
PhD in TOXICOLOGY

Toxicology research and training in the Department focuses on the mechanisms of toxicity in cells, tissues and organisms at the chemical, biochemical, cellular, and molecular levels. Faculty research programs involve investigation of the mechanisms of toxicity of environmental agents, the mechanisms controlling host responses to environmental toxicants, the potential hazards of exposure to such agents, and methods for protecting the exposed host from environmentally-induced disease. Emphasis is on cellular macromolecules and biochemical/molecular processes as targets for environmental toxicants. Doctoral students receive basic training in toxicology, as well as in cell biology, biochemistry, molecular biology, physiology, and biostatistics.

Doctoral students also gain initial research experience through research rotations in the laboratories of departmental faculty. Following completion of basic coursework and laboratory rotations, students proceed to advanced training in a selected area of concentration, including biochemical/molecular toxicology, neurotoxicology, immunotoxicology, and molecular biomarkers. The diversity of interests represented in the Department provides a unique interdisciplinary background in toxicology that will ultimately permit students to address toxicologic problems affecting public health in comprehensive and innovative ways.

Facilities available to toxicology students for research and training activities include molecular imaging, mass spectrometry, as well as equipment and facilities for gene array and proteomics and other molecular genetic techniques, cell culture and microbiology.

Applicants should have at least a baccalaureate degree in a relevant field, such as a focused undergraduate program in either biology or chemistry or a broader undergraduate program in environmental sciences or public health.

THE TOXICOLOGY SEMINAR COURSE

The Toxicology Seminar Course (187.861) is taken in each academic term during the entire training program. This course has three parts:

1. Each student is required to attend regularly and participate actively in a bi-weekly journal club. Students generally present one journal article over the course of each academic year.
2. The Division, alone or together with the NIEHS Center in Urban Environmental Health, EHS Training Program or the Center for Alternatives to Animal Testing, sponsors a bi-weekly seminar. In this setting, Hopkins faculty from outside the Division and scientists from other institutions are invited to present their latest research results.
3. Students present yearly updates of their thesis research to the division in the form of a short seminar. This is a eight credit (two credits per term) course that should be taken each term. The grade (pass/fail) for each term is assigned at the end of the fourth term. It is based on attendance, level of active participation, and quality of presentations.
4. Missing a Journal Club would require writing a summary of the paper in order to receive a passing grade.

THE RESEARCH ROTATION PROGRAM

Each predoctoral student must complete at least three research rotations by the end of the first academic year. Selection of the laboratories for rotation depends upon the interests of the student, but the need to obtain breadth in research experience is also important.

The goals of the research rotation program include:

1. Obtaining experience at the lab bench;
2. Learning a diversity of techniques and the theoretical bases of these techniques;
3. Learning aspects of the subject area of research in the laboratory;
4. Learning aspects of experimental design and;
5. Carrying out simple to complex experiments depending on prior experience.

The research rotation program is structured as follows:

1. Duration: Each rotation is essentially a tutorial. Thus, the goal and plan for each rotation must be agreed upon before it begins through discussions between the student and the faculty member. The duration will depend upon the time the student can devote to the lab but should typically be 10-13 weeks.

2. Faculty members of the Division are the only faculty who can serve as primary thesis advisors for a PhD student in Toxicology. Research rotations with faculty outside of the Division are possible but must be discussed with and approved by the faculty advisor. Students who desire to conduct their PhD thesis research with a faculty member in another program must either:

- a) develop a joint thesis project between one of the Toxicology training faculty (who will serve as the primary thesis advisor) and the other faculty member; or
- b) apply for admission and transfer to that program.

3. Students must complete their rotations by June of their first year in the program and select their thesis advisor by this point. Requirements for completion of each rotation are:

- a) successful completion of the rotation plan established at the beginning.
 - b) oral presentations of the results of the rotation research before Division faculty and students.
- Note: Rotations are graded on a pass/fail basis.

GRADE REQUIREMENTS

All students must maintain at least a “B” average to remain in the program. Furthermore, faculty expects that students will not obtain any grade below a “B”. This applies to all courses, both within the Department/Division and within other departments/divisions of the Bloomberg School and the JH School of Medicine.

If a student receives a grade lower than “B”, she/he must consult their faculty advisor and division director to discuss an appropriate course of action. A grade of “C” might be allowed to stand, or it may be important to retake the course. This is a decision that should be made with the approval of the faculty of the Division. However, it is the policy of this program that students may not have more than one “C” remain on their transcript. No grade of less than “C” is considered acceptable.

A student who receives a grade less than “C” or is unable to maintain a “B” average will be considered in academic difficulty and undergo a formal academic review by the faculty. Based on the outcome of this review, she/he may be asked to leave the program.

In order to monitor and document adequate academic performance and progress, the student’s advisor performs an assessment at the end of the first year of the program. The advisor assesses coursework performance (e.g., GPA), lab rotations or field experiences, and general interactions with faculty, and *must* sign off for the student to continue (via a formal End of the First Year Report). The student has an opportunity to add comments to the review form and must also sign the form. The Office of Educational Programs and the Departmental Chair reviews all reports.

TRAINEE SUPPORT

The major source of support for pre- and postdoctoral students in the Division of Toxicology is a training grant funded by the NIEHS. Each student on the training grant receives a stipend, health insurance coverage, and tuition. Training grant support for predoctoral students extends, generally, for four to five years. All trainees are expected to indicate on their Curricula Vitae (CV) that they were NIEHS trainees supported by training grant ESO7141. This support should also be acknowledged in all publications resulting from pre- and postdoctoral research.

ATTENDANCE AND VACATION

Students are expected to attend classes regularly, including Journal Club and Seminars. Scheduling conflicts that arise must be discussed with the student's advisor. Since research is a fundamental part of the curriculum, it is expected that students will work in the laboratory during term breaks. Generally, students will take no more than two weeks vacation per year. The advisor should be informed of vacation plans and any other absences.

DIVISIONAL ORAL EXAM

Toxicology students will take the Departmental Oral Exam at the end of the first year. The exam will include five members of the Toxicology faculty and while it will test the breadth and depth of knowledge of first year course work, it will emphasize an assessment of the ability of the student to draw upon multiple disciplines to synthesize hypotheses and design experiments. Students must pass all sections of the exam within no more than two examination trials in order to remain in the program. Any "condition" placed on passing an exam must be documented in writing and such conditions should be met within a time frame specified by the committee.

RESEARCH PROPOSAL REQUIREMENT

Students will prepare a research proposal based on the NIH RO3 format on their thesis research, instead of completing a written examination. Preliminary data is not required. Through discussion with the mentor, students can formulate a research plan, but the proposal should be written strictly by the student. The proposal will be reviewed by two members of the Toxicology faculty, followed-up within 1-2 weeks by a written critique and a verbal discussion with the student. During such discussion, specific strengths and weaknesses of the proposal can be addressed and the reviewers will assess the knowledge base of the student regarding the research area and experimental design. The reviewing committee can then make recommendations to the student regarding their preparedness for taking the Graduate Board Oral Examination (GBO). In order to fulfill the written proposal requirement, the student must submit a

revised "A1" application to the reviewing committee within two weeks of the discussion.

GRADUATE BOARD ORAL EXAMINATION (GBO)

GBOs must be taken within the second year following completion of the written proposal requirement. The student together with advice from the mentor and from the division director can formulate the GBO committee. Students should begin to select their GBO committee within six to eight weeks of the targeted GBO examination date. Two weeks prior to the GBO, the student should send an abstract or specific aims page of their thesis research to the examining committee.

THESIS ADVISORY COMMITTEES

Meetings must be held once every six months. The first of such committees must be held within 6 months of passing the GBO. If the mentor is not a primary member of the Toxicology Division, at least one member of the thesis committee must be a Toxicology faculty member. Immediately after the meeting, students must complete the progress form and insure that copies are distributed to the thesis committee members in advance of follow-up meetings. Note: See departmental section for details regarding committees, dissertations, and the final oral defense and seminar.

POSTDOCTORAL TRAINING PROGRAM IN TOXICOLOGY

Postdoctoral students begin the program working in the laboratory of their postdoctoral mentor. They are expected to register for, and to participate fully in, the Toxicology Seminar Course. Postdoctoral students may also, after consultation with their faculty mentor, take elective courses. However, the primary training of postdoctoral students in the program occurs in the laboratory. Accordingly, postdoctoral students must register for 187.830 Postdoctoral Research Toxicological Sciences each term.

Postdoctoral students who are U.S. citizens or permanent residents can be supported by the NIEHS training grant for up to two years. Postdoctoral

students are expected to apply for their own individual postdoctoral fellowships from the NIH or another appropriate organization with the goal of obtaining independent support beginning in the second year of postdoctoral study. This affords other faculty members the opportunity to recruit additional postdoctoral students. However, all postdoctoral students are offered two years of training grant support as long as their performance is satisfactory as determined by their mentor.

Department of Environmental Health Sciences
PhD in Toxicology
Core Curriculum Requirements ¹

Departmental Courses

180.609 Principles of Environmental Health I	MW 1:30-3:20 1 st term	4 units
180.610 Principles of Environmental Health II	TTh 8:30-10:20 2 nd term	4 units
183.631 Fundamentals of Human Physiology	MW 1:30-3:20 2 nd term	4 units
187.610 Public Health Toxicology	WF 3:30-4:50 1 st term	4 units
187.630 Xenobiotics Metabolism	MWF 10:30-11:50 2 nd term	4 units
187.632 Molecular Toxicology	MWF 10:30-11:50 3 rd term	4 units
187.634 Molecular Dosimetry & Biomarkers	MWF 10:30-11:50 4 th term	4 units
187.635 Mathematical Modeling of Toxicokinetics & Toxicodynamics	Th 1:30-3:20 2 nd term	2 units
187.861 Toxicological Sciences Seminar ²	TBA 1 st -4 th terms	2 units
187.840 Special Studies & Research ³	TBA 1 st -4 th terms	units vary

Outside Department

100.709 Macromolecular Structure and Analysis (SOM)	TTh 9:00-10:30 1 st term	
110.728 Cell Structure and Dynamics ⁴	TTh 9:00-10:30 2 nd , 3 rd term	
120.852 Core Research Literature	T 1:30-2:50 1 st , 2 nd , 3 rd term	2 units
140.615 Statistics for Laboratory Scientists I ⁵	MWF 10:30-11:20 3 rd term *	4 units
140.616 Statistics for Laboratory Scientists II ⁵	MWF 10:30-11:20 4 th term *	4 units
260.709 Molecular Biology and Genomics ⁴	MWF 9:00-10:30 1 st term	
360.728 Pathways and Regulation ⁴	MWF 9:00-10:30 2 nd , 3 rd term	
550.860 Research Ethics	W 4:00-5:20 2 nd term	1 unit
550.865 Public Health Perspectives on Research I	T 10:30-11:50 <i>OR</i>	1 unit
	F 1:30-2:50 1 st term	
550.866 Public Health Perspectives on Research II	T 10:30-11:50 <i>OR</i>	1 unit
	F 1:30-2:50 2 nd term	

Areas of Specialization

Biochemical/Molecular Toxicology

260.708 Genetics (SOM) <i>OR</i>	TTh 9:00-10:30 1 st term	
330.709 Organic Mechanism in Biology ⁴ <i>OR</i>	TBA	
800.707 Computational Biology & Bioinformatics ⁴	TBA	

Neurotoxicology

187.661 Environ Hlth in Neurotoxicological & Mental Disorders	TTh 1:30-2:50 4 th term	3 units
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Immunotoxicology

187.641 Immunology of Environmental Disease (<i>Note: Every other year.</i>)	TTh 1:30-2:50 3 rd term	3 units
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Epidemiology

340.601 Principles of Epidemiology	MWF 8:30-9:20 1 st term *	5 units
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Elective Courses

(Selected examples: Students must choose at least 3 electives in consultation with advisor)

Biochemistry/Molecular Biology/Physiology

120.603 Molecular Biology of Disease	Th 1:30-3:20 2 nd term	3 units
120.620 Fundamentals of Reproductive Biology	TTh 3:30-4:50 1 st term	3 units
120.621 Molecular Endocrinology	TTh 3:30-4:50 3 rd term	3 units
187.620 Toxicological Pathology (Note: Every other year)	WF 3:00-4:50 4 th term	4 units
260.665 Biological Basis of Aging (Note: Every other year)	TTh 1:30-2:50 3 rd term	3 units

Immunology

260.611 Principles of Immunology I	TTh 8:30-10:20 1 st term	4 units
260.612 Principles of Immunology II	TTh 8:30-10:20 2 nd term	4 units
260.714 Immunogenetics (Note: Every other year)	TTh 1:30- 2:50 4 th term	3 units
260.717 Graduate Immunology: The Immune Response	TTh 9:00-10:20 4 th term	3 units

Neurosciences

440.600 Neuroscience ⁴	1st, 2nd, 3rd, 4th terms	6 credits
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Cancer

120.615 Molecular Biology of Carcinogenesis	TTh 2:00-3:20 3 rd term	3 units
180.650 Fundamentals of Clinical Oncology	Th 5:30-8:00 2 nd term	3 units
340.624 Etiology, Prevention, and Control of Cancer I	TTh 1:30-2:50 1 st term	3 units
340.625 Etiology, Prevention, and Control of Cancer II	TTh 1:30-2:50 2 nd term	3 units

Risk Assessment & Policy

180.880 Special Studies in Environmental Health/Community Outreach	T 5:00-6:00 1st-4 th terms	1 unit
415.619 Genetic Technologies & Public Policy (Note: Every other year)	TBA 4 th term	3 units
415.610 Introduction to Genetic Counseling	M 5:30-7:30 1 st term	2 units
415.611 Introduction to Human Genetics I	M 5:30-7:30 2 nd term	2 units
415.612 Introduction to Human Genetics II	M 5:30-7:30 3 rd term	2 units
415.613 Introduction to Medical Genetics	M 5:30-7:30 4 th term	2 units
317.600 Introduction to the Risk Sciences & Public Policy	MW 5:00-6:30 1 st term	3 units
317.605 Methods in Quantitative Risk Assessment	MW 5:00-6:30 3 rd term	4 units
317.615 Topics in Risk Assessment	M 5:00-6:30 4 th term	2 units

Epidemiology

180.640 Molecular Epidemiology & Biomarkers in Public Health	TTh 2:30-3:50 3 rd term	4 units
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¹ Course descriptions appear in the Johns Hopkins Bloomberg School of Public Health catalog, the School of Medicine catalog, or the School of Nursing (SON) catalog

² Must be taken in each quarter during entire training period

³ This course, which includes the research rotations, is taken in each quarter until a trainee passes his/her Graduate University Board Oral Exam and begins a thesis project. These trainees then register for Thesis Research, Toxicological Sciences for the remainder of their time in the program.

⁴ SOM, School of Medicine

⁵ Statistics (can substitute for required course)

140.611-12 Statistical Reasoning in Public Health I & II

140.621-24 Statistical Methods in Public Health I, II, III, IV

100.505 Descriptive and Inferential Statistics (SON)

* Check current schedule for lab times (<http://commprojects.jhsph.edu/courses>)

School Requirements

The following courses fulfill the School requirements for all research students. Doctoral students who have earned a MPH Degree within the last ten years are waived from the 550.865-866 requirements. In addition, all students are required to complete the Academic Ethics Module (on-line course), which is located at <http://apps1.jhsph.edu/academicethics/>. This module should be completed within two terms of matriculation and must be completed before graduating.

550.865 Public Health Perspectives on Research I	T 10:30-11:50 <i>OR</i> F 1:30-2:50 1 st term	1 unit
550.866 Public Health Perspectives on Research II	T 10:30-11:50 <i>OR</i> F 1:30-2:50 2 nd term	1 unit
306.665 Research Ethics and Integrity <i>OR</i>	TTh 1:30-2:50 3 rd term	3 units
550.860 Research Ethics	Internet 2 nd term	1 unit
Academic Ethics Module	Internet	

Department of Environmental Health Sciences
PhD Toxicology
Core Curriculum Schedule – 1st Year

First Term

100.709 Macromolecular Structure and Analysis (SOM)	TTh 9:00-10:30	
120.852 Core Research Literature	T 1:30-2:50	2 units
180.609 Principles of Environmental Health I	MW 1:30-3:20	4 units
187.610 Public Health Toxicology	WF 3:30-4:50	4 units
187.840 Special Studies & Research	days vary	
187.861 Toxicological Sciences Seminar	T 3:00-4:00	2 units
260.709 Molecular Biology and Genomics (SOM)	MWF 9:00-10:30	
550.865 Public Health Perspectives on Research I	T 10:30-11:50 <i>OR</i> F 1:30-2:50	1 unit

Second Term

120.852 Core Research Literature	T 1:30-2:50	2 units
180.610 Principles of Environmental Health II	TTh 8:30-10:20	4 units
187.630 Xenobiotic Metabolism	MWF 10:30-11:50	4 units
187.635 Mathematical Modeling of Toxicokinetics and Toxicodynamics	Th 1:30-3:20	2 units
187.840 Special Studies & Research	days vary	
187.861 Toxicological Sciences Seminar	T 3:00-4:00	2 units
550.860 Research Ethics	W 4:00-5:20	1 unit
550.866 Public Health Perspectives on Research II	T 10:30-11:50 <i>OR</i> F 1:30-2:50	1 unit

Third Term

120.852 Core Research Literature	T 1:30-2:50	2 units
187.632 Molecular Toxicology	MWF 10:30-11:50	4 units
187.861 Toxicological Sciences Seminar	T 3:00-4:00	2 units
340.703 Cell Structure and Dynamics (SOM)	TTh 9:00-10:30	
360.728 Pathways and Regulation (SOM)	MWF 9:00-10:30	

Fourth Term

187.634 Molecular Dosimetry & Biomarkers	MWF 10:30-11:50	4 units
187.840 Special Studies & Research	days vary	
187.861 Toxicological Sciences Seminar	T 3:00-4:00	2 units