



The Huck Institutes
OF THE LIFE SCIENCES

Molecular Toxicology Graduate Program

Degree Requirements Booklet

Fall 2008

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Molecular Toxicology (MT)

Course Requirements

Students in the IGDP in MT must take a minimum of four 3-credit graduate level or approved undergraduate courses in addition to the Ethics in the Life Sciences (1 credit) and the Huck Institutes' Colloquium (4 credits). These courses may range from organic chemistry to molecular biology, and cell biology. The selection of courses is left to the student, advisors, and thesis committee. The courses should build on background, fill in essential gaps in knowledge and prepare the student for thesis research. The Co-chair and/or temporary advisor will provide guidance in course selection until a advisor(s) is chosen. Sample curricula are shown below.

First Year Advisor

The IGDP in MT Co-chair will serve as the first year advisor for each student upon entrance into the program. This advisor will serve as the primary program contact for the student if problems or questions arise until the student chooses a thesis advisor.

Rotations and Reports/Selection of Dual Advisors

Students will choose three laboratories for rotations, in consultation with the co-chair of the IGDP in MT. The purpose of these rotations is to acquaint the student with several laboratories, their approach to scientific practices, and work habits. The rotations should help students determine which laboratories they would prefer to work in and advisors (or dual advisors) of interest. Rotations will also introduce students to a variety of technologies and experimental approaches to science.

The duration of the rotations will depend on whether or not these rotations take place at the same time formal course requirements are being met. For example, while courses are being taken, rotations can be from 5-12 weeks; while during the summer, rotations can be for either 4 or 8 weeks. At the conclusion of each rotation, students will write a short report (typed, double-spaced) on the purpose of the work done, methods used, results obtained, conclusions drawn, and suggestions for further work in the area.

Selection of Dual Advisors

On the basis of student and faculty preference, students are encouraged to choose dual advisors whose complementary areas of expertise will offer novel, interdisciplinary opportunities for thesis research. Alternatively, student can first choose a primary advisor, and subsequently develop a thesis committee which includes a second advisor and others with complimentary scientific interests.

Teaching Assistance (optional, discuss this with your mentor before pursuing this option)

Students receive either a lecture, lab, or recitation class to help teach. Students also participate in the Huck Institutes teaching assistant training sessions and receive A-F grades on their transcripts from their faculty course supervisors. Please note that these grades are not computed in with the overall GPA. International graduate students must pass an English proficiency exam before any teaching duties are assigned.

Candidacy Exam

The Candidacy Exam is uniquely designed for each student. The exam should be taken by the end or during the student's third semester (e.g. the Fall semester of the second year) in the IGDP in MT program. The student and his/her advisor are responsible for establishing an appropriate committee, typically consisting of 5 faculty members including the student's advisor who will also serve as the chair of the committee. The student is responsible for obtaining the required paperwork with the Huck staff PRIOR to taking the exam. The student will be assigned a scientific paper from the Biochemical literature to read and analyze; the paper will be selected based upon the student's background and coursework. The assigned paper will be selected by the student's advisor(s) but must be approved by the co-chair before assignment. The analysis should involve exploring the relevant literature as well as the fundamental issues in toxicology, biochemistry and biology. The student will be given 10 days to write a 3 page single space review. At the same time as the paper is assigned a meeting of the committee should

be arranged for a 60-90 min oral exam by the committee to review the written assignment and discuss other issues. The committee meeting shall be within 21 days of the original assignment of the paper. The student is required to make a formal oral presentation, preferably using Powerpoint, with no more than 20-25 slides. The student should be able to integrate knowledge about chemical and biological aspects of the paper and understand and evaluate the experimental design, rationale, results, and the authors' interpretation of their work. In the event that the student does not pass this exam, the student's committee will make a recommendation as to whether to offer another opportunity or to terminate the student's tenure in the program.

Outline for the written critique:

Introduction:

Why was the study performed; what was the underlying hypothesis; background work from this or other laboratories that lead to the current hypothesis.

Results:

Critically discuss the result; was the series of experiments performed a sound approach; were the studies properly performed with all necessary controls; what was actually demonstrated by the results.

Discussion:

What the initial hypothesis addressed; what do the studies mean in context to the overall field of study; what questions of directions could be addressed in future studies.

Doctoral Committee

Upon successful completion of the Candidacy Examination, the student in consultation with the advisor will, as soon as possible, select a doctoral committee. The committee will consist of the advisor, two members of the IGDP in MT and up to two faculty members who are not a member of the IGDP in MT. If the student has selected the option of having dual advisors, then both of the advisors will be on the doctoral committee, along with two members of the IGDP in MT and one faculty member who is not a member of the IGDP in MT. If the faculty members from the IGDP in MT on the committee are also members of the same department, the one faculty member who is not a member of the IGDP in MT must be from a different department. This committee is responsible for supervising the academic program and monitoring the progress of the student towards his/her degree. Doctoral Thesis Committee Composition is based on the information in the Graduate Degree Programs Bulletin prepared by the Graduate School regarding Doctoral Committees ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm))

First-Year Meeting with Doctoral Committee

The student is required to meet with his/her Doctoral committee by the end of the first year in residence if the Candidacy Examination has been passed and a Doctoral Committee has been chosen. The student should be prepared to discuss his/her accomplishments as well as plans for the next year. Topics to be discussed include courses, seminars, the comprehensive examination and the thesis research.

Seminar Requirements

Students enrolled in the IGDP in MT are required to present one seminar presented as a public defense of their thesis, however, student may be asked to present once in the Pathobiology seminar series. At Hershey, students are encouraged to present in the Pharmacology Seminar Series or in the Graduate Student Seminar Series.

However, students will also make presentations in their coursework. For example VSC 597A Regulation of Gene Expression requires that students make formal presentations.

IGDP in MT students are also expected to attend seminars in their areas of specialization in addition to continuing their participation with the Colloquium throughout their graduate career.

Internship (optional, this must be discussed with and approved by the student's advisor)

The internship experience is optional. Typically after the first or second year in residence, students can spend a summer in an internship at a medical center, government laboratory or in an industrial environment. The time

frame for the internship is negotiable with the Research and Training Committee. Non-traditional settings are available.

Comprehensive Examination

The purpose of the Comprehensive Examination is to assess the student's ability to design and interpret experiments, and the breadth and depth of knowledge related to Toxicology. This exam should normally be taken by the end of the second summer, but must be taken prior to completion of the fifth semester (e.g. the Fall semester of the third year). For the examination, the student will prepare an NIH-type postdoctoral research proposal on a topic related to the thesis research. This proposal will be the basis of an oral exam administered by the student's thesis committee. The student should be prepared to discuss the background, significance, experimental design, feasibility, and potential impact of the proposed work. The student and his/her advisor are responsible for establishing an appropriate committee, typically consisting of 5 faculty members including the student's advisor who will also serve as the chair of the committee. The student is responsible for obtaining the required paperwork with the Huck staff and the Graduate School PRIOR to taking the exam.

Post-Comprehensive Progress Assessment

Subsequent to the Comprehensive Examination, IGDP in MT students are encouraged to arrange annual meeting of the student's committee to assess progress on the student's thesis project. The advisor is responsible for communicating with the Co-Director Chair any potential problems that arise during the post-comprehensive period.

Thesis Requirement

Submission of a written thesis, a public presentation of the thesis, and its defense before the thesis committee are the final program requirements. Students must follow the thesis guidelines outlined by the Graduate School.

Molecular Toxicology (MT) Curriculum

M.S. or Ph.D. degrees

1. Foundation of basic knowledge in molecular biology, cell biology, biochemistry, and molecular toxicology. The IGDP in MT requires at least 9 credits in one or more of these disciplines, taken either as an undergraduate or as a part of the graduate curriculum. The following courses are requirements for respective campuses.

University Park students

BMB 400 MOLECULAR BIOLOGY OF THE GENE (3 credits)

VSC 530 PRINCIPLES OF TOXICOLOGY (3 credits)

VSC/IBIOS 530 REGULATION OF GENE EXPRESSION (3 credits)

VSC 433 MOLECULAR AND CELLULAR TOXICOLOGY (3 credits)

Hershey Medical Center Students

PHARM 520 PRINCIPLES OF DRUG ACTION (2 credits)

Courses for Core Biochemistry and Core Molecular Biology (total of 7 credits) have been discontinued and will be replaced in the Fall 2007. Please see the Co-Chair regarding appropriate replacement courses. Appropriate paperwork will need to be filed with the registrar to change the current requirements of CMBIO502 and CMBIO503, which are no longer offered.

In addition to these required courses, electives must also be taken to fulfill the required number of academic credits for either an M.S. or Ph.D. degrees.

2. IBIOS 570 MOLECULAR TOXICOLOGY SEMINAR (2 credits, 1 per semester during any of the first four semesters in residence), a monthly colloquium that will present molecular toxicology topics of general interest to all faculty and graduate students in the IGDP in MT.

3. IBIOS 590 COLLOQUIUM (2 credits) All students are required to enroll for 4 credits of Colloquium. Students typically take this course in the Fall and Spring semesters of their first year. In Colloquium, students are introduced to a wide variety of topics of contemporary and future importance in the life sciences. A particular focus is placed on topics where science is likely to impact on society (and society on science). Topics are drawn from the area introduced by the speaker and can span the entire spectrum from basic research to the social, legal, moral and ethical implications of the science. A significant challenge in Colloquium is to organize and coordinate a presentation using contemporary presentation software, such as PowerPoint, in an environment in which part of the audience is present at a remote site. Students are required to attend the lectures and the dinners following the lectures. Students also participate in the group presentations during discussion sessions and submit written reports. Reports may be submitted to the co-chairs of the IGDP who may add them to the student's permanent record. Students receive A-F quality grades.

4. IBIOS 591. ETHICS IN THE LIFE SCIENCES (1 credit) Usually taken the Fall semester of their second year, students exam integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review. Students receive A-F quality grades.

5. IBIOS 595. INTERNSHIP (1 credit, optional) For students interested in exploring academic, government, medical, law, or business corporate approaches to research. This is an external work assignment relevant to individual research or career goals. Students receive an R (satisfactory/passing) or U (unsatisfactory/failing). Only R credits are counted for credit totals. Students typically participate in an internship the summer of their first or second year. Contacts, positions, applications, course registration, course requirements, and grading are processed through the Eberly College of Science Cooperative Education Program (814-865-5000). Additional credits of IBIOS 595 are at the expense of the student. Interested graduate students are to discuss the opportunity with the IGDP in MT chair and/or their faculty advisor.

6. IBIOS 596. INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 credits per semester) For students exploring potential Ph.D. projects and faculty advisors. Students receive a R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.

7. IBIOS 597 (optional, variable credits) SPECIAL TOPICS

8. IBIOS 600. THESIS RESEARCH (1-9 per semester) For students who have been matched with a faculty advisor AND have not taken/passed their comprehensive exams. Students may receive A-F grades or R/F grades at any time. By the time a student passes his/her comprehensive exam, up to 12 credits worth of IBIOS 600 may have the A-F quality grade.

9. IBIOS 601. THESIS PREPARATION (0 per semester) For those students who passed their comprehensive exams. This course appears on the transcript but does not have any grade or credit associated with it.

10. VSC 602/IBIOS 602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1 credit, optional) All students are strongly encouraged to enroll for 1 credit (or the equivalent) of Supervised Experience in College Teaching before the beginning of their third year. Students typically take this course during the Fall semester of their second year. To encourage teaching experience in toxicological sciences, students will be encouraged to enroll in VSC 602 for supervised experience in college teaching for a toxicology-related course (VSC 433, VSC 430, ERM 431). As an alternative, after consulting with their respective advisor, students may elect to enroll in IBIOS 602. Teaching at Hershey is arranged by the Co-Chairs of the IGDP and Co-Director of Graduate Education for the IBIOS program. Students receive A-F grades on their transcripts but these grades are not computed in with the overall GPA. International fellows must pass an English proficiency exam before any teaching duties are assigned.

11. The Graduate School requires all graduate students to maintain a 3.0 grade-point average.

M.S. Degree Requirements

Masters students must have a minimum of 30 credits and a 3.0 overall GPA. If pursuing a masters thesis option, up to 6 IBIOS 600 credits may be A-F graded. 18 credits must be at the 500-600 level, and a minimum of 12 credits need to be in the major at the 400-600 level (excluding IBIOS 600). The student selects a thesis committee (upon consultation with faculty advisor), writes a thesis, and defends his/her work. If pursuing a masters non-thesis option, the student must have a first authored manuscript (based on his/her research) that has been either accepted and/or published in a peer reviewed journal. Additionally, if pursuing a masters non-thesis option, 18 credits need to be in the major at the 500 level. The manuscript is given to at least the faculty advisor and the IGDP Chair for evaluation.

IBIOS 595 (Internship) and 596 (Rotations) credits count toward the 30 credits. However, the 602 (Teaching) optional credits do not count toward the 30 credits. All IGDP in Molecular Toxicology graduate students must successfully take the following list of required courses and/or electives during the first two years of their graduate education. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending his/her work.

Year 1-Fall Semester

University Park

Course	Credits	Hershey	Credits
BMB 400 Mol. Biol. of the Gene	3	Biochemistry-to be determined	3
IBIOS 570 Mol. Tox. Seminar	2	PHARM 590 Pharm. Colloquium	1
IBIOS 590 Colloquium	2	IBIOS 590 Colloquium	2
IBIOS 596 Ind. Studies, Lab rot.	1-2	IBIOS 596 Ind. Studies, Lab rot.	1-2
VSC 430 Princ. of Toxicology	3	PHARM 520 Princip. of Drug action	2

Graduate elective 2-4 Graduate elective 2-4

Year 1-Spring Semester

University Park

Course	Credits
VSC/IBIOS 530 Reg. of Gene Ex	3
IBIOS 570 Mol. Tox. Seminar	2
IBIOS 590 Colloquium	2
IBIOS 600 Thesis research	1-2
VSC 433 Mol. and Cell. Toxic.	3
Graduate elective	3-6

Hershey

Course	Credits
Molecular Biology-to be determined	4
PHARM 590 Pharm. Colloquium	1
IBIOS 590 Colloquium	2
IBIOS 600 Thesis research	1-2
Graduate elective	3-6

Year 2-Fall Semester

University Park

Course	Credits
IBIOS 570 Mol. Tox. Seminar	2
IBIOS 591 Ethics in Life Sci.	1
IBIOS 600 Thesis research	3-6
IBIOS/VSC602* Supervised teaching	1
Graduate electives	3-6

Hershey

Course	Credits
PHARM 590 Pharm. Colloquium	1
IBIOS 591 Ethics in Life Sci.	1
IBIOS 600 Thesis research	3-6
IBIOS 602* Supervised teaching	1
Graduate electives	3-6

Year 2-Spring Semester

University Park

Course	Credits
IBIOS 570 Mol. Tox. Seminar	2
IBIOS 600 Thesis research	3-6
Graduate electives	3-6

Hershey

Course	Credits
PHARM 590 Pharm. Colloquium	1
IBIOS 600 Thesis research	3-6
Graduate electives	3-6

*optional

Ph.D. Degree Requirements

Ph.D. students must have a minimum of 30 credits and a 3.0 overall GPA. If pursuing a masters thesis option, up to 6 IBIOS 600 credits may be A-F graded and 12 credits need to be in the major at the 400-600 level (excluding IBIOS 600). The course requirements are essentially the same as that required for the M.S. degree listed above, with some discretion left to the student and advisor.

Grade Point Average/Unsatisfactory Scholarship: Student are required to maintain an overall 3.0 GPA throughout the program, and, in particular, must have a 3.0 to take the doctoral candidacy, the comprehensive examination, and the final oral examination. One or more failing grades or a cumulative grade-point average below 3.0 may be considered evidence of unsatisfactory scholarship and may be grounds for dismissal from the IGDP in MT.

General Information

English Requirement for International Students

The English Requirement for International students is that prescribed by the Graduate School. Depending on the graduate program, all entering international students, whether or not they hold a Teaching Assistantship, will be required to take a Test of Spoken English (TSE) which is administered by the University's Center for English as a Second Language (ESL).

Given at the beginning of fall and spring semesters, international students are required to pre-register for the TSE. The test scores from the TSE are posted on the University's Administrative Information System (AIS) computer. Below is the course of action for the various TSE score ranges.

- > 250 approved for teaching and the ESL requirement will be satisfied.

- 230-249 required to schedule and pass ESL 118G.

- 200-229 required to pass ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

- <200 required to schedule and pass with the grade of A ESL 115G, before ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

* At the end of this course, students are re-tested. Based upon these test results, students are either approved for teaching, placed in a subsequent ESL course, or asked to retake the course.

Students, who are required to enroll in ESL courses, must complete the ESL requirement by the end of the second semester of residency. Students who fail to satisfy this requirement may be terminated from the respective graduate program, at the discretion of the graduate program chair.

Safety Training Sessions / Examinations

Within the first semester of residence, all students are required to take/pass the radioisotope safety and chemical waste disposal training sessions offered at the respective campus.

Grade Point Average

Credit hours are earned only for the grades A, B, and C. However, all A and F grades are included in the computation of the grade point average. Grade points are assigned as follows:

- A = 4 (above average graduate work)
- B = 3 (average graduate work)
- C = 2 (below average graduate work)
- D = 1 (failing graduate work)
- F = 0 (failing graduate work)

Grades D and F are not acceptable for graduate credit. If a course is repeated, then both grades are used in computing the cumulative grade point average.

Unsatisfactory Scholarship

Students are required to have a minimum grade-point average of 3.0 for the doctoral candidacy examination, admission to the comprehensive examination, thesis defense, and graduation. One or more failing grades, a cumulative grade-point average below 3.0, or failing any of the examinations may be considered evidence of

unsatisfactory scholarship and be grounds for dismissal from the University (see the Appendix III of the Graduate Programs Bulletin [www.psu.edu/bulletins/whitebook/\\$appendices.htm](http://www.psu.edu/bulletins/whitebook/$appendices.htm)).

Assistantships and Student Status

Students with teaching or research graduate assistantships must be registered as full time students to maintain stipend eligibility. Full time status is considered either a minimum of nine credits each fall and spring semester (pre-comprehensive exam) or XXX 601 (0 credits, post-comprehensive exam). The assistantship appointments typically originate with the department of the faculty advisor. If no faculty advisor has been identified, as likely the situation with first year doctoral students, students should consult with their respective graduate program Chair.

Thesis Submission and Exit Interview

Upon completion of the degree, students are to provide the Graduate Program with a paper copy of their thesis. Students also participate in both the University and Huck Institutes' Exit Interview Process. For the latter, students may meet with the Graduate Program Chair or appropriate representative.

Activate Intent to Graduate

Students must present their thesis in accordance with the Penn State University guidelines as described in the THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses". Current copies can be obtained from the Thesis Office:

115 Kern Building
University Park, PA 16802
Phone: 814/865-5448

Web site: http://www.gradsch.psu.edu/gs_overview/thesisguide

At the beginning of the semester that students wish to graduate, they are to either:

- (1) access eLion via www.eLion.psu.edu, if in the PSU computer system
- or
- (2) call Graduate Enrollment at 1-814-865-1795, if not in the PSU computer system

Internships (optional)

As members of the Huck Institutes of the Life Sciences, all graduate students may participate in a three month internship in academia, industry, or government and receive credit on their transcript by enrolling in IBIOS 595 (1). Non-traditional settings are also available. Students interested in this opportunity should initiate discussion early on with their advisor and graduate program chair to help determine the best timing for this experience (typically the first or second summer).

Teaching

Depending on the graduate program, teaching experience may be required or optional.

For a teaching experience beyond a departmental funding means or as a requirement, the Huck Institutes of the Life Sciences Supervised Experience in College Teaching Booklet lists courses available and corresponding teaching responsibilities at the respective campuses. Besides an opportunity to develop teaching skills in a classroom setting, students also participate in the Huck Institutes teaching assistant training sessions and receive credit on their transcript by signing up for IBIOS 602 (1). Students interested in this opportunity should initiate discussion early on with their advisor and graduate program chair to help determine the best timing for this experience.

Doctoral Thesis Committee Composition

According to the Graduate Degree Programs Bulletin published by the Graduate School regarding Doctoral Committees: ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm))

- 4 person minimum of approved PSU Graduate Faculty.
- 2 members must be inside the major and 1 member must be outside the major. Note - the outside member must be member of the approved PSU Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department. The outside member may not be a co-funded faculty from the same department, have budgetary ties, or conflict of interest (aka co-author paper) with any of the other committee members.
- A person not affiliated with PSU may be added as a special member (beyond the 4 members of the approved PSU Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean. A memo plus the individual's C.V. must be drafted with approval signature spaces for the Graduate Program Chair plus Ms. Cynthia Nicosia (Director, Graduate Enrollment).
- Have committee chair or one of the co-chairs be a member of the approved PSU Graduate Faculty. Typically this is the faculty advisor or someone in the graduate program.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School. A form letter is available for this special request.
- Need approval of 2/3 of the committee members for passing comprehensive exam and defense dissertation.
- **Need to submit paperwork 3-4 weeks prior to your scheduled comprehensive exam and defense. Please contact the appropriate staff member:**
Hershey:
Lori Coover (Neuroscience) H179 Hershey Medical Center; 717-531-1045; ljc11@psu.edu
Kathy Shuey (Genetics, IBIOS, IM, MM, MT) H133 HMC; 717-531-8982; kes6@psu.edu
Lisa Harman (Physiology) H166 HMC; 717-531-8566; lsb10@psu.edu
University Park:
Huaru Yan (Genetics) 202 Life Sciences Bldg.; 814-865-3076; huy2@psu.edu
Mary Hudson (Ecology) 101 Life Sciences Bldg.; 814-867-0371; meh25@psu.edu
Janice Kennedy (CDB, IBIOS, IM, MM, MT) 101 Life Sciences Bldg.; 814-865-3155; jkk5@psu.edu
Deb Murray (Plant Biology, Physiology) 101 Life Sciences Bldg.; 814-865-8165; dkm9@psu.edu
- Please note- Graduate Programs may have additional committee composition criteria.

This publication is available in alternative media on request.

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