that all students recognize that the state budget for Pathobiology does not provide for the purchase of supplies and equipment for student research. Instead, faculty members provide such funds from their individual research grants for their students. Please ask your rotation advisor or permanent advisor for the appropriate budget number when ordering supplies.

Ordering Procedures
Orders are placed by different procedures at each institution, and always require approval from either the faculty advisor or his/her designee. Complete the required forms fully to avoid delays.

Lab Coats
At the Health Sciences F-wing labs, lab coats are maintained by the central facility and stored in the glassware room. Be sure to remove everything from the pockets before depositing soiled lab coats in the bin in F-149. Laundry is picked up once a week on Friday.

Off-campus and non-F-wing labs have their own procedures for lab coats.

Computing
Students have access to computers within Harris Hydraulics, the Health Sciences Library, and other computer labs on campus. All students should promptly establish an email account by visiting MyUW. Please inform the Program Manager of your email address and check your email frequently, as all official program and UW communication occurs via e-mail. The Graduate School has established the MyGrad Website at http://grad.uw.edu/for-students-and-post-docs/mygrad-program. Students can also consult the Pathobiology Program web page at http://globalhealth.washington.edu/education-training/phd-pathobiology for information and links to procedures and program requirements.

The Program has been awarded funds from the Student Technology Fee Committee to purchase computer equipment for exclusive use by the students in the program. The site for these computers is Harris Hydraulics. To access the space please contact the Program Manager for the code to the computer lab.

Student Representatives
Students select a Senator, Student Representative, and Student Seminar Representative during the Summer Quarter each year for the upcoming academic year.

The Senator represents student issues and concerns at the Graduate and Professional Student Senate (GPSS) meetings which occur on a semi-monthly basis. The Senator is also responsible for appropriation of the annual GPSS allocation of funds to the Pathobiology Program. The Senator for 2017-2018 is Kristine Dye.

The Student Representative is a member of the School of Public Health Student Affairs Committee. The Student Representative also represents student interests and concerns at Pathobiology faculty meetings. The Student Representative for 2017-2018 is Veronica Davé.

The Student Seminar Representative provides the seminar organizer with input on the seminar series and also organizes a handful of lunches/happy hours on seminar days. This student also helps the speakers get from campus to other institutes he/she may be visiting while here in Seattle and helps as needed to make the seminars run smoothly.The Student Seminar Representative for 2017-2018 is Rachael Parks.

Student Public Health Association

The Student Public Health Association (SPHA) was formed in the spring of 1996 to promote a positive Graduate School experience for all the students with public health interest. As a part of its function, SPHA will host brown bag lunches to foster interdisciplinary learning, work to represent students' voices in various committee meetings, provide educational opportunities through conferences and tours of various facilities, arrange networks with future mentors and colleagues, and organize social activities. If you are interested in finding out more about SPHA, please e-mail the organization at spha@uw.edu.

Libraries

In addition to the Health Sciences Library (HSL), there are several other libraries located on upper campus and in other departments. The HSL can provide you further information.

Health Care

Hall Health Primary Care Center (http://depts.washington.edu/hhpccweb) provides routine health care for students. Graduate students with Research Assistant or Teaching Assistant appointments are eligible for Graduate Appointee Insurance Program (GAIP) insurance coverage, and should consult the GAIP website: http://www.washington.edu/admin/hr/benefits/insure/gaip/index.html. Students should consult with individual personnel or business office for benefits at their specific site.

Student Union and Recreational Facilities

Information about student union and recreation activities is available directly from the Student Union office and the Intramural Activities office.

Research Assistant, Stipend, and Fellowships

Students are funded on a yearly basis contingent on academic progress and funding availability. It is the student's responsibility to understand how they are funded. Each student's package consists of one or a combination of a Research Assistantship, stipend, and/or fellowship. Depending on your source of funding, taxes may or may not be withheld. It is possible to owe taxes at the end of the year on some of your funding. While the University of Washington cannot advise on taxes we can provide some resources to assist students.

Please check out Payroll's information on taxes at http://f2.washington.edu/fm/payroll/employees/taxes. In addition, Student Fiscal Services offers informational sessions on taxes for students each year. You can visit their website for further information at http://f2.washington.edu/fm/sfs.

You can also go to IRS publication 970 and/or consult a tax accountant.

Travel Funds

Occasionally funds are allocated for Pathobiology graduate students who are going to give research presentations at scientific meetings. Contact the Program Director, Dr. Lee Ann Campbell, regarding travel funding disbursement.

Food Services

Cafeterias are located in the Hospital AA-Wing, 1st floor; Etc., Health Sciences Building 2nd floor, E-Wing; the Rotunda, Health Sciences Building 1st floor, H-Wing Atrium; and Vista Café, Foege Building 1st floor South. Vending machines are also at all these locations.

Student Lounges

Student lounges are located at South Campus Center and Health Sciences Building T-466 and T-469. There is also a computer lab available for all Global Health students in Harris Hydraulics (please see the Program Manager for the code to enter).

Lockers

Lockers are available on the 3rd floor of T-Wing of the Health Science Building. You can register for a locker at Classroom Services (Health Sciences Building T-291A) in September. The lockers are distributed on a first-come/first-served basis. There are also day-use lockers in the Harris Hydraulics Global Health Computer Lab.

Appendices

Appendix A

New Student Checklist

☐ **Set up a UW NetID and email**
Admitted students receive their student number and PAC (personal access code) after accepting the offer of admission. With a student number and PAC, a UW NetID can be set up. A student's UW NetID will precede uw.edu and become the student's UW email address. The UW offers four email systems to choose from. You can obtain information about them here: http://www.washington.edu/itconnect/connect/email/.

☐ **Communicate with your student host**
Incoming students are paired with a continuing student during the admissions process. Student hosts can assist with the transition of moving to Seattle, entering graduate school, and the identification of social and cultural resources.

☐ **Register for courses**
In order to register for courses, students must first have established a UW NetID. International students must also complete an online check-in. Students should reference the UW Academic Calendar for dates of instruction, registration deadlines, school holidays, and more.
Add codes and faculty codes: PABIO courses are restricted by add codes or faculty codes. To get your codes, contact the Program Manager at pabio@uw.edu and list the courses that you will be taking. For independent research credits (PABIO 500,600,700,800), you need the faculty code. To receive this, fill out either the Rotation Confirmation Form and get permission from the Principle Investigator you will be rotating with or confirm your faculty advisor and have them sign the Advisor Confirmation Form. These documents should be sent to the Program Manager once signed by both the student and faculty member.

☐ **Find housing:** The majority of our students live off-campus in shared housing. Campus housing information can be found through UW Housing and Food Services. They offer housing options for single students and students with families. For off-campus housing, Craigslist is more often used. The UW School of Law has a list of neighborhood descriptions to assist with identifying housing: http://www.law.washington.edu/Admissions/Admits/Housing/.

☐ **Research transportaton options**
Most students utilize the U-PASS to travel by Metro bus around town. Students are automatically charged for the pass each quarter they are registered. Extensive bike and walking trails are found around Seattle as well. The closest airport to Seattle is SeaTac International Airport. For new residents, referring to a map of the Seattle area is strongly recommended; with so many bodies of water and hills it can be a confusing city to navigate.

☐ **Set up your first rotation lab**
The Program Manager will send out a list of faculty looking for students for rotations by August. You are encouraged to contact faculty directly to discuss. Aim to have your rotation set up by the beginning of September at the latest.

☐ **Get your Husky Card**
The Husky Card is the official identification card for members of the University of Washington community. The U-PASS is electronically embedded into the Husky Card (you'll scan it when you get on the bus or other transportation that is covered). A Husky Card should be obtained as soon as a student arrives on campus. The Husky Card Account & ID Center is located on the ground floor of the Odegaard Undergraduate Library.

☐ **Apply for Washington state identification**
New Washington state residents are legally required to get a Washington state driver's license or ID card within 30 days of moving to the state. Check out the Washington State Department of Licensing website (http://www.dol.wa.gov/officelocations.html) to find office locations and information on what type of identification is needed when applying for an ID or driver's license. If eligible, you can also register to vote when getting an ID.

☐ **Explore UW resources**
The UW Student Guide (http://www.washington.edu/students) is a comprehensive reference for UW students and includes information on Academics, Finances, Student Life, University Policies, and much more. The University Bookstore (http://www.bookstore.washington.edu/home/home.taf) is where you can purchase Husky products and books for class.

☐ **Prepare for the first day of class**
Helpful maps include a campus map (http://www.washington.edu/maps) and a Health Sciences Building (HSB) map (http://depts.washington.edu/disteche/images/healthsciencesmap.pdf). The Health Sciences Building is where many of your classes will be held. It is a very confusing building! You are highly encouraged to locate your classrooms in advance of the first day of class.

☐ **Attend school and departmental orientations**
Attendance at the Pathobiology Program Orientation is required for all entering students. Typically it is held the week prior to the beginning of Autumn Quarter.

☐ **Attend the TA/RA Conference sessions that are relevant to you**
The conference schedule is at the Center for Teaching and Learning website: http://www.washington.edu/teaching/programs/ta-ra-conference/.

Appendix B

First Year Student Checklist

To do:

- ☐ Pathobiology Program Orientation
- ☐ Complete three lab rotations
- ☐ Take Pabio core courses
- ☐ Select dissertation lab in May

Coursework:

Autumn
- ☐ PABIO 500
- ☐ PABIO 550
- ☐ PABIO 551
- ☐ PABIO 581
- ☐ IMMUN 441

Winter
- ☐ PABIO 500
- ☐ PABIO 552
- ☐ PABIO 580
- ☐ PABIO 553

Spring
- ☐ PABIO 500
- ☐ PABIO 536
- ☐ PABIO 582
- ☐ PABIO 591

Summer
- ☐ UCONJ 510 (2 credits)

Appendix C

Second Year Student Checklist

To do:

- ☐ Carry out research in dissertation lab
- ☐ Complete Pabio core and elective class work
- ☐ Select Supervisory Committee during Autumn Quarter
- ☐ Hold committee meeting(s)

Coursework:

Autumn
- ☐ PABIO 581
- ☐ EPI 511
- ☐ PABIO 600

Winter
- ☐ PABIO 580
- ☐ PABIO 600

Spring
- ☐ PABIO 582
- ☐ PABIO 591
- ☐ PABIO 600

Summer
- ☐ PABIO 600 (2 credits)

Appendix D

Third Year Student Checklist

To do:

- ☐ Carry out research in dissertation lab
- ☐ Complete General Exam by Autumn Quarter
- ☐ Hold committee meeting(s)
- ☐ Complete biostatistics competency requirement (if you entered the program in Autumn 2016 or later)

Coursework:

<u>During the Third Year Any Quarter</u>

- ☐ PABIO 598

<u>Autumn</u>

- ☐ PABIO 581
- ☐ PABIO 600

<u>Winter</u>

- ☐ PABIO 580
- ☐ PABIO 600 (if General Exam not completed) or Pabio 800 (if General Exam passed)

<u>Spring</u>

- ☐ PABIO 582 (if not completed General Exam)
- ☐ PABIO 591
- ☐ PABIO 600 or 800

<u>Summer</u>

- ☐ PABIO 600 or 800 (2 credits)

Appendix E

Fourth Year and Beyond Student Checklist

To do:

- ☐ Carry out research in dissertation lab
- ☐ Complete didactic teaching requirement
- ☐ Hold committee meeting(s)
- ☐ Complete dissertation and final exam

Coursework:

Autumn/ Winter/ Spring/ Summer

- ☐ PABIO 800
- ☐ Finish any outstanding electives
- ☐ PABIO 580
- ☐ PABIO 591 (just in your fourth year)

Appendix F

General Exam Checklist

Before beginning the General Exam process, please be sure to familiarize yourself with the UW Graduate School's Doctoral Degree Policies (http://grad.uw.edu/policies-procedures/doctoral-degree-policies). You are responsible for knowing this information.

DURING AUTUMN QUARTER OF YOUR SECOND YEAR

☐ **Form your Doctoral Supervisory Committee.**
The committee must have a minimum of four members, including:

- Faculty advisor (Chair)
- Two members (two committee members must be Pathobiology faculty)
- Graduate School Representative (GSR)
    - Please note that only one of the committee members is permitted to not be appointed as Graduate School Faculty.

To set up your Doctoral Supervisory Committee, email the Program Director and Program Manager the following:

- The name(s) of your faculty advisor or co-advisors.
- The names of at least two faculty who have agreed to be on your committee.
- The name of the GSR who has agreed to be on your committee.
    - See the Graduate School's GSR Eligibility Information (http://grad.uw.edu/policies-procedures/doctoral-degree-policies/graduate-school-representative-gsr-eligibility) if you have questions concerning who can serve as your GSR.

AT LEAST THREE MONTHS BEFORE YOUR GENERAL EXAM

☐ **Set the General Exam date with your Supervisory Committee.**
At least four members of your committee must be present at the exam. These members must include the Chair, GSR, and at least two additional Graduate Faculty members. However, it is recommended you have a committee of five total members.

AT LEAST THREE WEEKS BEFORE YOUR GENERAL EXAM

☐ **Schedule your General Exam online via MyGrad.**
If your exam will not be held on the UW main campus, Fred Hutch, or at Center for Infectious Disease Research, you will need to include the full address and room number of the venue. When the exam is approved, you will be notified that your warrant is available. The warrant is sent electronically to both you and your advisor. Please remember to print it out and bring to your General Exam.

AT LEAST TWO WEEKS BEFORE YOUR GENERAL EXAM

☐ **Submit your dissertation research proposal to exam committee members and the Program Manager.**

AT LEAST ONE DAY BEFORE YOUR GENERAL EXAM

☐ **Print out the warrant for your exam.**
Make sure to bring it with you to your exam.

AFTER YOUR GENERAL EXAM

☐ **Return the signed warrant to the Program Manager.**
Within three days or no later than the last day of the quarter, whichever is first. The Program Manager will officially report the outcome of your exam to the Graduate School. Upon successful completion of your General Exam, the Program Manager will also send an announcement to the Pabio listserve unless a special request is made.

Appendix G

Dissertation Defense Checklist

Before beginning the Final Exam process, please be sure to familiarize yourself with the UW Graduate School's Doctoral Degree Policies (http://grad.uw.edu/policies-procedures/doctoral-degree-policies). You are responsible for knowing this information.

SHOULD ALREADY BE DONE

☐ **Complete requirements for degree.**

☐ **3.0 minimum cumulative GPA.**

☐ **Set up your Doctoral Supervisory Committee.**
The committee must have a minimum of four members, including:

- Faculty advisor (Chair)
- Two members (two committee members must be Pathobiology faculty)
- Graduate School Representative (GSR)

If your committee membership has changed since it was set up, please make sure to inform the Program Manager.

☐ **Have a formal committee meeting.**
Each member must be in agreement that you should proceed with writing your dissertation.

☐ **Committee report signed by all members.**
The report must detail in writing that the members are in agreement about the timing of the dissertation defense.

AT LEAST THREE MONTHS BEFORE YOUR FINAL EXAM

☐ **Set the Final Exam date with your Supervisory Committee.**
At least four members must be present at your Final Exam. These include the Chair, Graduate School Representative, and one additional Graduate Faculty member.

☐ **Establish the Reading Committee.**
The Reading Committee must have a minimum of three members, consisting of:

- Faculty advisor (Chair)
- Two other Supervisory Committee members

Email this information to the Program Manager to get this set up.

AT LEAST FIVE WEEKS BEFORE YOUR FINAL EXAM

☐ **Present your Reading Committee with your dissertation.**
Your Reading Committee must agree that the work described in the dissertation is appropriate for fulfillment of the doctoral degree and that the dissertation is in good enough shape that you will be able to make the necessary changes prior to the end of the quarter. The full Supervisory Committee must then formally agree to the date and time of your exam before your schedule your Final Exam online.

Please consult with the Program Manager for options if it is not possible to have four members attending.

☐ **Schedule your Final Exam.**
This includes finding a room, confirming with your committee they are available, and submitting a request for your Final Exam in MyGrad (http://grad.uw.edu/for-students-and-post-docs/mygrad-program).

AT LEAST ONE DAY BEFORE YOUR FINAL EXAM

☐ **Print out the exam warrant and bring it to your Final Exam.**
Once the Program Manager has received confirmation of your Supervisory Committee approval, they will approve the request for your Final Exam online (a system generated email will be sent to the student and all members of the committee) and email the warrant to the student and their advisor.

WITHIN THREE DAYS OF COMPLETING THE EXAM

☐ **Return the signed warrant to the Program Manager within three days or by the end of the quarter, whichever is first.**
The Program Manager will officially report the outcome of your exam to the Graduate School. Your warrant must be returned to the Program Manager. You will also submit via email attachments, the abstract of your Dissertation Defense and publications. Upon successful completion of your Dissertation Defense, the Program Manager will also send an announcement to the Pabio listserve unless a special request has been made.

Appendix H

Doctoral Dissertation Checklist

Review the Graduate School dissertation submission policies carefully before preparing your final dissertation document: http://grad.uw.edu/for-students-and-post-docs/thesisdissertation/final-submission-of-your-thesisdissertation.

☐ **Collect signatures on the Doctoral Dissertation Reading Committee Approval Form.**
Upload a scanned pdf version of the approval form to the Administrative documents section of the UW ETD Administrator Site.

☐ **Complete the Survey of Earned Doctorates (SED)**
Upload the SED Certificate of Completion to the Administrative documents section of the UW ETD Administrator Site.

☐ **Submit your final dissertation electronically to the UW ETD Administrator Site.**
Deadline is the last day of the quarter of graduation.

Appendix I

Graduation Checklist

☐ **Department of Global Health Graduation Reception**
The Department of Global Health holds a special reception during finals week each Spring Quarter to individually recognize graduates. Highlights include student speakers and a photo summary of student work.

☐ **School of Public Health Graduation**
The School of Public Health Graduation Celebration (http://sph.washington.edu/news/graduation.asp) is held during finals week each Spring Quarter and recognizes undergraduate and graduate degree recipients.

☐ **University of Washington Commencement**
The annual UW Commencement Ceremony (http://www.washington.edu/graduation) is held the Saturday following finals week of Spring Quarter. The event includes bachelor, master, doctoral, and professional degree students. An estimated 5,000 graduates and 40,000 guests participate. Graduates who earned their degrees the Summer, Autumn, and Winter prior to the Commencement are eligible to participate. Candidates who have a reasonable expectation of graduating the Spring or Summer Quarter directly preceding and following the Commencement Ceremony are also eligible to participate.

Appendix J

Student Progress Checklist

	Quarter	Events	Date Accomplished
Year 1	Autumn	Arrange rotations	
		Complete rotation one	
	Winter	Complete rotation two	
	Spring	Complete rotation three	
		Select dissertation lab	
	Summer	Begin dissertation research	
Year 2	Autumn	Establish Doctoral Supervisory Committee	
		Present poster at Retreat	
	Winter or Spring	Research presentation at Graduate Research Symposium	
	Summer	Formal coursework should be finished	
	Variable	Committee meeting(s)	
Year 3	Autumn	Present poster at Retreat	
		Schedule oral part of General Exam; Dissertation Research Proposal must be given to committee members at least two weeks prior to oral examination.	
	Winter or Spring	Research presentation at Graduate Research Symposium	
	Variable	Committee meeting(s)	
		Complete General Exam by end of Summer Quarter	
		Complete didactic requirements (TA for a Pabio course)	
Year 4	Autumn	Present poster at Retreat	
	Winter or Spring	Research Presentation at Graduate Research Symposium	
	Variable	Committee meeting(s)	
Year 4 and on	Prior to submitting dissertation and scheduling defense	Meet with Committee	
	Variable	Complete dissertation research	
		Write dissertation	
		Give defense	

Appendix K

Pathobiology Graduate Program Rotation Confirmation

Date: _____

During the _____ quarter, I will do a rotation in the laboratory of

Dr. _____. We have met, discussed, and agreed to this arrangement.

_____
Student Name (printed)

_____ _____
Student (signature) Date

_____ _____
Rotation Supervisor (signature) Date

IT HAS BEEN APPROVED BY:

_____ _____
Graduate Program Director (signature) Date

Appendix L

Student Rotation Evaluation

PABIO 500
Student Performance Appraisal

Student Name_____

Rotation Supervisor_____

Quarter, Year_____

Number of credits registered_____

	Excellent	Adequate	Unsatisfactory
Attendance			
Lab notebook			
Participation			
Lab presentation			
Written report			
Experimental progress			

Additional Comments:

Grade (circle one): CREDIT NO CREDIT

_____ _____
(Rotation Supervisor's signature) Date

_____ _____
(Student's signature) Date

Appendix M

Advisor Confirmation

Interdisciplinary Program in Pathobiology
Department of Global Health
University of Washington

Date: _____

Beginning _____ quarter, Dr. _____ will be acting as my permanent advisor. We have met and discussed this arrangement. I am aware that this arrangement is not a guarantee of funding.

_____
Student Name (printed)

_____ _____
Student (signature) Date

_____ _____
Advisor (signature) Date

_____ _____
Graduate Program Director (signature) Date

_____ _____
Human Resources Delegate (signature) Date

Appendix N

Report of Graduate Student Committee Meeting

Interdisciplinary Program in Pathobiology

Date: _____

Student name: _____

Committee members present: _____

Research Progress report submitted was:

_____ Satisfactory

_____ Unsatisfactory *

* If checked, this constitutes formal warning that adequate research progress has not been made to date.

_____ Provisional**

Comments/Recommendations:

** For provisional report: Specific expectations to be met in the next three months:

1.

2.

3.

4.

_____ Chairperson

_____ Member

_____ Member

_____ Member

_____ Member

_____ Member

I agree/do not agree that this report reflects the conclusions reached at the committee meeting.

_____
Student (signature)

Next Committee Meeting Scheduled for: _____

Appendix O

Pathobiology Student Research Symposium Evaluation

Student Name: _____ Faculty Reviewer: _____

Did it appear that the student had practiced the presentation? _____ Yes _____ No
Was the talk on time? _____ Yes _____ No

In addition to a numerical score, comments can help our students improve their presentation skills. Thank you for your effort to provide comments in the space below every item.

1=Needs Improvement; 2=Sufficient; 3=Good; 4= Very good; 5=Excellent	1	2	3	4	5
Introduction					
Clarity of hypothesis					
Use of appropriate scientific methods					
Summary/Conclusion					
Answers to questions					
Comments on Audiovisuals, slides, and organization of the talk. The presenter could improve/did well at:					

Appendix P

Faculty Research Interests

Members of the Graduate School Faculty are denoted by an asterisk (*). Graduate faculty membership enables professors to serve as the chair of graduate student supervisory committees. Please be advised that not all Pathobiology faculty accept graduate students in their laboratories. We encourage you to contact those faculty with whom you are interested in working.

***Lee Ann Campbell, PhD**
Dr. Campbell's overall research emphasis is the elucidation of molecular mechanisms of chlamydial pathogenesis. *Chlamydia pneumoniae*, a human respiratory pathogen, has been associated with cardiovascular disease and found in atherosclerotic lesions. A major focus is on elucidating the role of *C. pneumoniae* in atherogenesis through the use of animal models of *C. pneumoniae* infection and atherosclerosis and *in vitro* models. Efforts are also focused on host/pathogen interactions to elucidate the mechanisms by which *Chlamydia* enters the host and the host receptors involved. Animal models are also being used to investigate therapeutic interventions and develop preventive strategies.

***Gerard Cangelosi, PhD**
Dr. Cangelosi works on infectious diseases, most notably in the areas of molecular diagnostics, pathogen detection, and exposure/transmission issues. His work in the public and private sectors has addressed tuberculosis and related diseases, enteric disease, and hospital acquired infections. Recent accomplishments include the development of a novel, oral swab-based tuberculosis case finding approach, new molecular viability testing methods, and new semi-synthetic affinity reagents for molecular diagnostic testing.

***Darrick Carter, PhD**
Dr. Carter's research focuses on vaccines and innate signals targeting the immune system to modulate responses to elicit protective and therapeutic immunity. These technologies will help in providing low cost treatments and prophylactics for deployment in developing countries to address needs in Global Health. As part of this research his group is developing adjuvants based on TLR and non-TLR signaling that synergize to tune appropriate high quality immune responses. The molecules are designed based on structural and systems biologic considerations and have been moved into numerous human clinical trials. An emerging current focus is on how to use appropriate adjuvant combinations to produce lasting immune diversity and mucosal immunity. In addition to the adjuvant research, his laboratory is performing process development to further move new vaccines for Schistosomiasis, Onchocerciasis, and Leishmaniasis into the clinic as well as doing translational work on other vaccine candidates. A separate focus of the lab is innovative immune oncology where tumors are attacked through tumor junction openers and checkpoint inhibitor technologies targeting the complement system. Finally, the lab has medical device projects and is developing a microneedle platform for immunization and diagnostic testing as well as an inhaler for drug resistant TB.

***Rhea Coler, PhD**
The overall research emphasis is to rationally design vaccines for infectious diseases that require humoral and cellular immunity. Efforts are focused on understanding the factors affecting innate and adaptive immune responses to infectious diseases using in vivo model systems and human clinical trial samples. Host/pathogen interactions and next generation adjuvant formulations and delivery systems are also studied to elucidate the mechanisms by which effective B and T cell immune responses are conferred in experimental animal models of *Mycobacterium tuberculosis*, *Leishmania* sp., West Nile Virus, non-tuberculous mycobacteria, Chikungunya, Zika virus and influenza.

***Ian N. Crispe, MD, PhD**
The Crispe lab studies innate and adaptive immune responses in the liver. Liver is both the target of infectious and non-infectious disease, and an active participant in systemic immunity. We use mouse models based on

Adeno-Associated Virus vectors to study liver inflammation driven either by CD8+ T cells, or by the death of hepatocytes and the consequent innate immune response. We are also studying the impact of dietary insults including sugar and alcohol on the liver's immune responses. We are interested in which cells are the primary responders to injury, and which pathways are engaged. Among the major liver cell types, we currently focus on hepatocytes as sensors of liver injury, and on Kupffer cells, an abundant population of tissue macrophages that originate partly from yolk sac and fetal liver, and partly from adult bone marrow-derived monocytes. In parallel with in vivo approached in mice, we have developed a human liver slice organ culture and use this to study human innate immunity in intact liver tissue.

***Malcolm Duthie, PhD**
Dr. Duthie's main research interest lies in determining and examining the host/pathogen interactions that initiate and control immune responses, how these interactions can be beneficially manipulated, and ultimately, their practical application within disease control programs. An emphasis is placed on neglected tropical diseases. This research uses preclinical models of immunization and infection to determine mode-of-action of early stage vaccine candidates. It also capitalizes on an extensive collaborative network across several countries to identify vaccine candidates and develop new diagnostic tools to improve the control of leprosy, leishmaniasis and Chagas disease.

***Michael Emerman, PhD**
The Emerman lab studies host-cell interactions of the human immunodeficiency virus (HIV) and related viruses. We wish to understand the molecular and evolutionary basis of virus replication and pathogenesis. They study the evolution and function of host antiviral genes in order to determine how HIV adapted to humans, and how ancient viral infections influenced the susceptibility or resistance of humans to modern lentiviruses.

***Ferric C. Fang, MD**
The Fang Laboratory studies the pathogenesis of infections caused by *Salmonella enterica* and *Staphylococcus aureus*. Active projects include the antimicrobial actions of nitric oxide, bacterial stress responses, the evolution of transcriptional regulatory networks, and the pathogenesis of human typhoid.

Jean Feagin, PhD
Dr. Feagin did her postdoctoral research at Center for Infectious Disease Research before becoming a principal investigator there. Her research focused on mechanisms that regulate gene expression and function in apicomplexan parasites, with emphasis on identifying differences between parasites and their human hosts that might be exploited for disease intervention. Dr. Feagin has an extensive background in regulatory issues, having served on committees that review proposed animal model and biohazard uses in the laboratory, and proposed recombinant DNA uses in clinical trials. She is interested in practical, ethical, and regulatory issues for adaptation of medical technologies to less-developed countries.

***Christopher Fox, PhD**
Dr. Fox's research focuses on developing stable, biocompatible vaccine adjuvant formulations, including physicochemical characterization and cGMP production. Vaccine adjuvants are a critical component of modern vaccine development. Dr. Fox's work involves the major classes of clinical adjuvant formulations including aluminum salts, oil-in-water emulsions, and liposomes. Furthermore, Dr. Fox's research has investigated the interactions of Toll-like receptor ligands with various formulation platforms and the resulting biological effects in a variety of disease models, including tuberculosis, malaria, leishmaniasis, pandemic influenza, and amebiasis.

***Nicole Frahm, PhD**
Dr. Frahm's research addresses the influence of HIV sequence diversity on its recognition by cytotoxic T lymphocytes, as well as the factors governing the recognition of sequence variants both in HIV-infected subjects and in vaccine trial participants. Her research also includes the assessment of immune responses to viral vectors used as immunogens in HIV vaccine trials to help understand how pre-existing cellular immunity to the vector

influences the quality of vaccine-induced immune responses. As the Associate Laboratory Director for the HVTN, she oversees the Endpoints Laboratory, which is responsible for the generation of validated immunogenicity data for all HVTN trials, and the R&D Laboratory, which provides ancillary and exploratory data leading to a more complete view of the immune responses generated by HIV vaccines. In addition to her research on HIV, Dr. Frahm also studies vaccine-induced immune responses to other pathogens, such as TB, malaria and ebola, as well as natural immunity to human rhinoviruses.

***Lisa Frenkel, MD**
The Frenkel Lab pursues the following: First, we are working to understand the mechanisms that despite effective antiretroviral therapy allow HIV infection to persist. Second, our group conducts studies to elucidate how HIV infection, despite effective antiretroviral therapy, results in higher rates of cancers, specifically cervical cancer in Ugandan women. Third, we conduct "translational studies" in adults and children to understand the establishment and dynamics of HIV-drug-resistant reservoirs. Fourth, in collaboration with bioengineers we are working to develop a rapid, affordable point mutation assay for detection of HIV-drug-resistance that should prove useful in both low- and high-resource communities.

***Michael Gale, Jr., PhD**
Research in the Gale laboratory is focused on understanding innate immunity to RNA virus infection, and the intracellular immune processes and virus-host interactions that govern viral replication, the immune response to infection, viral pathogenesis, and the overall outcome of infection. The laboratory is a member of the new Center Innate Immunity and Immune Disease, and is a component of the Hepatitis C virus (HCV) Cooperative Research Centers, as well as the Immune Mechanisms of Virus Control program, both supported by the NIH. Additionally, the Gale laboratory has research programs focused on understanding immune control of flavivirus infection, HIV, HIV/HCV coinfection, Hanta virus, contemporary and emerging coronaviruses, influenza viruses, and the immunomodulatory/antiviral actions of interferons and small molecule innate immune agonists as antiviral mediators of virus infection. The lab also conducts vaccine research focused on developing innate immune agonists as adjuvants for pairing with vaccines against high path influenza virus (bird flu), HIV, HCV, and other contemporary or emerging RNA viruses.

***Denise Galloway, PhD**
The Galloway lab is interested in the mechanisms by which human papillomaviruses (HPVs) contribute to epithelial cancers. They have sought to determine how the E6 and E7 oncoproteins disrupt the cell cycle checkpoints and facilitate the immortalization of primary human cells. Current effort is directed towards understanding how and why E6 activates and increases expression of hTERT, the catalytic subunit of telomerase. The mechanisms by which other oncogenes, immortalize cells, and the tumor suppressors that constrain these activities are under investigation. Another focus is studying beta HPVs, which commonly infect skin, and may play a role in squamous cell skin cancers (SCSC). They are studying the role of E6/E7 in blocking UV-induced apoptosis, as well as other functions. A long standing interest is the natural history of genital HPV infections, and the risk factors that cause only a small subset of women infected with high risk HPVs to progress to cancer.

***Lorenzo Giacani, PhD**
Dr. Giacani's work at the University of Washington focuses on the pathogenesis of syphilis and how the causative agent of this infection, *Treponema pallidum* subsp. *pallidum* (*T. pallidum*), can successfully evade the host immune response and establish persistent infection in spite of a vigorous host immune response. Research topics in the Giacani's lab include the study of transcriptional modifications that help the syphilis pathogen counteract host defenses, the identification of putative surface-exposed antigens that could serve as vaccine candidates, functional characterization of previously identified *T. pallidum* surface antigens, the study of the host immune response to *T. pallidum*, comparative genomics of *Treponema* subspecies and strains, and the use of innovative vaccine delivery approaches based on surrogate bacteria.

***Christoph Grundner, PhD**
Despite being the world's most prevalent pathogen, Mycobacterium tuberculosis (MTB) is still a puzzle. The Grundner lab is working toward a better understanding of MTB pathogenesis by studying the phosphosignaling network of MTB with the ultimate goal of translating these findings into better therapies. The lab also uses chemical biology and structural approaches to identify functions for the large numbers of hypothetical proteins in MTB and other pathogens.

***John Hansen, PhD**
The Immunology group at Washington Fishery Research Center focuses on immune responses to infection in fish, the development of immune-related tools (mAbs) and reagents for salmonids and the impact of environmental chemicals on immune response potential. Dr. Hansen's lab is particularly interested in host-pathogen interactions and their impact on fish health & populations.

To better appreciate these interactions, they have developed specific research projects that utilize zebrafish. Zebrafish present an attractive model for studies involving fish and vertebrate health owing to the ease of breeding and maintaining stocks and the availability of specific tools including a finished genome, comprehensive DNA microarrays, gene knockouts/knockdowns and transgenic animals for specific immune-related genes. Current projects using zebrafish at the WFRC include models to assess pathogenesis mediated by *Francisella* species that infect fish and the impact of endocrine disruptors on fish health. These research efforts have translational value for human health as well, as our comparative approach can lead to the identification of key virulence factors and essential components of host immunity that are conserved across all vertebrates. Ultimately, the goal is to better understand how pathogens and host immune responses contribute to pathogenesis &/or immunity and how this information can be applied to vertebrate health.

***Kevin Hybiske, PhD**
The Hybiske lab investigates the pathogenesis of *Chlamydia trachomatis* and how this bacteria interacts with host cells at the molecular level. A major research focus in the lab is to determine how intracellular pathogens, including *Chlamydia* and liver-stage malaria parasites, manipulate host cell factors to promote cell-to-cell spread and dissemination. Other active projects include defining virulence correlates for *Chlamydia*, developing novel genetic tools for manipulation of *Chlamydia*, and studying immune responses to disseminating *Chlamydia*.

***Keith Jerome, MD, PhD**
Dr. Jerome's research interests focus on chronic and latent viral infections, and potential approaches to their eradication. Much of the research involves the use of DNA editing enzymes, including CRISPR/Cas9, homing endonucleases, zinc finger nucleases, and TAL effector nucleases, to induce deletion of essential viral genes or cellular receptors for virus. Dr. Jerome has active projects in HIV, hepatitis B virus, herpes simplex virus, and human papillomavirus. The long-term goal is to develop curative therapies for each of these infections. Clinically, Dr. Jerome serves as Director of the University of Washington molecular virology laboratory.

***Stefan Kappe, PhD**
Dr. Kappe's research is focused on the biology, immunology and vaccinology of malaria, a parasitic disease caused by Plasmodium parasites. The goal of his lab is to elucidate the malaria parasites biology and its interactions with the host after the parasites are transmitted by mosquitoes and infect the liver, where they develop asymptomatically within hepatocytes before initiating disease-causing blood stage infection. We operate a malaria transmission laboratory that houses Anopheles mosquitoes, the vectors for malaria, which enables work with the parasites transmission stages. The lab studies the cell biology of infection, networks of host-parasite interactions during intracellular development, innate immune responses to infection and adaptive immune responses. We use malaria parasites infecting rodents as models but also study the human malaria parasites *Plasmodium falciparum* and *Plasmodium vivax,* This work is enabled by the use of human tissue-chimeric mice as infection models. We utilize the information gleaned from studying the basic biology and immunology of parasites to develop new interventions, both drugs and vaccines. One important translational aspect of our work is targeted at designing genetically engineered, live attenuated *Plasmodium falciparum* (GAP) strains for vaccination and elucidating correlates of protection. We conduct clinical trials with GAPs in

human volunteers, allowing the straightforward determination of vaccine efficacy using a challenge model with infectious parasites but also the direct analysis of protective human immune responses.

***Rachel Katzenellenbogen, MD**
Human papillomavirus (HPV) is the most common sexually transmitted infection, affecting more than 75% of the adult population. HPV is categorized as high-risk or low-risk, based on its association with cancer. Through dysregulation of normal cellular function, high-risk HPV blocks signals for DNA damage, programmed cell death, and cellular arrest, all as a part of its viral life cycle. Dr. Katzenellenbogen studies the mechanism by which high-risk HPV activates telomerase, and enzyme found normally in stem cells and almost categorically activated in cancers, Notch1, a master cell fate regulator, and the balance of growth and differentiation in keratinocytes in order to understand how HPV drives cells to become malignant.

***Alexis Kaushansky, PhD**
Dr. Kaushansky's research emphasis is how host cells respond to intracellular pathogens. One major focus within the lab is the basic question of how the malaria parasite is able to modify its human liver environment in order to counteract host defenses and ensure for its own survival. Historically, investigating this question has been slowed by technical hurdles and as such we adapt and develop a range of technological approaches to address this line of inquiry. We are also extremely interested in identifying common underlining requirements that diverse pathogens have of their host cells, and translating these insights into interventional approaches that slow or stop the infection of infection.

Anne Kasmar, MD MSc
Anne Kasmar joined the Bill and Melinda Gates Foundation in 2015 as a Program Officer in the TB vaccine program. She is a physician scientist with 18 years' experience in TB, spanning fieldwork, epidemiology and clinical practice as well as basic and translational immunology. She received her medical degree from the University of California San Francisco and was inspired to devote her career to TB while living in Southern Thailand as a Luce Scholar in 1998-9. She subsequently completed her internship and residency in internal medicine at the Massachusetts General Hospital before earning a masters' degree in the Immunology of Infectious Diseases at the London School of Hygiene and Tropical Medicine. She completed her clinical infectious diseases fellowship as well as chief residency at the MGH, after which she joined the laboratory of D. Branch Moody as a postdoctoral fellow. Her work at the bench focused on non-classically restricted T cells that target mycobacterial lipids presented by non-polymorphic CD1 molecules. In addition to making human CD1 tetramers for use in translational studies in Boston and at the KwaZulu Natal Research Institute for TB and HIV in Durban, South Africa, she was a key contributor to the annual New England TB symposium and she chaired the first ever Gordon Research Seminar in Immunochemistry and Immunobiology.

***Nichole Klatt, PhD**
The complex interactions between the epithelial barrier, the microbiome, mucus and immune cells are critical for protection from disease. The focus of the Klatt lab is to understand mechanisms underlying mucosal dysfunction, microbiome dysbiosis and altered immunity in mucosal tissues (mainly gastrointestinal and female reproductive tracts), and how these defects contribute to HIV transmission and pathogenesis. Our ultimate goal is to improve prevention and treatment strategies for HIV infection.

***David Koelle, MD**
T-cell immunology is at the core of infectious diseases, cancer, and allergy. The Koelle lab is fortunate to be able to work in each of these areas. They have funded programs in antigen identification and prioritization for herpes simplex viruses types 1 and 2, varicella zoster virus, and vaccinia (the vaccine for smallpox). In 2008, Merkel cell polyoma virus (MCPyV) was discovered as the cause of Merkel cell carcinoma (MCC). Dr Koelle has been actively collaborating with the leading MCC clinical group to develop therapies focusing on improving the immune response to the oncogenic viral protein. For *Mycobacterium tuberculosis* (MTB), Dr. Koelle is responsible for the IGRA testing at the medical center, and has mentored several trainees interested in this unique application of T-cell immunology to clinical testing. The pathogens that he works on mostly have large genomes, so determining the antigens that elicit T-cell responses is challenging. Dr. Koelle's technical expertise

is the use of genomic libraries and genome-spanning ORF s ets to interrogate CD8 and CD4 T-cell responses to a very high level of definition. A suite of modern immunology tools such as intracellular cytokine cytometry, tetramers, cell killing assays, TCR expression, etc. are in use to measure several variables in the T-cell response. HSV-1 and HSV-2 vaccine candidates have been identified and studied in mice, and some have entered phase I-II human trials. Dr. Koelle's group also performs clinical immune monitoring for clinical trials of candidate HSV vaccines. Recently, they have begun collaborative work with investigators interested in drug-related cutaneous toxicity (SJS-TEN reactions) mediated by CD8 T-cells.

***Gael Kurath, PhD**
Research on negative sense RNA virus epidemiology, pathogenesis, fitness, and evolution using a fish rhabdovirus, infectious hematopoietic necrosis virus (IHNV), as a tractable experimental model for in vivo infection of vertebrate hosts. As the earliest animals on the evolutionary tree of life to have evolved adaptive immunity, fish provide a host with innate and adaptive responses similar to mammals, but facilitate studies with large numbers of animals to assess population-scale phenomena. Research studies focus on viral emergence and displacement in the field, mechanisms of host specificity and host jumps, evolution of virulence, host-to-host variation, and viral fitness. A major effort has been development of several in vivo viral fitness assays that assess fitness components associated with host entry, in-host replication, viral shedding, and most recently superinfection fitness. The ultimate goal is to understand drivers of viral infection as it occurs and evolves in natural infections of host populations.

***Paul Lampe, PhD**
The Lampe laboratory investigates the control of cell growth both at the cell biological/ mechanistic level and through cancer biomarker discovery. Specifically, we attempt to mechanistically connect gap junction regulation with wound repair responses in skin, hypoxic events in heart, the cell cycle, the control of cell growth, and how the relationship is disrupted during carcinogenesis. Specifically, we determine the functional consequences of kinase signaling in terms of the level of intercellular communication, proliferation, migration and interaction with other key regulatory proteins. Related to cancer biomarker discovery, the advent of new high data content methodologies has expanded our lab's efforts into broad proteomic screens for cellular signaling using high density antibody array technologies to discover proteomic, autoantibody and glycomic biomarkers of cancer.

***Kelly Lee, PhD**
Viruses undergo dramatic structural reorganizations at many critical stages of their life cycles, including during host cell invasion, genome expulsion, assembly, and cell egress. The changes often involve concerted changes among hundreds of protein components and, in the case of enveloped viruses, membranes as well. From this perspective, virions are intricate, nano-scale cell-invasion and replication machines. The dynamic structural transitions are attractive targets for anti-viral therapeutics that would "throw a spanner into the works" and arrest viral infections. Neutralizing antibodies also inhibit infection by blocking interactions with receptors and arresting conformational changes the proteins must carry out in order to mediate genome delivery. Dr. Lee's lab use a suite of biophysical, structural, and biochemical techniques including X-ray scattering, mass spectrometry, cryo-electron microscopy, and fluorescence microscopy to understand the function of viral machinery. The viruses studied include influenza A and HIV. Our work can both bring fundamental biological mechanisms to light and provide novel insights that are useful for optimization of vaccine immunogens.

***Dara Lehman, PhD**
Research interests include viral dynamics, viral reservoirs and drug resistance following antiretrovirals used as prophylaxis and treatment for HIV infection. Studies involve cohorts of HIV infected women, infants and serodiscordant couples in Kenya. In addition, Dr. Lehman has been involved in the development of multiple assays to detect HIV infection and drug resistance that work across HIV subtypes, and uses these assays in population-based studies. Currently, she collaborates on the development of a non-instrumented infant HIV diagnostic that is appropriate for use in resource-poor settings.

***Jairam Lingappa, MD, PhD**
For the last 10 years, Dr. Jairam Lingappa has focused his research efforts on identifying host factors mediating natural host resistance to and disease progression from HIV-1 infection. He has done this using samples and data prospectively collected in cohorts of African HIV-1 serodiscordant heterosexual couples (one partner HIV-1 infected and the other HIV-1 uninfected). In the context of these collaborative studies, he has coordinated integration of prospective clinical, epidemiological and behavioral data with laboratory analysis for genomic, transcriptomic, proteomic, virologic and microbiome factors. Currently, his team is primarily focused on analysis of whole human genome sequence data to identify rare genetic factors mediating altered risk of sexual HIV-1 acquisition.

***Jaisri Lingappa, MD, PhD**
The Lingappa lab studies viral host interactions involved in assembly of human immunodeficiency virus type 1 (HIV-1) and other viruses. Their group demonstrated that immature HIV-1 capsid assembly in cells occurs through a pathway of assembly intermediates, and is facilitated by the catalytic activity of the host enzymes ABCE1 and DDX6. Their recent studies show that ABCE1 binds directly to HIV Gag through an ancient binding site that is present even in the Ty3 retrotransposon Gag protein. One current direction in the lab involves understanding the evolution of the ABCE1 binding site in different retroviral Gag proteins and cellular Gag-like proteins. Other projects in the lab address how polymorphisms that arise in Gag *in vivo* can enhance ABCE1-Gag binding, thereby accelerating the kinetics of this assembly pathway and increasing virus particle production. The latter studies have important implications for viral pathogenesis, since they test the hypothesis that altering viral-host interactions during assembly could impact viral set point and viral load. The Lingappa lab's studies have also led to development of novel antiretroviral compounds that inhibit virus replication by acting on the capsid assembly pathway.

***Maxine Linial, PhD**
The Linial laboratory is interested in the natural and zoonotic transmission of simian foamy viruses (SFV). Foamy viruses (FV) are complex retroviruses that are prevalent in most primate species, and in some accidentally infected humans, as well as in cats, horses, and cows. These viruses are cytopathic to some but not all cells in tissue culture. However, in vivo there is no indication that any of these viruses are pathogenic. There is much interest in the use of FVs as gene therapy vectors since they have large genomes, broad host range and are non-pathogenic. In the past, our lab has worked on the molecular biology of foamy viral replication. However, our current interest is in the biology and epidemiology of natural SFV infections in free-ranging macaques, as well as in the humans that interact with these macaques in Bangladesh. All of this work is done in collaboration with Dr. Lisa Jones-Engel in the Anthropology Department at UW.

Our group is interested in how FV can establish lifelong persistent infections without ensuing pathology. Our studies revealed that naturally FV infected rhesus macaques (Macaca mulatta) have high levels of virus in the oral tissues and in saliva (which is the mayor route of transmission), but not in any other tissues.

In Bangladesh, most village residents (VR) live in close proximity to rhesus macaques and occasionally interact with them. We found that about 4-5% of VR are persistently infected by SFV, after being bitten or licked by macaques. There is a seminomadic group of humans, the Bedey, that interact with macaques on a daily basis and usually have scars from macaque bites. We expected that the Bedey would be highly infected by SFV. Much to our surprise, we instead found that the Bedey are not persistently infected. Our research is now focused on understanding why the Bedey are apparently resistant to SFV infection. Our data thus far indicate that the viruses that VR and Bedey encounter are very similar. Thus, our research will focus on differences in acquired and/or innate immunity to SFV between the Bedey and VR. The Bedey are the only group of humans shown to be resistant to any retrovirus that can infect humans. Understanding resistance of the Bedey to SFV could have implications for human infections by other retroviruses.

***Sheila Lukehart, PhD**
The Lukehart laboratory studies the pathogenesis of syphilis and the immune response to *Treponema pallidum* in humans and in animal models. A major focus of research is the 12-membered *tpr* gene family of *T. pallidum*, which is hypothesized to encode surface-exposed antigens that are major targets of the protective immune response, may be involved in immune evasion, and are promising vaccine candidates. We have demonstrated that one member of the Tpr family, TprK, undergoes antigenic variation, and variants are implicated in the development the secondary stage of syphilis The laboratory is also working to identify surface molecules that are targets of opsonization and to define the kinetics of and requirements for bactericidal activity by macrophages. Many of the projects described above involve collaboration with Dr. Lorenzo Giacani. In collaboration with Dr. Caroline Cameron (University of Victoria), we are testing several antigen cocktails for efficacy as a syphilis vaccine in the rabbit model.

Additionally, our laboratory is involved in studies of clinical aspects of syphilis and other treponematoses. With Dr. Christina Marra (Neurology), the laboratory is exploring the molecular basis for neuroinvasion, the immunologic response to *T. pallidum* within the CNS, and the efficacy of recommended therapy for CNS syphilis in immunocompetent and HIV-infected patients. Other ongoing studies involve the investigation of emerging macrolide resistance in *T. pallidum*, application of a molecular typing method for *T. pallidum* to epidemiological studies of syphilis, studies of mass treatment for yaws control in Papua New Guinea (Dr. Oriol Mitja), and the role of treponemal infection in Tanzanian wild baboons as a potential reservoir for human infection (Dr. Sascha Knauf).

***Jennifer Lund, PhD**
Our focus is on elucidating the basic mechanisms of immunity in the context of virus infection. Specifically, we use mouse models to study T cell responses to genital HSV-2, influenza, and West Nile virus. Additionally, we are investigating the immune correlates of protection from HIV infection using a cohort of exposed seronegative individuals, as well as the potential immune modulatory effects of using pre-exposure prophylaxis in protection from HIV acquisition. Overall, we hope that our studies will lead to improved clinical interventions for virus infections of public health importance.

***M. Juliana McElrath, MD, PhD**
Dr. McElrath's laboratory seeks to identify the components of immunity that are important in preventing and controlling HIV-1 infection, with studies encompassing a broad range of translational research investigations in persons who experience unusual control of HIV-1. The McElrath Lab’s research is focused on obtaining a better understanding of the role HIV-1-specific memory T cells play in protecting against mucosal HIV-1 transmission and determining optimal strategies to accomplish protection by vaccination.

***Peter Myler, PhD**
The Myler laboratory played a key role in sequencing the "Tritryp" genomes, revealing that the protein-coding genes are arranged in long polycistronic gene clusters. Using genome-scale approaches such as microarray-based transcript mapping and chromatin immunoprecipitation (ChIP-chip), as well as more traditional molecular approaches such as electrophoretic mobility shifts assays, affinity chromatography, and in vitro transcription, we are now elucidating the molecular mechanisms involved in RNAPII-mediated transcription of protein-coding genes in L. major. In collaboration with Dan Zilberstein (at Technion, Israel), they are using genome-wide approaches (such as RNA-seq and tandem mass spectrometry), to identify and characterize changes in gene expression during differentiation from the insect form (promastigotes) to the mammalian form (amastigotes) of L. donovani and to elucidate the signaling pathways involved in this process. Dr. Myler is also PI of the NIAID-funded Seattle Structural Genomics Center for Infectious Disease (SSGCID), which includes investigators at Center for Infectious Disease Research, Beryllium, University of Washington and Pacific Northwest National Laboratories. To-date, they have solved over 250 three dimensional protein structures from NIAID Category A-C pathogens and organisms causing emerging or re-emerging infectious diseases. These protein structures serve as a blueprint for structure-based drug development, as well as facilitating vaccine development and other basic research.

***Mark Orr, PhD**
Dr. Orr's research is focused on understanding the immunobiology of vaccines and adjuvants in the support of developing new vaccines for infectious diseases impacting global health. A major focus has been on identifying the key vaccine immune responses necessary for the control of *Mycobacterium tuberculosis* using small animal models of infection. Recent work has focused on defining the mechanisms of action of formulated TLR4 agonist adjuvants that lead to robust TH1 and humoral immune response to vaccine adjuvants.

***Julie Overbaugh, PhD**
The Overbaugh lab has a long-standing interest in understanding the mechanisms of HIV-1 transmission and pathogenesis.The lab is part of a larger team, comprising researchers in both Seattle and Kenya (The Kenya Research Program). Trainees in the lab have opportunities to engage in studies of viral evolution, virus-host cell interactions, and viral immunology all within the context of this international collaboration. Studies in the lab focus on identifying correlates of protection in HIV-infected humans, including individuals who become superinfected with HIV and infants of HIV-positive mothers. Current areas of emphasis include identification of HIV specific antibodies that neutralize virus or mediate ADCC. Other projects in the lab focus on rationale design of more relevant models of HIV infection and the role of IFN and viral entry in viral restriction in model systems.

***Tanya Parish, PhD**
Tanya Parish's work focusses on the global pathogen *Mycobacterium tuberculosis*, in particular the understanding of the mode of action of anti-tubercular agents and drug resistance. Her work has a strong emphasis on drug discovery for tuberculosis, which includes drug target identification and validation, high throughput screening and medicinal chemistry. In addition, her group works to understand the pathogenic mechanisms and basic biology of *M, tuberculosis* and using this information to inform drug discovery.

***Marilyn Parsons, PhD**
Among different disease agents, parasites are the most similar to their human host, which has made the search for drugs and vaccines highly challenging. A major focus of Dr. Parsons' laboratory is identifying differences in cell structure and function between parasites and humans. Her long-term goal is to identify differences between host and parasite that would be appropriate targets for drug development. Current work examines Trypanosoma brucei (African trypanosomes) and Toxoplasma gondii, with a focus on protein kinases.

***Stephen J. Polyak, PhD**
Research in the Polyak lab focuses on one hand, on virus-host interactions that lead to chronic inflammation and disease. On the other hand, we are interested in defining the mechanisms by which natural and synthetic compounds protect cells from damage by virus infection and chronic inflammation. The virus models include hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and Zika virus. We have studied how hepatocytes sense viral hepatitis infection and mount an inflammatory response. Another project focuses on silymarin, an extract from the milk thistle plant. We have found that silymarin alters cellular metabolism, which modulates the inflammatory status of liver and immune cells, and also suppresses HCV infection. The HIV project focuses on chronic immune activation associated with virus infection, and how silymarin and other metabolic modulators reduce the inflammatory status of primary human immune cells. We also study the synthetic antiviral drug known as Arbidol (a.k.a. umifenovir) as a broad spectrum antiviral agent. Originally developed over 30 years ago in Russia, Arbidol is an anti-influenza virus drug that is used clinically during every Flu season. We and other scientists have shown that Arbidol inhibits a growing number of viruses including HBV, HCV, poliovirus, chikungunya virus, and Ebola virus. The Arbidol project seeks to understand the mechanisms for how Arbidol inhibits so many viruses, with the hypothesis that Arbidol acts on the cell to curtail infection. As a drug already in clinical use with a proven safety record, we also believe that Arbidol should be a candidate for clinical studies for viral outbreaks like Ebola virus and Zika virus.

***Martin Prlic, PhD**
The Prlic laboratory studies immune responses following infection and vaccination, using in vivo (mouse) and in vitro (human) systems. Their goal is to understand how to manipulate the immune system for therapeutic purposes. Current research directions include:

Regulating CD8 T Cell Responses
Many established vaccination programs depend on an efficient antibody response, but this classic approach has failed for current challenges such as malaria, HIV, and tuberculosis. CD8 T cells are key players in protecting against intracellular pathogens by eliminating infected cells and hence we believe a strong CD8 T cell response will be an integral part of a successful vaccine.

Mucosal-associated invariant T (MAIT) cells
Human mucosal-associated invariant T (MAIT) cells are located at critical sites of pathogen entry, but their role in the immune response is poorly understood. Their goal is to understand their role in infections, chronic inflammatory responses and other inflammation-driven pathologies.

***Lakshmi Rajagopal, PhD**
Current research projects are on Group B Streptococcus are focused toward understanding how the pathogen migrates through different host niches during infections. These include identifying the environmental cues/signals that are sensed by the pathogen for regulation of toxins and other virulence factors. Our studies on *S. aureus* are focused on elucidating on factors that regulate antibiotic resistance and virulence of the pathogen. The Rajagopal lab is also investigating how mutations in host signaling pathways affect disease susceptibility to *S. aureus*. This is particularly relevant as patients with genetic disorders such as Jobs syndrome and chronic granulomatous disease (CGD) are prone to recurrent and life-threatening infections due to *S. aureus.*

***Pradip Rathod, PhD**
Malaria causes 500 million infections and at least 500,000 deaths per year. The Rathod lab uses both biology-driven and chemistry-driven projects to help deliver new antimalarials more efficiently. Many early lessons on potency and specificity were learned from studying dihydrofolate reductase-thymidylate synthase. Recently, the Rathod laboratory has developed antimalarials against dihydrooratate dehydrogenase (including DSM265 which is in human trials) and against topoisomerase II. The lab also studies how haploid malaria parasites rapidly acquire evolutionary advantages by altering parasite DNA at the relevant locus, without large collateral damage in the rest of the parasite genome. Some of these questions have led to a US NIH International Center of Excellence for Malaria Research (ICEMR) Program Project to study parasite evolution in South Asia. The results show that parasites may be evolving not only to initiate new types of drug resistance, but also new types of parasite-mosquito interactions and new types of cytoadhesion to host cells leading to severe disease.

***Steven Reed, PhD**
IDRI and the Reed laboratories focus on vaccine and diagnostic development, with an emphasis on adjuvants and antigen discovery. The emphasis is on specific immune responses to infection with macrophage pathogens, including tuberculosis, leishmaniasis, and leprosy. Other applications of the adjuvant technology is towards host directed therapy to stimulate innate immune responses. The basic laboratory studies are complemented by a strong emphasis on clinical studies, with clinical trials and training ongoing in several developing countries**.**

***Marilyn Roberts, PhD**
The Roberts' laboratory focuses on projects related to antibiotic resistant genes and antibiotic resistant bacteria found in man, animals and the environment. A variety of bacteria are studied from pathogenic *Neisseria gonorrhoeae* to opportunistic pathogens such as MRSA and VRE to environmental bacteria. The laboratory is also interested in determining if new antibiotic resistant genes such as KPC can be identified in environmental samples. Studies related to dental caries including clinical studies in both the US and Peru also engages the laboratory. Work with both human and animals samples looking for antibiotic resistant bacteria and genes and how human, animal and environmental bacteria interact with each other.

***Timothy Rose, PhD**
The Rose lab's research focuses on the Kaposi's sarcoma-associated herpesvirus/human herpesvirus 8 (KSHV/HHV8) and its transmission and pathogenic role in AIDS-related malignancies.

KSHV is the causative agent for Kaposi's sarcoma (KS) and two lymphoproliferative disorders: Multi-centric Castleman's disease and primary effusion lymphoma. KS is the world's most common AIDS-associated malignancy and has become a public health problem of enormous proportions in many parts of Africa.

Although KSHV infections are primarily found in HIV-infected individuals in the United States and Europe, the virus is endemic in Sub-Saharan Africa, with extremely high infection rates in children, adolescents and adults. Compounded with the high rate of HIV and AIDS in this geographical area, pediatric and adult KS are some of the most common malignancies, with the highest fatality rate. There is great need for increased understanding of the biology of KSHV, including its transmission, dissemination and associated pathology, in order to develop novel prevention and treatment strategies.

Our current research projects include the identification and characterization of cellular receptors mediating KSHV infection; cell-cell transmission of KSHV infections; the comparative analysis of KSHV and its simian homologs and their role in tumor induction associated with HIV-induced immunosuppression; the characterization of latency and the activating switch to herpesvirus replication; and the development of diagnostic tests for known and emerging viruses of global health importance.

***Michael Rosenfeld, PhD**
Dr. Rosenfeld studies cardiovascular disease with an emphasis on the pathology of atherosclerosis. The current research focuses on the role of the OPG, RANK, RANKL pathway in the accelerated vascular pathologies that accompany chronic kidney disease. Research also includes the roles of air pollution and respiratory infection in the pathogenesis of atherosclerosis.

***Nina Salama, PhD**
Helicobacter pylori, establishes lifelong infection in the stomach of half the human population worldwide. Most infected individuals have asymptomatic gastritis which may progress peptic ulcer (10-20%) or stomach cancer (1-2%). This wide range of disease outcomes remains a mystery of *H. pylori* pathogenesis. The Salama lab is interested in the mechanisms by which this bacterium can establish and maintain a chronic infection in the unusual environment of the human stomach and the molecular cross talk between the host and the bacteria during the decades long infection. The activation of host cell processes, either through direct action of bacterial products or as part of the host's attempt to contain the infection presumably causes the different diseases associated with *H. pylori* infection. To approach this complex problem, the Salama lab is using both global and molecular approaches to analyze strain diversity and progression of infection in a variety of infection models and human clinical isolates.

***David Sherman, PhD**
With about 30% of the world's population infected and 1.4 million deaths caused each year, tuberculosis is the world's deadliest infectious disease. The Sherman laboratory studies the bacterial and host strategies that underpin this success. They use tools of systems biology such as transcriptomics, ChIP-seq and mutant analysis to define the TB gene regulatory network under physiologically relevant conditions, and then use modeling to produce testable hypotheses about novel regulatory circuits, genes and proteins of TB. This iterative approach allows us continually to test and refine our understanding of TB pathogenesis. In addition, the lab is always looking to mine systems-level insights to identify and validate novel TB drug targets and to advance new drug candidates.

***Joseph Smith, PhD**
Dr. Smith studies the biology the malaria parasite during the blood stage. The research focus is the binding interaction between parasitized red blood cells and the host vascular system, a major virulence phenotype. We study how parasitized red blood cells attach to endothelial cells to "sequester" from blood circulation and the resulting vascular dysfunction mechanisms, in order to understand pathogenic disease mechanisms and to design disease interventions.

***Donald Sodora, PhD**
Dr. Sodora's research is focused on correlates of protection against HIV transmission and developing immune therapeutic approaches to confront HIV-induced disease progression. The laboratory utilizes HIV-infected patient samples as well as SIV-infected monkey models. The first area of research involves the assessment of the earliest events following transmission of HIV/SIV in a new host. Most of this work focuses on oral transmission (including mother-to-child transmission) that still occurs at relatively high levels in developing countries. The second area of research focuses on understanding how HIV/SIV infection results in disease progression and AIDS. Current studies are assessing dysfunctional immune responses to *M. tuberculosis* in HIV infected humans as well as employing different monkey models to provide mechanistic insights into these dysfunctions.

***Leonidas Stamatatos, PhD**
The emphasis of the Stamatatos group's work is to develop a safe and effective vaccine to combat the spread of HIV and to investigate how HIV infection leads to AIDS. The lab seeks to: a) identify immunological pathways that lead to the development of broadly neutralizing antibodies during natural HIV infection and exploit these pathways for vaccine-related purposes, b) design immunogens that active the precursors of those B cells that produce broadly neutralizing antibodies, and c) develop prime-boost immunization regiments to guide the maturation of those B cell clones that produce broadly neutralizing antibodies. This work encompasses the entire spectrum of basic to clinical vaccine research.

***Kenneth Stuart, PhD**
The Stuart lab investigates the molecular biology of protozoan pathogens with the intent of elucidating fundamental molecular processes and identifying drug targets, vaccine candidates and biomarkers for diagnostics. Most studies are focused on African trypanosomes that cause lethal human disease and *Leishmania* that cause mild to lethal diseases. One program focuses on RNA editing; a type of RNA processing that is unique to these organisms and hence, presents several promising drug targets. Projects include characterizing the process of editing and the multicomponent ribonucleoprotein complex that catalyzes this process and studying regulation of RNA editing during development, the protein products of edited mRNAs, and the physiological consequences of editing. A second program area is characterizing the mitochondrial proteome of *T. brucei* by identifying all the mitochondrial proteins, their suborganellar location, associations in complexes and changes during the life cycle. The intent is to identify the functions of these proteins and the functional networks.

***Naeha Subramanian, PhD**
Dr. Subramanian's laboratory studies innate immune responses mediated by a class of intracellular sensors of pathogens and danger called the NOD-like receptors (NLRs) and their role in immune disease. Mutations in NLRs are associated with a spectrum of autoinflammatory diseases and cancers. A key aspect of her research is using unbiased systems biology approaches for combining information from multiple levels such as genes, proteins and whole cells to identify NLR signaling pathways and their regulation. Another major focus is on investigating the activation of inflammasomes, which are signaling complexes formed by some NLRs, and the role of sub-cellular structures such as mitochondria in regulation of inflammasome function. The goal is to novel discern functions and regulatory mechanisms of NLRs, and ultimately harness this information for therapeutic modulation of NLR function in disease.

***Justin Taylor, PhD**
Dr. Taylor's research aims to inform vaccine design by gaining a deeper understanding about the mechanisms limiting the generation of protective B cell responses. Most vaccines provide protection by inducing the production of antibodies that can bind to a pathogen and block infection. Unfortunately, there are many dangerous viruses in which the development of a vaccine has been elusive despite decades of intense research. These failures highlight gaps in knowledge about the type of cell that can produce antibodies, the B cell. To do this, the Taylor lab studies B cell responses in humans and murine models beginning with the rare pathogen-specific "naive" B cells present prior to the vaccination using an enrichment method we recently developed. These approaches allow for the phenotypic and functional analysis of naive and activated B cells that target protective epitopes on viruses such as HIV and RSV.

***Patricia Totten, PhD**
Research in the Totten group focuses on the molecular biology, pathogenesis, and disease associations of the recently discovered STD pathogen, *Mycoplasma genitalium*. Our finding that this bacterium can persist for months, if not years, in infected women lead to our hypothesis that this pathogen evades the host immune response in part by antigenically varying two of its immunogenic surface-exposed proteins. Supporting this hypothesis, we have shown that the sequences of the genes encoding these proteins evolve using reciprocal recombination with non-coding homologous DNA distributed throughout its minimal chromosome. Further, contrary to the accepted wisdom that this bacterium contains few regulatory genes, we have shown that recombination leading to antigenic variation is regulated at the transcriptional, post-transcriptional, and translational levels. The novel recombination and regulatory mechanisms of antigenic variation, the biologic significance of the resulting antigenic variants, and the immunopathology of *M. genitalium* in our experimental primate model are ongoing studies in the Totten laboratory. The significance of these findings is emphasized by our other ongoing studies, performed in collaboration with epidemiologists and clinicians, linking *M. genitalium* with STD syndromes and their sequelae, developing new diagnostics, and defining effective treatment regimens for this increasingly antibiotic-resistant bacterium.

***Kevin Urdahl, MD, PhD**
The Urdahl lab uses the highly tractable mouse model to study T cell mediated immunity against *Mycobacterium tuberculosis (Mtb)*, the bacterium that causes tuberculosis. They aim to understand the factors that promote, as well as restrict, protective immunity against pulmonary Mtb infection, and are driven by the belief that such understanding will be critical for rationally designing an effective TB vaccine.

***Wesley Van Voorhis, MD, PhD**
There is a great need for new drugs for parasitic diseases, such as malaria, African Sleeping Sickness, Chagas' disease, and leishmaniasis, which sicken or kill over 200 million people per year. Though some pharmaceutical companies devote research effort to discover drugs to cure such diseases, there is little done given the need as the people with these diseases have little money to pay for medicine. Dr. Van Voorhis's research group uses emerging knowledge about the genomes of these parasites to aid in rational drug discovery. His research group and collaborators have developed a website called TDRtargets.org, which allows pharmaceutical companies and scientists to select optimal drug targets from the genomes. His lab has found several potential drugs, based on several enzymatic targets from the parasites' genomes that show great promise. The challenge now is to optimize these candidates to become effective and safe.

Appendix Q

Mentor Resources and Tips

Compact between Biomedical Graduate Students and Their Research Advisors: This is a good document to use for a discussion about expectations between you and your mentor.

https://www.aamc.org/initiatives/research/gradcompact/

Mentoring Guide for Students and Faculty: Two guides written by the Graduate School to use in setting up a mentoring relationship.

http://grad.uw.edu/for-students-and-post-docs/core-programs/mentoring

Mentor memos from the Graduate School: There are some memos about approaching new mentors and how to set up successful mentoring relationships.

http://grad.uw.edu/for-students-and-post-docs/core-programs/mentoring/mentor-memos

***Nature*'s guide for mentors:** This is a great article about mentoring.

http://www.nature.com/nature/journal/v447/n7146/full/447791a.html

Appendix R

Pathobiology Standing Committees

Steering Committee

Charge:
The Pathobiology Steering Committee is charged with oversight of the Interdisciplinary Program in Pathobiology and its governance

Membership:
The Committee consists of four members and is headed by the Director of the Graduate Program. Current membership: Lee Ann Campbell (Director), Jennifer Lund, Marilyn Parsons, and David Sherman.

Responsibilities:
Coordination of all aspects of the Graduate Program.
Development and implementation of Program Policies.

Admissions Committee

Charge:
The Pathobiology Admissions Committee is charged with oversight of admission and entry of applicants into the graduate program. Responsibilities include review of program admission requirements, program advertisement, application procedures, recommending funding strategies, the review process, establishing entry into the program.

Membership:
The Admissions Committee will consist of four faculty members, including a committee chair, and a graduate student representative who is selected by the students and is nearing completion of the PhD program. Faculty will serve staggered three-year terms, while the student representative is appointed annually. The Graduate Program Director is an ex *officio* member and, in addition to the Program Manager, attends committee meetings. Current membership: Kevin Hybiske (Chair), Justin Taylor, and (Student).

Responsibilities:
The Committee has the following responsibilities:
1. Review and recommendation of revisions of the requirements for admission into the PhD and MS programs including out-of-cycle applications and those for transfer from other programs and from the MS to the PhD program.
2. The development and distribution of informational materials to advertise the graduate program.
3. Oversight of the application process including revision of application packet materials.
4. Operation of the process of reviewing applications for admission.
5. Operation of the process of offering admission including follow-up.
6. Development of guidelines and recommendations for funding accepted students for their first year.

Curriculum Committee

Charge:
The Curriculum Committee is charged with oversight for the teaching program in Pathobiology including the detection of curriculum gaps, course duplication and overall quality control. Responsibilities include programmatic development, proposal of teaching assignments to the chair, and supervision of peer and student evaluation.

Membership:
The Committee will consist of four faculty members and an elected student representative. Faculty will serve staggered three-year terms, while the student representative is elected annually. The chair also serves on the GH Curriculum Committee, and on the SPH Curriculum and Educational Policy Committee. The Program Manager also attends committee meetings which occur at least twice per year. Current membership: Jaisri Lingappa (Chair), Marilyn Parsons, Martin Prlic, Joseph Smith, and Veronica Davé (Student).

Responsibilities:
The Committee is responsible for the development and oversight of the teaching program. This includes the proposal of teaching assignments and timing of course offerings. The Committee will administer the Peer Evaluation of Teaching program and is responsible for providing course instructors information on the UW Student Evaluation program. The Committee will make course peer review assignments and will review both peer and student evaluation results.

The Committee advises instructors in preparing new courses, reviews all new course proposals and course changes, and makes recommendations to the chair regarding approval of those submissions. Periodically the Committee will review the curriculum to determine if there is any duplication or if there are any gaps in the curriculum.

The Committee is also responsible for reviewing and proposing any changes to other curriculum-related aspects of the graduate program, such as the procedure for the General Exam.

Significant proposed policy or procedural changes are brought to the faculty for discussion and vote before implementation.

Graduate Student Advisory Committee

Charge:
The Pathobiology Graduate Student Advisory Committee is charged with monitoring the academic progress of Pathobiology graduate students.

Membership:
The Graduate Advisory Committee will consist of one member from each of the major institutes represented in the Program and the Graduate Program Director, who chairs the committee. The Program Manager also attends the committee meetings. Current membership: Lee Ann Campbell (Chair), Rachel Katzenellenbogen, and Donald Sodora.

Responsibilities:
The Committee members serve as temporary advisors for new students until a final advisor is chosen and provide advice to students on course work. The Committee meets at least once every quarter to review the progress of each student. If a student is not processing satisfactorily through the program, or is doing poorly in course work or research, the student and the student's major advisor are notified. The Committee will report students' progress to the faculty at the end of the academic year.

The committee members will serve as a neutral body to aid in the resolution of problems between students and instructors or advisors. Student requests for major advisor transfers will be reviewed by the committee.

The committee is responsible for the annual Graduate Research Symposium.

The Graduate Student Advisory Committee also monitors thesis and dissertation committee activities to ensure they are meeting as required and providing documentation of those meetings.

The committee supervises the operation of the laboratory rotation program.

Student Affairs Committee

Charge:
The Pathobiology Student Affairs Committee is charged with maintaining, and increasing as necessary, effective communication between the faculty and students of the Pathobiology Program. It organizes the new student orientation, provides oversight for the Student Handbook and the program newsletter, and is a forum for discussion of non-academic student concerns.

Membership:
The committee consists of three faculty members and three students. The faculty members are appointed by the Graduate Program Director. The student members are selected by the Pathobiology students and serve one-year terms. The chair of the committee is appointed by the Graduate Program Director. The Program Manager will also attend the committee meetings. Current membership: Lorenzo Giacani (Chair), Alexis Kaushansky, Mark Orr, and three graduate students: Andrew Gustin, Rachel Kinzelman, and Brianna Traxinger.

Responsibilities:
The Student Affairs Committee will meet at least once a quarter. It is responsible for planning the new student orientation held at the beginning of Autumn quarter. It will solicit updates for the Student Handbook yearly and provide oversight for production of the program newsletter. Non-academic student concerns, especially those concerned with student-faculty communication and interaction, may be referred to this committee, which will review them and make recommendations regarding an appropriate course action.

Appendix S

Graduate School Resources

Summary of University Requirements for the MS Degree

http://grad.uw.edu/policies-procedures/masters-degree-policies/masters-degree-requirements

Summary of University Requirements for PhD Program

http://grad.uw.edu/policies-procedures/doctoral-degree-policies/doctoral-degree-requirements

Graduate School Memoranda Index

http://grad.uw.edu/policies-procedures/graduate-school-memoranda

Appendix T

General Exam Research Proposal Format

Prior to the oral examination, the student must provide (at least two weeks before their exam) a copy of their dissertation proposal to their committee members. This proposal should be focused on the student's dissertation research. It is written in a format similar to an NIH research proposal.

The format should include the following:

1. **Abstract**
    - Include succinct explanation of the hypothesis to be tested and the objectives and methods to be used.
    - No more than 300 words.
2. **Specific Aims**
    - What are the specific goals of your proposed research?
    - Briefly summarize how each aim will be accomplished.
3. **Research Strategy - Include:**
    - The significance of your research.
    - Background (literature review).
    - Prelimininary results.
        - The approach you will take to explore each aim, expected outcome, and alternative approaches.

Appendix U

Required Courses for Pathobiology Graduate Students

PABIO 550 Diseases and Issues in Global Health (2)
Provides a broad perspective on global health issues; the biology and strategies for control of diseases of global importance; the global health landscape; and factors that influence global health.

PABIO 551 Biochemistry and Genetics of Pathogens and Their Hosts (4)
Provides a strong foundation in biochemistry, molecular biology, and genetics for students interested in disease. Principles will be illustrated through examples focusing on pathogens, and infectious and non-infectious disease. Prerequisite: Undergraduate level course work in molecular biology or biochemistry or permission of instructor.

PABIO 552 Cell Biology of Human Pathogens, Disease, and Public Health (4)
Cell biology and immunology explored through diseases of public health importance with examples of pathogen interaction with host cell biology and immune systems, unique aspects of the cell biology of pathogens, perturbations of these systems in non-infectious diseases and design of therapeutics and vaccines to combat diseases of public health importance. Prerequisite: Undergraduate level coursework in biology or molecular biology or permission of instructor.

PABIO 553 Survival Skills for Scientific Research (2)
Focuses on skills needed for scientific career: writing abstracts, curriculum vitae, research proposals; preparing for oral presentations; lab management skills; discussion of mentorship/trainee relationships; case-based discussions of various topics in ethics and scientific misconduct.

PABIO 580 Pathobiology Seminar (1, max. 21)
Research from students, faculty members, and invited speakers is presented and discussed. Topics include immunochemistry, viruses, membranes, infectious diseases, immune response and other related topics. Note: students are also required to attend the presentations of dissertation research in the Final Exam of students completing the Pathobiology doctoral program.

PABIO 581 Current Literature in Pathobiology (1, max. 15)
Develop skills in analyzing data and assessing conclusions through an analysis of current literature in Pathobiology. Focuses on breadth and analytical skills. Prerequisite: enrollment in the Pathobiology graduate program.

PABIO 582 Critical Thinking and Research Design in Pathobiology (1.5)
Analysis of issues, hypothesis and experimental design and testing. Credit/no credit only. Prerequisite: graduate standing in Pathobiology.

PABIO 591 Selected Topics (1)
Intensive 3-week offerings focusing on topics such as pathogenesis, immunology, virology, disease agents, bioinformatics and grant writing. Topics differ from year to year. Prerequisite: permission of instructor.

PABIO 598 Didactic Pathobiology (2)
Supervised teaching experience in Pathobiology courses for Enrolled graduate students in the Interdisciplinary Pathobiology program on the PhD track. Prerequisite: permission of instructor.

Department of Epidemiology

EPI 511 Introduction to Epidemiology (4)
For the graduate student wanting an overview of epidemiologic methods. Description of ways in which

variation in disease occurrence is documented, and how that variation is studied to understand causes of disease. Prerequisite: graduate standing.

Department of Immunology

IMMUN 441 Introduction to Immunology (4)
General properties of immune responses; cells and tissues of immune system; lymphocyte activation and specificity; effector mechanisms; immunity to microbes; immunodeficiency and AIDS; autoimmune diseases; transplantation.

OR

IMMUN 532 Advanced Immunology (4)
Examines the molecular and cellular basis of immune function. Students must have completed a baccalaureate degree in a biological specialty and be conversant with molecular genetics. Topics include: hematopoiesis, antigen receptor structure, lymphocyte development, antigen presentation, and cytokines.

University Conjoint Courses

UCONJ 510: Introductory Laboratory Based Biostatistics (2)
Introduces methods of data description and statistical inference for experiments. Covers principles of design and analysis of experiments; descriptive statistics; comparison of group means and proportions; linear regression; and correlation. Emphasizes examples from laboratory-based biomedical sciences, and provides demonstrations using standard statistical programs.

Public Health Interdisciplinary / Health Services

PHI/HSERV 579: Structural Racism and Public Health (1)
Introduces the concept of institutional racism and ways structural racism undermines public health. Discusses history of racism and intersections between structural racism and other systems of oppression. Explores relationship to racism and ways internalized racism acts as a barrier to health equity. Considers public health practitioners' role in addressing racism.

Appendix V

Campus Resources

Office	Location	Phone	Email
Childcare Assistance Program & Student Parent Resource Center	Schmitz Hall 520	206-543-1041	*stuparrc@uw.edu*
Disability Resources for Students	Mary Gates 011	206-543-8924	*uwdrs@uw.edu*
Foundation for International Understanding Through Students	HUB 205	206-543-0735	*info@fiuts.org*
Graduate School	Communications G-1	206-543-5900	*uwgrad@uw.edu*
Hall Health Primary Care Center	East Stevens Circle	206-685-1011	*hhpccweb@uw.edu*
Husky Card Account & ID Center	Odegaard Ground Floor	206-543-7222	*huskycrd@uw.edu*
Husky NightWalk		206-685-WALK	
International Students Services	Schmitz Hall 459	206-221-7857	*uwiss@uw.edu*
Intramural Activities Building (IMA)		206-543-4590	*ima@uw.edu*
Libraries Information	Allen 482	206-543-0242	*libquest@uw.edu*
Ombud	HUB 339	206-543-6028	*ombuds@uw.edu*
Parking and U-PASS Information	1320 NE Campus Pkway	206-221-3701	*ucommute@uw.edu*
Police, University	3939 15th Ave NE	206-543-0507	*uwpolice@uw.edu*
Q Center	HUB 315	206-616-7296	*qcenter@uw.edu*
Registrar	Schmitz Hall 209	206-543-5378	*registrar@uw.edu*
Residence Classification	Schmitz Hall 264	206-543-5932	*resquest@uw.edu*
South Campus Center	Portage Bay	206-543-0530	*hsbrooms@uw.edu*
Student Activities Office	HUB 232	206-543-2380	*sao@uw.edu*
Student Counseling Center	Schmitz Hall 401	206-543-1240	
Student Financial Aid	Schmitz Hall 105	206-543-6101	*osfa@uw.edu*
Student Fiscal Services	Schmitz Hall 128	206-543-4694	*sfshelp@uw.edu*
Student Legal Services	HUB 306	206-543-6486	*slsuw@uw.edu*
Student Union Building (HUB)		206-543-1447	*thehub@uw.edu*
UW Technology	UW Tower C-3000	206-221-5000	*help@uw.edu*
Visitor's Information Center	Odegaard 022	206-543-9198	*uwvic@uw.edu*
Waterfront Activities Center	Union Bay	206-543-9433	*h2ofront@uw.edu*