

PHARMACOLOGY AND MOLECULAR SCIENCES, PHD

The Department of Physiology, Pharmacology and Therapeutics hosts the Pharmacology and Molecular Sciences Graduate Program, which offers a program of study and research leading to the PhD degree. Research training opportunities within the program cover a broad spectrum of biomedical sciences, including chemical biology, immunology, virology, cancer, and neuroscience. The mission of departmental research is to understand the molecular processes underlying physiology and pathology and to apply this knowledge to discover new drug targets and develop novel therapeutics. Within the program, students may choose to focus their efforts in any of a large number of specific research areas, including signal transduction, structural biology, and drug design, NMR spectroscopy, molecular genetics, cancer chemoprevention, viral immunosuppression, cancer immunology, cell-mediated immunity, mechanisms of HIV infection, vaccine development, glycobiology, biomedical mass spectrometry, clinical pharmacology, drug delivery, anti-parasite drug development, histone acetylation and gene regulation, melatonin and circadian rhythm, drug metabolism, Vitamin D pharmacology, natural product biosynthesis, telomerase and chromosome stability, T-cell activation and tolerance, DNA repair, DNA topoisomerases, molecular imaging, and the clinical pharmacology of cardiovascular agents.

Financial Support

All accepted students are offered full support, providing coverage of tuition, health, dental, and vision benefits, as well as a stipend for the duration of their Ph.D. training.

Admission Requirements

Applicants should have an undergraduate degree with a major in any of the biological or physical sciences. Entering students are expected to have completed college-level courses in chemistry (inorganic, organic, and physical), calculus, and physics; a strong background in biochemistry is particularly desirable. A completed application form, at least three letters of recommendation, unofficial undergraduate transcripts, and a statement of interest must be received by the application deadline in order to be considered for admission. The GRE is **not** required. International students who hold an undergraduate degree from an institution where the primary language of instruction is not English must also submit TOEFL or IELTS scores.

Please visit School of Medicine Graduate Admissions (<https://www.hopkinsmedicine.org/som/education-programs/graduate-programs/admissions/>) for complete information on application requirements and deadlines.

Program Requirements

Core Courses

Students in the Pharmacology program must successfully complete the following courses:

Code	Title	Credits
First Year		
ME.100.716	Analysis of Macromolecules	2
ME.330.709	Organic Mechanisms in Biology	2
ME.110.728	Cell Structure and Dynamics	1.5

ME.360.728	Pathways and Regulation	2
ME.360.720	Organ Systems-Physiology	6
ME.330.708	Primary Source Readings and Analysis	0.5
ME.330.801	Pharmacology Research ¹	1 - 18
ME.330.802	Topics in Physiology, Pharmacology & Therapeutics (biweekly seminar series) ²	0.5
ME.800.811	Introduction to Responsible Conduct of Research	1

Second Year

ME.330.707	Graduate Pharmacology I	2
ME.330.715	Graduate Pharmacology II	2
PH.120.602	Concepts of Molecular Biology	4
PH.140.615	Statistics for Laboratory Scientists I	4
ME.330.714	Essential Grantsmanship: Writing the Research Grant Proposal	1
ME.330.801	Pharmacology Research ¹	1 - 18
ME.330.802	Topics in Physiology, Pharmacology & Therapeutics (biweekly seminar series) ²	0.5

Third Year and Above

ME.330.801	Pharmacology Research ¹	1 - 18
ME.330.802	Topics in Physiology, Pharmacology & Therapeutics (biweekly seminar series) ²	0.5

¹ Students must enroll in ME.330.801 Pharmacology Research each term while in training.

² Students must enroll in ME.330.802 Topics in Pharmacology in the Fall and Spring semesters of Years 1-3.

Electives

Students must also take two advanced elective courses selected from those offered by this or other departments. Students are able to select a course of studies uniquely suited to their own career goals. Electives must be completed by the end of Year 4.

Research Rotations

During their first year of study, students will complete ~8-week research rotations in addition to their coursework. At the end of the Fall and Spring semesters, students will submit a written summary of research conducted during select rotations. Students will also give an oral presentation on work completed in a rotation of their choice. Students will initiate dissertation research by the end of their first year.

Annual Academic Progress and Professional Development Plan

In the second year of study, students will hold their first annual Individual Development Plan (IDP) meeting with their thesis advisor, in which the student's individual goals and progress to date are discussed and a plan for the upcoming year is created. In subsequent years, the IDP meeting is held in conjunction with thesis committee meetings.

Doctoral Board Oral Exam

At the end of Year 2, students will be required to pass a qualifying examination conducted as prescribed by the Doctor of Philosophy Board of the University. This examination will probe the depth and breadth of

the student's knowledge of the biomedical subjects taught in the core courses and assess readiness to conduct thesis research.

Thesis Committee Meetings

In Year 3, students prepare an F31-style thesis proposal and select their thesis committee. The first thesis committee meeting must take place no later than April 30 of the third year of study. Students must complete both an IDP meeting and the thesis committee meeting in order to satisfy this requirement.

Training in the Responsible Conduct of Research (RCR)

Students fulfill the program's RCR training requirement by completing the Introduction to Responsible Conduct of Research course in Year 1 as listed above, attending the RCR session at the annual departmental research retreat, and completing a refresher in Year 5. The refresher consists of five online modules and attendance at two SOM-sponsored Research Integrity lectures.

Dissertation

Each candidate is required to present a written dissertation based on original research undertaken while in residence as a graduate student and to present a departmental seminar describing the thesis research.

Professional Development

Students participate in the OPTIONS curriculum offered through the Doctoral Life Design Studio (DLDS). The curriculum consists of three phases, allowing for career awareness, exploration, and hands-on experience such as internships.

Students also complete the BioGREAT curriculum, a workshop series designed to support students as they navigate key transition points in their training.

Program Activities

Annual departmental research retreat: Attendance is required for all students in the program. Students in years 3-5 are also required to present either a poster or a flash talk at the retreat.

Research in Progress seminars: Attendance at these biweekly student and postdoc research presentations is not required but highly encouraged. Students in year 3-5 are required to present once per year.

Learning Outcomes

Students graduating from the Pharmacology and Molecular Sciences program will be able to:

- Demonstrate advanced knowledge and expertise in pharmacology and molecular sciences.
- Apply rigorous research skills to design, conduct, analyze, and interpret experiments.
- Think critically, creatively, and independently, and engage in reflective practice to improve their work.
- Uphold and model the principles of responsible conduct of research.
- Communicate effectively with diverse audiences, both orally and in writing.
- Collaborate respectfully and productively as part of multidisciplinary teams.
- Foster an inclusive, respectful research environment.
- Adapt skills and knowledge to pursue a range of career paths in pharmacology and related fields.

- Exhibit professional resilience, career awareness, and the ability to manage career development.
- Contribute meaningfully to the research enterprise and professional community.