Biomedical Science, PhD

Experimental Pathology

The Doctor of Philosophy in biomedical science with an experimental pathology subprogram requires a minimum of 72 s.h. of graduate credit. Students must maintain a cumulative grade-point average of at least 3.00 to earn the degree. The subprogram provides students with advanced knowledge of disease pathogenesis at the genetic, molecular, cellular, and systems levels. It also teaches cutting-edge research skills enabling graduates to investigate the basis of disease and lay the foundation for novel and improved therapies.

The curriculum is a sequence of required and elective courses with the goal of providing students with a foundation in current cellular and molecular biology, in-depth knowledge of disease pathogenesis, and specialty content in the area of their thesis work.

Students enter the experimental pathology subprogram through the Biomedical Science Program. These students will perform laboratory rotations. The experimental pathology subprogram may also accept direct admits at this time. These direct admit students will have already identified a faculty mentor and laboratory upon entering the subprogram. Accordingly, these students in experimental pathology do not perform rotations, but begin developing a thesis project with their mentor at the onset of their PhD training. Consistent with the direct admission policy, Medical Science Training Program (MSTP or MD/PhD) students may join the experimental pathology PhD subprogram. Admission also is considered off-cycle or for the spring semester.

The PhD in biomedical science with an experimental pathology subprogram requires the following coursework.

Core Experimental Pathology Curriculum

Course #	Title	Hours
All of these:		
BMED:5207	Principles of Molecular and Cellular Biology	3
BMED:5208	Topics in Principles of Molecular and Cellular Biology	1
BMED:7270	Scholarly Integrity/ Responsible Conduct of Research I	0
BMED:7271	Scholarly Integrity/ Responsible Conduct of Research II	0
BMED:7777	Biomedical Science Seminar	1
BIOS:4120	Introduction to Biostatistics	3
MMED:6260	Methods for Molecular and Translational Medicine	1
PATH:5270/ IGPI:5270/ MMED:5270	Pathogenesis of Major Human Diseases	3
PATH:6220	Seminar in Pathology	1
PATH:7211	Research in Pathology	arr.
PCOL:5204	Basic Biostatistics and Experimental Design	1

Typical Curriculum

First Year, Fall

Course #	Title	Hours
All of these:		
BMED:5207	Principles of Molecular and Cellular Biology	3
BMED:5208	Topics in Principles of Molecular and Cellular Biology	1
BMED:7888	Biomedical Science Research	arr.
BMED:7777	Biomedical Science Seminar	1
PCOL:5204	Basic Biostatistics and Experimental Design	1

First Year, Spring

Course #	Title	Hours
All of these:		
BMED:7777	Biomedical Science Seminar	1
BMED:7888	Biomedical Science Research	arr.
MMED:6260	Methods for Molecular and Translational Medicine	1
PATH:5270/ IGPI:5270/ MMED:5270	Pathogenesis of Major Human Diseases	3
PHAR:6504	Mastering Reproducible Science	1

Second Year, Fall

Course #	Title	Hours
All of these:		
BMED:7270	Scholarly Integrity/ Responsible Conduct of Research I	0
BIOS:4120	Introduction to Biostatistics	3
PATH:7211	Research in Pathology	arr.
Elective		3

Second Year, Spring

Course #	Title	Hours
All of these:		
BMED:7271	Scholarly Integrity/ Responsible Conduct of Research II	0
PATH:6220	Seminar in Pathology	1
PATH:7211	Research in Pathology	arr.
Elective		3

Electives

The following are possible elective choices. Electives are determined by the area of thesis research.

Course #	Title	Hours
CBIO:7001/ FRRB:7001/ PATH:7001	Molecular and Cellular Biology of Cancer	3
GENE:6150	Genetic Analysis of Biological Systems	3
GENE:7191	Human Molecular Genetics	3
IMMU:6201/ MICR:6201	Graduate Immunology	3
MICR:6247/ IMMU:6247	Graduate Immunology and Human Disease	4
MICR:6267	Graduate Viruses and Human Disease	3
MMED:6220/ ACB:6220/ MPB:6220	Mechanisms of Cellular Organization	3
MMED:6227/ ACB:6227/ MPB:6227	Cell Fate Decisions	1
MMED:8115	Molecular Physiology	4
NSCI:5653/ BIOL:5653/ PSY:5203	Fundamental Neurobiology I	3
NSCI:7235/ NEUR:7235	Neurobiology of Disease	3
PCOL:6225	Growth Factor Receptor Signaling	1

Additional Requirements

Laboratory Rotations

Rotations are not required for students entering the experimental pathology subprogram as direct admits, as a faculty mentor will already be identified. All other students will rotate through at least three different pathology labs during their first academic year in the program. This allows students to gain more experience in pathology research and to aid in selecting a laboratory home and thesis advisor.

Teaching

The experimental pathology subprogram does not have a teaching requirement. However, there are opportunities to teach if students desire this experience.

Publication Requirements

Students must have one first-author, peer-reviewed paper published or in press, as well as a co-authored, peer-reviewed paper or review article published or in press prior to being allowed to schedule their dissertation defense.

Comprehensive Examination

The comprehensive examination is generally taken in the spring semester of the second year of study. Students with advanced standing (medical scientist training program students or those with an MS) may choose to take the examination in the fall semester of their second year.

The comprehensive examination is off-topic. The focus of the proposal is on the field of a student's research. To determine the topic, each of the five comprehensive exam committee members choose a recent high-profile paper in the area of the student's research interests, but not directly related to the dissertation project. After examining the papers, the student chooses one and makes it the subject of the comprehensive exam.

The student then prepares and submits a two-page, single-spaced abstract to the committee. The abstract should include the background/rationale, the significance of the question being asked, and an outline of the specific aims. Upon approval of the abstract, the student is given permission to prepare a full proposal based on the NIH R21 format. Specifically, the proposal should be seven single-spaced pages and must include significance, innovation, rationale, and experimental approach. The proposal is then defended orally in front of the entire committee.

Final Examination

The dissertation committee consists of the mentor and four additional faculty. Students are required to select and meet with their committee by the end of the first fall semester of their second year, and at least yearly thereafter.

Upon meeting all requirements, students may then defend their dissertation/final exam. Two weeks prior to the defense, students must provide the entire committee with a completed draft of their dissertation. On the day of the defense, students present a public seminar on their dissertation work. This is then followed by a defense of the dissertation before the entire dissertation committee. A final version of the dissertation is prepared based on suggested edits provided by the committee. After final approval by the research advisor and committee, the dissertation is submitted to the Graduate College.

For more information, see the Experimental Pathology PhD Graduate Program on the Department of Pathology website.

Combined Programs

PhD/MD

Students may work toward the Doctor of Medicine degree and a PhD in biomedical science (experimental pathology subprogram) in a combined degree program offered by the Graduate College and the Carver College of Medicine. Applicants must be admitted to both programs before they may be admitted to the combined degree program. See the Medical Scientist Training Program (Carver College of Medicine) in the catalog.