DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY
DIVISION OF BIOMEDICAL SCIENCES
UNIVERSITY OF PUERTO RICO
MEDICAL SCIENCES CAMPUS

GRADUATE PROGRAM GUIDELINES
STUDENT HANDBOOK

MASTER OF SCIENCE DEGREE
&
DOCTOR OF PHILOSOPHY DEGREE

This document describes the policies of the Department of Pharmacology and Toxicology regarding granting Ph.D. and M.S. degrees. These policies are subject to periodic revisions; thus, please keep a copy of this document to establish the rules in effect at the time of your admission to our Graduate Program.

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A. Admission to the Program

The applicant must comply with the general requirements established in the Manual for the Master of Science and Doctor of Philosophy degrees from the Graduate School of Biomedical Sciences of the University of Puerto Rico Medical Sciences Campus, School of Medicine.

The following undergraduate courses are required for all incoming students. Students with deficiencies in any of these courses will be required to remove the deficiency before being accepted as a full-time student.

General Principles of Calculus
General Chemistry and Laboratory
Organic Chemistry and Laboratory
General Physics and Laboratory
General Biology and laboratory
Computer literacy/proficiency

The following courses are **strongly** recommended:

Human Physiology
Cell and Molecular Biology
Biochemistry
Human Biology

B. Course Requirements

The curriculum includes a core curriculum and a series of programmatic courses specific to Pharmacology students. In the 1st year, all students in the Pharmacology Program must take Ph.D. Soft Skills, Responsible Conduct of Research and Statistics. All students in the Pharmacology Program must take the following programmatic courses in the first year: Graduate Biochemistry, Graduate Physiology, and Introduction to Pharmacology. In the second year, students must take Graduate Pharmacology. Each student is expected to complete three research rotations before selecting a thesis research laboratory. In addition, students must take two graduate-level elective courses chosen with advice from the Program Director and/or the Research Advisor. All students must register and participate in the seminar/journal club course every semester while in the program. It is required that thesis research results in at least one publication or a submitted first-author manuscript.

C. Curriculum

I. PhD

First Year

Soft skills	1 credit (first semester)
Biochemistry	6 credits (first and second semester)
Physiology	3 credits (first semester)
Biostatistics	3 credits (second semester)
General Principles of Pharmacology	3 credits (second semester)
Seminar	1 credit (first and second semester)
Topics in Pharmacology: Journal Club	1 credit (second semester)
Anatomy for Pharmacologists	1 credit (first semester)

Summer

Rotation	3 credits

Second Year

Pharmacology	6 credits
Electives (2)	each elective of 1 or more credits
Seminar	1 credit
Journal Club	1 credit

Summer
Preparation for the Qualifying exam.

Third Year
Qualifying exam (Fall or Spring)
Seminar
Write the Ph.D. thesis proposal, dissertation approval, and admission to candidacy.

Fourth, Fifth, and Six Year and on
Completion of Thesis Research Proposal
Seminar / Journal Club
Dissertation defense and approval

* Note: The Pharmacology Department strongly encourages the student and the Ph.D. Committee to develop a timeline for the completion of the research within three (3) years.

II. MS

First Year

Soft skills	1 credit
Biochemistry	6 credits
Physiology	3 credits
Biostatistics	3 credits
General Principles of Pharmacology	3 credits
Seminar	1 credit
Journal Club	1 credit

Summer

Rotation

Second Year

Pharmacology	5 credits
Electives (2)	1 credit ea.
Seminar	1 credit
Journal Club	1 credit

Presentation of Thesis Proposal

Third Year and on

Thesis Research

Defense of Master thesis.

Note: Successful completion of the M.S. Degree does not guarantee acceptance into the Ph.D. program.

D. Laboratory rotations

Students are expected to complete three laboratory rotations, each at least 18 hours in length, to choose an advisor. Laboratory rotations will give the student and the research advisor/mentor an essential opportunity to evaluate the potential for successful scientific training and research work collaboration. At the end of the rotation, the student will submit a report that includes the following information: significance, methodology, results, and conclusions of the project and discuss it with the research advisor/mentor. The research advisor will complete a Rotation Evaluation form at the end of the rotation. Also, the student will meet with the research advisor to discuss the student's performance and the possibility of the student joining the lab.

E. Grading system

The students will be evaluated by the professor(s) teaching the courses using the method they consider most appropriate, which must be specified in the syllabus.

Courses offered by the Department must be passed with a grade of **B (3.0 average)** or better. If the student fails to maintain a B average (3.0 average) at the completion of the departmental core courses, they will be required to repeat the course with a grade B average or better. Failure to maintain a B average will result in the student being placed on Probation by the Graduate School and losing all financial aid. (https://md.rcm.upr.edu/anatomyneurobiology/wp-content/ uploads/sites/23/2021/05/ Manual-MS-PhD.pdf)

The student must pass PHAR 8500 with a B grade minimum. If a student shows a deficiency in up to two of 9 modules, they may take a remedial course to compensate for the deficiency. The remedial course must be approved by the Department's Chair and arranged with the graduate program coordinator after thoroughly evaluating the options available. The students must successfully complete PHAR 8500 before their third academic year, or they will lose access to financial aid.

F. Advising

Students are **encouraged** to meet with their advisors/mentors/ peer mentors during the course of each semester to discuss ongoing progress and formulate plans for satisfactory academic progress.

Academic Advisor

The Pharmacology Graduate Program coordinator serves as the academic advisor. The student meets with the program coordinator/ academic advisor before the beginning of each semester to discuss course registration, choices for laboratory rotations, and other academic matters. The academic advisor must approve each student's course and rotation selection. Faculty members can also act as academic advisors until the student's graduation.

Research Advisor

The student must select a research mentor within the time limits specified by the Pharmacology Graduate Program. Each student must complete three full rotations before selecting the thesis laboratory. The thesis advisor must be selected preferably by the beginning of the second year but no later than the end of the second year.

Selecting a faculty member who will supervise the Ph.D. thesis work is one of the most critical decisions for a graduate student. The research advisor/ mentor will guide the student's training in obtaining a doctoral degree by supporting the student in developing

a thesis, creating a research plan, developing time management skills and collaborations, and successfully passing the qualifying exams. The graduate student and the advisors/mentors have rights and responsibilities that must be delineated early on. A compact outlining these rights and responsibilities helps them align their expectations about the student career goals and advisor research goals.

Research advisors are responsible for monitoring the student's research progress and academic training. This responsibility is shared with the thesis committee. The thesis committee's primary duty is to review the student's research progress and provide scientific and personal advice and support. The committee must include five members, including the co-mentors if applicable; the committee must include at least three (3) members from the Pharmacology department and at least one external member. Regular meetings of the thesis or dissertation committee with students to discuss progress must be established. Annual research committee meetings must be reported to the Graduate School. Research advisors and thesis committee members are encouraged to communicate to students any perceived difficulties or deficiencies openly and frankly so that the student may address and correct the problems. Also, students are encouraged to openly communicate to their advisors any advising/mentoring difficulties or deficiencies so that these are addressed.

If the graduate student is interested in an interdisciplinary project, the student could engage two advisors/mentors. An interdisciplinary project is defined as research that analyzes, synthesizes, and harmonizes links between disciplines into a coordinated and coherent whole. In exceptional cases, after approval of the Pharmacology Graduate faculty, a graduate student may conduct the dissertation research co-mentored by a Pharmacology faculty member and a qualified researcher external to the Department, who has been designated as an approved dissertation advisor, and who can provide an alternate perspective to the proposed research (Multiple Mentor Model).

The Pharmacology faculty mentor with experience in the research area will actively co-mentor, provide content expertise and research input and ensure compliance with the Graduate School and departmental requirements. They represent the Pharmacology department, are officially responsible for the student's progress, and judge the quality of the student's work and signs of the thesis, indicating the student can submit the thesis for examination.

III. Changing Mentors

If a student chooses to leave a research laboratory, or if the student and faculty advisor mutually agree that the student would be better served in another laboratory, the student will be allowed to find another thesis laboratory. The decision should be communicated

in writing to the Department Chair's office, which will help the student secure a new laboratory within three (3) months. The student must form a new thesis committee and present a thesis proposal within six (6) months of joining the new research group.

The MS student's Thesis Committee members play critical advising and mentoring roles. Committee members with valuable expertise in the student research question and objectives must be selected. The Chair and Graduate Committee must be informed of the committee formation in writing. For the M.S., the committee members must include at least two members from the department and one external member.

G. Individual Development Plan

After joining the thesis lab, the student should meet with the research advisor and start formulating the thesis project. Also, the student will prepare an Individual Development Plan (IDP) with the help of the research advisor using the form provided by the Department.

H. Student Responsibilities and Rules

I. Student Conduct Issues

Professional behavior appropriate to graduate students and faculty in an academic research setting is expected. Students are expected to maintain high professionalism, self-motivation, scientific curiosity, and ethical standards. BSGP students are also subject to the code of conduct detailed in the "*Código de Conducta Estudiantil de la UPR*" (https://de.rcm.upr.edu/wp-content/uploads/sites/13/2023/01/Codigo-de-Conducta-Estudiantil-Universidad-de-Puerto-Rico.pdf) y en el "*Reglamento de Estudiantes* del Recinto de Ciencias Médicas"(https://de.rcm.upr.edu/wpcontent/uploads/sites/13/2023/01/ Reglamento-Estudiantes-RCM-2021.pdf).

II. Academic and Research Integrity

Academic and Research Integrity is a central feature of academic life. The BSGP provides specific procedures to be followed in cases of an allegation of academic misconduct. This policy is available at: https://md.rcm.upr.edu/biomed/.

Any student who suspects or is witness to any acts of academic misconduct should report the act(s) to the course director, the Program Coordinator, and the Graduate School Associate Dean.

Research misconduct issues will be investigated by the Office for Research Integrity(ORI). The Research Integrity Officer will have primary responsibility for the implementation of UPR's policies and procedures on research misconduct. (https://research.rcm.upr.edu/wp-content/uploads/sites/10/2020/08/Cert-45-2006-07-Research-Misconduct.pdf).

III. Social Media Policy

We recommend that students accepted to the BSGP and current students be cautious using social media (i.e., Twitter, Facebook, etc.). The Pharmacology Department expects its graduate students to exhibit high professionalism and accountability. Posting items that represent unprofessional behavior on social networking sites will result in disciplinary action.

IV. General Rules

The following are general rules that the student must abide by.

- Students are expected to maintain a 3.0 average or better after every academic year. If the student fails to fulfill this requirement, the Pharmacology and Toxicology Department will place the student on probation for up to one year. If, during this one year, the student does not correct the situation, the faculty may recommend the student leave the program. Students lose all access to financial aid while on Probation.
- The student's responsible for ensuring that the paperwork for Lab Rotation Evaluations, Qualifying Exams, Thesis Committee Formation, Thesis Proposal Evaluation, and Thesis Defense is completed and submitted on time.
- Attendance and punctuality are mandatory for all courses. Three unexcused absences or lateness may lead to dismissal from the course. The faculty will notify the Pharmacology Chairperson if students do not fulfill their academic responsibilities.
- Students must complete evaluations of the courses and the participating faculty in the Pharmacology and Toxicology Department before the end of the course.
- If a student does not meet the requirements for the M.S. or Ph.D. in Pharmacology, the Graduate Program Coordinator will inform the Associate Deanship of Graduate Studies of the decision to dismiss the student from the program.

I. Pharmacology Faculty Responsibilities

The graduate program faculty serve multiple critical role models as teachers, researchers, graduate student advisors, mentors, and research committee members. The faculty must offer intellectual guidance and support for the student's scholarly efforts. Also, they are responsible for the continuing evaluation of graduate students' performance in academic, research, and scholarly activities.

The faculty and the graduate program coordinator are responsible for ensuring that students receive training and guidance in the responsible conduct of research as appropriate for the field of Pharmacology.

J. Program Requirements

I. Pharmacology Ph.D. and M.S. Program domains of competency

Upon successful completion of the program, PhD, and M.S. students are expected to exhibit demonstrable competence in the following areas:

1. **Discipline-specific conceptual knowledge**. Demonstrates substantial and up-to-date core knowledge of broad areas in basic biomedical, translational, or clinical research applicable to Pharmacology. Demonstrates the ability to critically evaluate information and connect links between fields.
2. **Research Skills Development** - Demonstrates understanding of various technical and conceptual approaches used in pharmacological research.
3. **Communication Skills -** Demonstrates oral, written, and listening communication skills that enable effective communication about science, both orally and in writing, to diverse audiences.
4. **Responsible conduct of research-** Apply the highest standards of ethics in research and interactions with colleagues and the public.
5. **Professionalism** - Demonstrate a commitment to accepted professional standards and practices within the workplace, the institution, and the discipline of Pharmacology.
6. **Leadership, teamwork, and management skills -** Demonstrate the ability to organize, coordinate, and motivate themselves and their peers to accomplish goals and solve problems efficiently and effectively.
7. **Diversity and inclusion** - Demonstrate understanding and apply best practices that create an equitable and inclusive environment.

II. Qualifying Exam

Ph.D. students must take the Qualifying Exam, which consists of a written examination over three days followed by an oral presentation. The exam is designed to examine the student's capacity for critical thinking, research design and rigor, and the fundamental body of knowledge in the discipline. The students must take this exam no later than the first semester of their third year. The examination will be offered a maximum of twice per academic year (Fall and Spring).

Requirements

Before requesting the qualifying exam, doctoral students must have completed at least 40 credits, including all departmental requirements and electives. An "Incomplete" grade in any course will NOT be considered a satisfactory status to take the qualifying exam.

The student must request the qualifying exam by completing the appropriate form (Appendix 1) with an official transcript and turning it in to the Graduate Coordinator. Once the request for examination is received, the Department will assign the date. The student must arrive 15 minutes before the beginning of the examination at the announced location. All Department of Pharmacology and Toxicology faculty members will participate in the examination, except those who express a conflict of interest. This conflict must be notified in writing to the Department's Chair.

Preparation

Students are encouraged to contact each faculty member to secure a list of suggested readings/topics to assist in preparing for the examination. The student should visit all faculty members for specific guidance before starting their preparation and then set aside 2-3 months for intensive review. The examination will be prepared by a rotating Examination Committee of three faculty members, including the Graduate Program Coordinator. The Faculty will elect committee members.
The duties of the Examination Committee will include identifying a closed room for administering the exam, providing a computer that does not have access to the internet, finding proctors, receiving written questions, verifying that the content to be examined has been presented in core courses, distributing written answers to two readers for each question, ensuring that exams are corrected within two weeks, and compiling the scores. The faculty member whose student is taking the exam is expected to recuse from the Examination Committee.

Exam Format

The exam will consist of two parts:

Part 1-Written exam: A written examination testing knowledge in general principles of Pharmacology, including the areas of absorption, distribution, metabolism, excretion (ADME), pharmacodynamics, and receptor theory. Questions related to Systems Pharmacology will examine the areas of Cardiovascular, Renal, Autonomic, and Peripheral Nervous System, Central Nervous System (CNS), Chemotherapy, Endocrine, Inflammation, and Immune Suppression, Gastrointestinal, and Toxicology. The written examination will integrate questions related to the basic principles of Physiology and Biochemistry.

The Written Examination of Pharmacology:

1. General Principles: The examination will include two obligatory questions, one (1) on Pharmacokinetics and one (1) on Pharmacodynamics/Receptor Theory. At least two alternative questions will be available for each topic. The student must pass each of these questions with a minimum score of **70%.**

2. Toxicology: The examination will include one obligatory question on Toxicology. At least two alternative questions will be available. The student must pass the question with a minimum score of **70%.**

3. Systems Pharmacology: The student must answer five questions in the areas of Systems Pharmacology. The student must pass each question with a minimum score of **70%**. Limited choice will be permitted in answering questions related to Systems Pharmacology. The question to be answered will be selected randomly before the exam from a pool of questions previously screened by the exam committee. The student must answer one question in the following system groups: Cardiovascular **or** Renal, Autonomic and Peripheral Nervous System **or** Central Nervous System, Anticancer drugs, **or** Antibiotics. The student will answer two questions in each of the following system groups: Respiratory, Endocrine, Inflammation and Immune Suppression, and Gastrointestinal System. See **Table 1** for a sample timetable.
The exam will include at least one (1) question formulated by a faculty member with expertise in the particular area. The student must pass these questions with a minimum score of **70%**.

4. Area of Specialization: The proposed thesis advisor will submit a single question in the student's area of specialization. If the student has not yet selected an advisor or if that person is unable to prepare the question, it will be submitted by a faculty member designated by the Chair of the Department in consultation with the student and the Graduate Program Coordinator. The questions will examine both theory and hypothesis testing. The student must pass the question with a minimum score of **70%**.

Administration of the written exam: The written examination is allotted three days and distributed within a maximum of two weeks. Approximately 2 hours should be allotted to answer each question. The student must pass all questions. After the initial administration of the exam, the student must obtain a minimum score of **70%** on 6 of the 8 written questions to be eligible for the Oral Exam and a minimum score of **65%** on the failed questions. The Oral Exam must be scheduled within 4 weeks of having completed the written exam.

Table 1: Sample timetable for the written examination (Part 1)

	Day 1	**Day 2**	**Day 3**
Morning questions	* ADME question * Receptor theory	* Specialty question * Toxicology question	Anticancer drugs **and** Antimicrobials
Afternoon questions	Cardiovascular ***or*** Renal	Autonomic & peripheral nervous system drugs o**r** Central Nervous System drugs	Answer questions for two of the following: Endocrine drugs; Inflammation; Respiratory system drugs; Gastrointestinal System

Notes: * Required question

Part 2-Oral exam: Part 2 does not apply to the student that passed all 8 written questions. The oral exam will be focused on clarification and in-depth questioning related to the written exam. Students shall have the opportunity to raise their exam scores by demonstrating adequate knowledge upon oral questioning. The maximum score that can be obtained in Part 2 by the student will be **70%.**

The purpose of the oral exam is to clarify answers to the written exam and to offer the student an opportunity to improve his/her score by demonstrating an adequate command of the material previously failed on the Written Exam. The student must obtain a minimum score of **70%** on 6 of the 8 written questions to be eligible for the Oral Exam (Part 2) and a minimum score of **65%** on the failed questions. Part 2 must be scheduled within 4 weeks of having completed Part 1. All members of the faculty, without conflicts of interest, will administer the oral examination. Each faculty member will be allotted a certain amount of time to question the student. There may be more than one round of questioning.

Remediation: The examination committee will consider remedial work for a maximum of two questions in which the student failed to obtain a score higher than **65%** on the written exam or failed to pass the Oral Exam **(<70%).** Remedial work may include a reposition question or a course, if available. Remediation must be finalized by March of the third academic year. If the remediation is not successful, the student is at risk of losing financial aid. If the student fails a second attempt to the exam, it may result in dismissal from the graduate program. However, if they meet the program requirements, the student may be awarded a Master of Science in Pharmacology degree.

Exam evaluation

It is expected that the student will be able to demonstrate critical thinking, a depth of knowledge suitable to a Ph.D. candidate, appropriate communication skills, and to be able to defend the scientific ideas within the research design. These criteria will be used to evaluate the performance of the student.

The Written Exam:

Faculty members must submit their written questions and rubric to the Examination Committee at least two weeks before the examination. The rubric must include specific discussion points, expected correct answers, and questions.

At least two faculty members will grade all written questions, and the student will be evaluated using a 0-100% scale. A third reader may be asked to evaluate the student's answer in the case of a significant difference between two readers. A written summary,

including the student's strengths and deficiencies, will be prepared and provided to the student. The written summary will also include areas that need to be strengthened but do not require re-examination.

The final grade for each independent area of the written exam will be based on the scores from all faculty members involved in the evaluation. A written evaluation will be sent to the student two weeks after finishing the written exam. To pass, the student must obtain a minimum of **70%** on each question.

The Oral Exam:
The purpose of the oral exam is to clarify answers to the written exam and to allow the student to improve their score. A special rubric will be prepared to evaluate the oral presentation. At the end of the oral exam, the Examination Committee will lead the faculty in deciding the overall score on the Oral Exam and whether the student has succeeded in passing any written question that was previously failed. The Examination Committee will inform the result of the exam to the Graduate Committee. Students who do not successfully raise their scores to pass the Oral Exam will be assigned remedial work by the Examination Committee.

What happens if the students fail the Qualifying Exam?
If the student fails more than two (2) areas of the written exam or fails to increase their score after the Oral Exam and Remedial Work, the entire examination must be repeated. The student will receive written notification of instructions on how to proceed. The student may request re-examination only once. Re-examination must take place no later than March of the second semester of the third academic year. A final report informing that the student has satisfactorily approved the qualifying exam will be sent to the Graduate School after the student successfully passes the re-examination. If the student fails the second examination, their record will be evaluated, and a terminal Master of Science degree will be awarded if all requirements are met. The student will not be able to continue in the doctoral program if they fail both attempts to pass the Qualifying Examination.

Table 2. Expected time frame for the written examination and its evaluation.

Time	Day 1	Day 3	Day 5	Day 19	Days 26-33
	Written Exam	Written Exam	Written Exam	A written evaluation will be given to the student	Oral Exam

III. Dissertation / Thesis Committee, Thesis Proposal, Research and Defense
For a detailed description, refer to the current Manual for the Master of Science and Doctor in Philosophy Degree Requirements and Regulations.
(https://md.rcm.upr.edu/anatomyneurobiology/wp-content/ uploads/sites/23/2021/05/ Manual-MS-PhD.pdf)

K. Graduation Requirements

Dissertation: Beginning August 2023, all dissertations and theses must be published in ProQuest. Doctoral dissertations may be embargoed upon request of the author and endorsement by the dissertation's director. For authors concerned with the publication issue, ProQuest and the MSC Conrado Asenjo Library offer a number of embargo options.

Publications: The awarding of the PhD requires the student to have published **or** have *in press,* **or** submitted at least one first-author, peer-reviewed, original research paper in the primary literature that contains substantial data from the student's dissertation research. A paper on which a student is a co-first author can meet the publication requirement.

L. Contact Information

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