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## **Drexel University College of Medicine**

### **MOLECULAR & CELLULAR BIOLOGY & GENETICS GRADUATE PROGRAM**

### **POLICIES AND PROCEDURES**

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**Michael J. Bouchard, Ph.D.**

Associate Professor

Dept. of Biochemistry and Molecular Biology

Director, Molecular and Cell Biology and Genetics Graduate Program

Drexel University College of Medicine

245 N. 15th St. NCB 11312

Philadelphia, PA 19102

(215) 762-1898 office

(215) 762-4452 fax

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## **I. INTRODUCTION**

This booklet:

- describes academic policies and procedures pertaining to graduate study in the Molecular and Cell Biology and Genetics (MCBG) Graduate Program;
- supplements procedures and general rules of the Office of Biomedical Graduate Studies;
- contains current guidelines that are revised periodically by faculty in the Program.

The Graduate Program offers coursework and research opportunities leading to the Ph.D, M.D./Ph.D and M.S. degrees. The goal of the Graduate Program is to provide an intensive interdisciplinary research training and classroom experience in order to prepare graduates for significant contributions to their field. Research interests of the faculty members are described elsewhere.

There are five components of requirements to be fulfilled for obtaining a Ph.D. degree:

- Research rotations
- Required and elective courses
- Preliminary and qualifying examinations
- Dissertation research proposal
- Research dissertation and defense

In addition, the MCBG Program requires a Ph.D. candidate to submit at least one manuscript for publication by a peer-reviewed journal and to prepare a second manuscript for submission.

For the M.S. degree, the requirements are modified to include all of the above except for the qualifying examination, the dissertation research proposal, and manuscript submission, which are not required.

## **II. BASIC GUIDELINES FOR THE Ph.D. DEGREE**

### **A. CURRICULUM**

#### **1. Required Core Courses**

IDPT-522	Molecular Structure and Metabolism
IDPT-523	Molecular Biology and Genetics
IDPT-527	Cell Biology I
IDPT-528	Cell Biology II
IDPT-529	Cell Signaling and Cell Cycle
IDPT-530	Cells to Systems
MCBG-511S	Special Topics in MCBG (Fall 1 <sup>st</sup> year)
MCBG-506-05	Advanced Cell Biology (Spring 1 <sup>st</sup> year)

#### **Required Courses for Biomedical Graduate Studies**

IDPT-501-05	Biostatistics I
IDPT-500-05	Scientific Integrity and Ethics

#### **2. Advanced Elective Courses**

In consultation with the Advisory Committee and according to the area of selected research, the student must select a minimum of 3 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge.

**NOTE: All formal courses must be completed within the first two years.**

#### **3. Special Topics Courses, Seminars and Journal Club**

Students are required to sign up for and participate in the Molecular and Cell Biology and Genetics Student Seminar Series (MCBG-513) and Journal Club (MCBG 512-05). Students who have passed the qualifying exam may choose a graduate program journal club that best fits their academic and thesis interests.

#### **4. Lab Rotations**

The Molecular and Cell Biology and Genetics Graduate Program is an interdisciplinary Program that includes participating faculty from several departments. The student therefore has the opportunity to pursue laboratory rotations in any participating departmental laboratory.

A minimum of three rotations must be arranged during the first year in consultation with the Program Director and faculty members within the Graduate Program. The research areas may be chosen to complement the student's long-term research interests. Research rotations should provide an opportunity to:

- Practice scientific logic and experimental design
- Acquire useful technical expertise
- Extend scientific and personal interactions within and between labs
- Explore the possibility for a future thesis research topic

At least 20 hours per week (minimum) for a three-month period are required for each rotation. The first rotation must begin no later than mid-August of the first year, and students must satisfactorily complete all rotations by the end of summer of the first year. A written summary and oral presentation of the research experience is prepared by the student at the end of each rotation and is evaluated by the faculty and the student. Upon completion of the third rotation, a student must immediately choose and enter a research lab to start thesis research.

Students in good academic standing (GPA 3.0 and above), who have extensive previous academic lab research experience (1 year minimum, full time), have already identified/selected a specific thesis laboratory for their these work, and/or have a Master of Science in a field related to biomedical research may petition the Program Director to opt out of the third rotation. The students must provide a letter from their chosen thesis advisor to verify that the student has been accepted in that lab for thesis work. The Program Director will forward the student's request to the MCBG Steering Committee for consideration. If approved, students must immediately start their thesis research.

## **5. Research**

A minimum of two years of full-time research is required following the choice of the thesis research laboratory (which must occur by the end of the first summer). Generally, the time required to complete a Ph.D degree is five years and an M.S. degree is three years. Additional time may be required for writing the dissertation and research publications.

## **6. Committee Meetings**

Meetings between the student and his/her Thesis Committee serve to provide an objective, supportive and critical feedback evaluation of academic and scientific progress throughout Graduate School training. They are an essential part of the mentoring process.

Committee meetings must be held every six months, or more frequently if deemed necessary by the research advisor, student, or thesis committee. It is the responsibility of each student to convene committee meetings at a mutually convenient time and to provide evidence of such meetings in writing to the Program Director and the Biomedical Graduate Studies office.

## **7. Teaching**

Teaching is not required but may be arranged if requested by the student and approved by the Advisory Committee.

# **B. ADVISORY COMMITTEES**

1. The Program Director will serve as advisor during the first year. Student must meet with the Program Director every six months. The Program Director will inform the MCBG steering committee of the progress of first year graduate students at least twice during the first year. The Steering Committee will serve as the Advisory Committee for an MCBG student until a thesis committee is formed for that student.

2. After successful completion of the Preliminary Examination the student and advisor select a five-member Dissertation (Thesis) Committee that consists of at least three faculty in the MCBG program, including the research advisor, and one faculty outside of the graduate program. At this time a chair of the dissertation committee will be selected who is **not** the dissertation advisor. The dissertation committee will evaluate the student's progress every 6 months or more frequently if deemed necessary by the research advisor, student, or thesis committee. It is the responsibility of each student to convene committee meetings every six months and to provide evidence of such meetings in writing to the Program Director and the Biomedical Graduate Studies office.

## C. EXAMINATIONS

1. **Preliminary Examination:** The purpose of the Preliminary Exam is to assess the student's ability to integrate, process and utilize knowledge gained prior to and during the first year of Graduate School. Molecular and Cell Biology and Genetics Graduate Program faculty are involved in preparing and evaluating this exam. The results of the exam are included in the student's permanent file. **The preliminary exam is taken at the end of the 1st year of graduate study.**

*Format:* The students are given a specific research question whose complete answer requires the integration of several overlapping fields of scientific investigation. The student is given a general hypothesis-driven question whose solution requires the student to integrate the core curriculum. Students have approximately two weeks to research and evaluate the given topic in the form of a written outline (3-5 pages with additional space for diagrams and references). One to two weeks later, students orally present their solution to the assignment to a panel of MCBG faculty. The oral exam lasts 60-120 minutes. This exam must be completed prior to the start of the fall semester of the second year. Successful completion of the preliminary exam is necessary to go on to the second year of study.

2. **Qualifying Examination:** This is a mock NIH grant proposal that is defended orally. The purpose of the examination is to assess the students' scientific creativity, ability to design a research project, and oral and written communication skills. The student's dissertation committee administers the exam.

*Written Part (A):* The focus of the qualifying exam can be directly related to ongoing research in the advisor's laboratory and the student's thesis work. If the student chooses to conduct the qualifying exam on the thesis project, a "Specific Aims" page must be presented to the Dissertation Committee for approval at least one week prior to the start date for the written portion of the exam (see below for timeline). If the student chooses to do the qualifying exam on a topic that is not related to his/her thesis research, a list of three topics, presented in the form of "Specific Aims" must be presented to the student's Dissertation Committee at least one week prior to the start date of the written portion of the exam; the Dissertation committee will select one topic. The exam must follow NIH instructions for a F31 pre-doctoral fellowship. However, no budget is required, and the length may be ~10 pages, to cover a research project that would take 2 years to complete.

Approximately four but no more than five weeks are required to prepare the proposal **(to be handed in to the Advisory Committee in the summer of the second year in the program and no later than November 1 of the third year)**. Students spend up to 50% time during this period on researching the current status of the proposed topic and the preparation of the mock grant. Graduate student peer review is recommended, but no faculty or post-doctoral assistance is permitted. The student may choose one faculty member of the dissertation committee to provide advice on construction of a grant proposal. This faculty member cannot be the thesis advisor and will only provide advice relevant to constructing a grant proposal and will not help the student formulate ideas for his/her specific proposal.

*Oral Part (B):* Within two weeks after submission of the written portion of the qualifying exam, an oral presentation and defense are performed, and evaluated by the student's Advisory Committee. At this time both the theoretical knowledge that is pertinent to that branch of science and the experimental design and evaluation of the proposed research are examined. The mock grant and the committee's evaluation of performance are included in the student's permanent file. Successful completion of the qualifying exam is necessary to continue in the Ph.D. program.

#### **D. EVALUATION OF PROGRESS**

The Program Director, Advisory Committee, or Dissertation Committee will evaluate performance in coursework, on exams, in laboratory rotations and oral presentations every 6 months or more frequently if deemed necessary by the research advisor, student, or thesis committee. In addition:

##### **1. Summer of First Year**

- a. *Students with 3.0 GPA and satisfactory rotation performance* will take the Preliminary Examination.  
Pass on Preliminary Exam - qualifies the student to continue in the Ph.D. program.  
Failure or Deficiency on Preliminary Exam - the student is permitted a single retake of the Exam, to be scheduled within one month of the original examination.  
Failure on retake of Preliminary Exam - the student must withdraw from the Ph.D. program, and is eligible to apply for the M.S. program, with reapplication to the Ph.D. program possible after completion of M.S.
- b. *Students with <3.0 average or who have less than a B in a core course* are not eligible to take the Preliminary Exam, unless so decided by the program Steering Committee. As part of this decision, the Steering Committee considers satisfactory performance in rotations. If the Steering Committee decides that the Preliminary Exam will be administered:  
Pass on Preliminary Exam - student may continue in the Ph.D. program under probationary status, upon recommendation of the faculty and in accord with Office of Biomedical Graduate Studies policies regarding any necessary course remediation.  
Fail on Preliminary Exam - the student must withdraw from the Ph.D. program. To be eligible for the M. S. on probationary status, core

courses must be remediated, and student must obtain permission of the faculty and approval from the Graduate School.

## **2. Summer of Second Year or Fall of Third Year**

To continue into the third year of the Ph.D. program, students are required to achieve an overall GPA of 3.0, satisfactory performance in the laboratory, and pass the Qualifying Exam. The qualifying exam must be completed no later than November 1 of the third year.

Failure on Qualifying Exam - One retake will be permitted, within one month of the first attempt. The retake may constitute submission of a new proposal, revision of the first proposal, and/or a repeat of the oral presentation and defense. A second failure will result in withdrawal from the Ph.D. program. A student may petition for admittance into the M. S. program.

## **E. REGISTERING FOR “THESIS WRITING.”**

When all program requirements have been completed, including all necessary research activity for generating required publications, a student may register for “Thesis Writing.” The student’s thesis committee, research advisor, and the program director must approve registration for “Thesis Writing”.

## **F. DISSERTATION AND DEFENSE**

The preparation and public oral defense of the Ph.D. dissertation are conducted as outlined in the Office of Biomedical Graduate Studies guidelines. In conjunction with the dissertation, the student must have submitted one manuscript and prepared a second manuscript for publication. The student's dissertation committee must approve the dissertation proposal and is responsible for evaluating the dissertation, conducting the oral defense, and recommending approval to the Associate Dean of Biomedical Graduate Studies. Students in the Molecular and Cell Biology and Genetics Graduate Program must submit their final, completed dissertation to their thesis committee at least two weeks prior to the oral defense date.

# **III. GUIDELINES FOR M.D./Ph.D. DEGREE**

## **A. PROGRAM**

1. Except where agreed upon by the student and his/her advisory committee, the MD/PhD program consists of two or three years of graduate work following the second pre-clinical year of medical school. The general schedule for the M.D./Ph.D. program is (1) complete the first two years of medical school. It is strongly recommended that students complete rotations and any required graduate school courses that are offered during the summers preceding formal enrollment into the Graduate Program, (2) complete the required graduate program courses, exams and research during the next three to four years, (3) complete the last two years of medical school, finishing and defending the dissertation prior to December 31st of the year of the return to Medical School.
2. The MD/PhD student completes all of the standard requirements of medical school, and all of the requirements for the Ph.D. degree, with the following exceptions:



- a. A single two-month lab rotation is required. A second rotation may be arranged if appropriate.
  - b. The same core and elective courses are required as for the Ph.D. degree, except where equivalent courses have been passed during medical school training.
  - c. Selection of the research advisor must be made immediately following the lab rotation(s).
  - d. Teaching is not required but may be arranged if requested by the student and approved by the Advisory Committee.
3. The M.D./Ph.D. student, upon entry into the graduate program, is equivalent to a beginning second year student, and as such will take the Qualifying Exam by the summer of the second year or fall of the third year. Rules for taking the Qualifying Exam and for the timeline of completion of all coursework are the same as for students in the Ph.D. program. A Dissertation (thesis) Committee must be established within six months of entering the program. The make up of the Dissertation Committee is the same as for students in the Ph.D. program. Dissertation Committee meetings must be held every six months or more frequently if deemed necessary by the research advisor, student, or thesis committee. It is the responsibility of each student to convene committee meetings every six months and to provide evidence of such meetings in writing to the Program Director and the Biomedical Graduate Studies office.
4. The program and manuscript-preparation requirements and the dissertation preparation and defense guidelines are identical to those of the Ph.D. program. The dissertation must be written and defended before returning for the last two years of medical school. In exceptional cases, the dissertation committee, in accord with the Office of Biomedical Graduate Studies guidelines, may grant an extension to this deadline.

#### **IV. GUIDELINES FOR MASTER OF SCIENCE PROGRAM (Thesis track)**

M.S. students will have specific research goals, relating to a chosen area of Molecular and Cell Biology and Genetics. There is an increasing demand within biotechnology industries for M.S. level research assistants with expertise in all areas of Molecular Biology and Genetics. Students who achieve outstanding performance during the M.S. may apply to the Ph.D. program and, if accepted, proceed with Ph.D. research after successfully completing the first-year core curriculum and Qualifying Exam. General requirements for admission to and completion of the M.S. program may be found in the Biomedical Graduate Studies Student Handbook. Specific departmental requirements are similar to those for the Ph.D. degree (see Guidelines for the Ph.D. program), with the exceptions and clarifications noted below.

##### **A. GENERAL REQUIREMENTS**

1. Full time M.S. students are expected to complete their program within three years, and in no more than four years.
2. A temporary advisory committee will be assigned upon admission to the program. After satisfactory completion of the first year, a formal advisory committee will be selected as described in the Graduate Student Handbook.
3. The teaching requirement is waived, but opportunities for teaching are

available to interested students.

4. Satisfactory performance is required on the Preliminary Examination, administered at the same time as for Ph.D. students (see above).

## **B. COURSE REQUIREMENTS**

1. Core curriculum, and at least two additional graduate level courses.
2. Additional required courses: Advanced Cell Biology, Biostatistics, Scientific Integrity and Ethics
3. Attendance at Journal Club and Seminar Series is required every semester.
4. A GPA of 3.0 must be maintained to successfully complete the program.

## **C. RESEARCH REQUIREMENTS**

1. The students will complete at least one and no more than three rotations in departmental laboratories by the end of the first year. It is highly recommended that M.S. students do no more than two laboratory rotations. These rotations are designed to expose the student to a variety of important techniques and research problems.
2. At any time after the first laboratory rotation, M.S. students can choose a thesis advisor. After completion of the Preliminary Exam, the student in conjunction with his/her thesis committee and advisor will select a research project with clearly defined objectives and feasibility. The thesis committee will consist of at least three members of the graduate faculty. Rules for taking and passing the preliminary exam are the same as for Ph.D. students except that if the student fails the preliminary exam (following one retake), the student must withdraw from the M.S. program.
3. The research project requires approximately one year of full time research. A suitable objective is the preparation of a publishable research paper.
4. The preparation and defense of the M.S. Thesis is conducted as described in the Graduate Student Handbook. The Thesis may follow the traditional format, or may consist of a research paper submitted or accepted for publication, with any additional material deemed necessary by the Thesis Committee.
5. Committee meetings will be held every six months or more frequently if deemed necessary by the student, research advisor, or thesis committee.

## **V. GUIDELINES FOR MASTER OF SCIENCE PROGRAM (Non-Thesis track)**

Students may enter the M.S. program in the non-thesis track. This track is predominately designed for individuals who may want to acquire an advanced degree so as to enhance already existing skills. For example a typical student might be an individual already working in industry or an individual wanting to learn specific laboratory skills. This track may also be an option for students unable to successfully complete the standard Ph.D. of M.S. program preliminary exam.

### **A. GENERAL REQUIREMENTS**

1. Students in the non-thesis master of science track are expected to complete their program within three years, and in no more than four years.
2. A temporary advisory committee will be assigned upon admission to the

program. After satisfactory completion of the first year, a formal advisory committee will be selected as described in the Graduate Student Handbook.

3. The teaching requirement is waived, but opportunities for teaching are available to interested students.
4. At the end of the first year, satisfactory performance is required on a Comprehensive Exam. The Comprehensive Exam will consist of a series of questions that are formulated by a faculty exam committee comprised of 3 faculty members of the MCBG program. A written response will be due three weeks after the faculty exam committee has forwarded the questions to the candidate.
5. At beginning of the second year, the student will choose an MCBG faculty advisor and, in consultation with the advisor, choose a topic for a scholarly literature review. Student will choose two additional committee members to evaluate the review. This review will be publication quality (although publication is not required for graduation). At the discretion of the student's evaluation committee, the student may be asked to present an oral summary of the written review.
6. Total credits required: minimum of 36 credits. Student must fulfill all course requirements including a minimum of 3 advanced level graduate courses. Students must maintain a minimum 3.0 grade-point-average to be considered in good academic standing.

## **B. COURSE REQUIREMENTS**

1. Core curriculum.
2. Additional required courses: Advanced Cell Biology, Biostatistics, Scientific Integrity and Ethics
3. Attendance at Journal Club and Seminar Series is required every semester.
4. A GPA 3.0 must be maintained to successfully complete the program.
5. At least three advanced elective courses.

## **C. RESEARCH REQUIREMENTS**

1. In most cases, a minimum of 2 lab rotations will be required. These would be designed to provide skills that would be useful for an industrial job search or supplement already existing skills (if student is already employed in industry).
2. For students who may want a non-thesis master, but no lab rotations (these may be students already employed in industry who are trying to acquire an advanced degree), additional coursework may be substituted for the lab rotations. Approval from the program director and steering committee would be required.
3. Committee meetings will be held every six months or more frequently if deemed necessary by the student, research advisor, or advisory committee.

### **CODE OF BEHAVIOR**

The Graduate Program in Molecular and Cell Biology and Genetics subscribes to the **Code of Behavior** for all of its members. This policy states that professional behavior appropriate to a faculty and students in an academic research setting is expected and required at all times. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

### **CODE OF ETHICS**

The Graduate Program in Molecular and Cell Biology and Genetics subscribes to the **Code of Academic Integrity** (presented in its complete form in the Student Handbook) for all its members. This policy states that cheating, plagiarism, forgery, or other forms of academic misconduct are not tolerated at our institution. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

## **JOURNAL CLUBS, SEMINARS AND LABORATORY ROTATIONS**

**Participation in the graduate program journal club and seminar series and successful completion of laboratory rotations are considered an integral part of the education of a graduate student. Accordingly, the Biomedical Graduate Education Committee has established the following guidelines for all graduate programs:**

### **Unsatisfactory Performance in Journal Clubs and Seminar**

Three unexcused absences are allowed per year for journal clubs and seminar. More than three absences will result in a grade of Unsatisfactory (U). The “U” must be remediated to the satisfaction of the program. If not, it will be grounds for dismissal.

### **Unsatisfactory Performance in Laboratory Rotations**

Laboratory rotations are graded on a Satisfactory (S) or Unsatisfactory (U) basis. Students receiving an “S” are rated on a performance scale ranging from Outstanding (1) to Poor (5). A “U” for a lab rotation is reserved for students that do not meet performance requirements, including attendance, of the rotation as stipulated by the program. A “U” for a laboratory rotation is grounds for dismissal.

**Drexel University College of Medicine  
Molecular and Cell Biology and Genetics  
Typical Graduate Program Schedule for First Year  
Required Courses**

**FALL**

Meet with Dr. Michael Bouchard, Advisor to New Graduate Students

<b>Core Curriculum I</b>	<b>6 credits</b>	<b>IDPT-521-05</b>
Molecular Structure and Metabolism		IDPT-522-05
Molecular Biology and Genetics		IDPT-523-05
<b>Special Topics in MCBG</b>	<b>2 credits</b>	<b>MCBG511S</b>
<b>Molecular &amp; Cell Biology &amp; Genetics 1<sup>st</sup> Lab Rotation</b>	<b>4 credits</b>	<b>MCBG-501-05</b>
<b>Molecular &amp; Cell Biology &amp; Genetics Journal Club</b>	<b>1 credit</b>	<b>MCBG-512-05</b>
<b>Molecular &amp; Cell Biology &amp; Genetics Seminar</b>	<b>1 credit</b>	<b>MCBG-513-05</b>

**SPRING**

Meet with Dr. Michael Bouchard, Advisor to New Graduate Students

<b>Core Curriculum II</b>	<b>6 credits</b>	<b>IDPT-526-05</b>
Cell Biology I		IDPT-527-05
Cell Biology II		IDPT-528-05
Cell Signaling and Cell Cycle		IDPT-529-05
Cells to Systems		IDPT-530-05
<b>Advanced Cell Biology</b>	<b>3 credits</b>	<b>MCBG-506-05</b>
<b>Biostatistics</b>	<b>2 credits</b>	<b>IDPT-501-05</b>
<b>Molecular &amp; Cell Biology &amp; Genetics 2<sup>nd</sup> Lab Rotation</b>	<b>4 credits</b>	<b>MCBG-502-05</b>
<b>Molecular &amp; Cell Biology &amp; Genetics Journal Club</b>	<b>1 credit</b>	<b>MCBG-512-05</b>
<b>Molecular &amp; Cell Biology &amp; Genetics Seminar</b>	<b>1 credit</b>	<b>MCBG-513-05</b>

Preliminary Examination Committee Meeting (by August 1)

**SUMMER**

<b>Molecular &amp; Cell Biology &amp; Genetics 3<sup>rd</sup> Lab Rotation</b>	<b>4 credits</b>	<b>MCBG-503-05</b>
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\*\*Choose Research Advisor by 8/31

**Drexel University College of Medicine  
Molecular and Cell Biology and Genetics  
Typical Graduate Program Schedule for Second Year  
Required and Elective Courses**

**FALL**

<b>Thesis Research</b>	<b>9 credits</b>	<b>MCBG-600-05</b>
<b>Journal Club</b>	<b>1 credit</b>	
<b>Seminar Series</b>	<b>1 credit</b>	
<b>Elective</b>	<b>3 credits</b>	
<b>Elective</b>	<b>3 credits</b>	
*Committee Meeting		

**SPRING**

<b>Elective</b>	<b>3 credits</b>	
<b>Thesis Research</b>	<b>9 credits</b>	<b>MCBG-600-05</b>
<b>Scientific Integrity and Ethics</b>	<b>3 credits</b>	<b>IDPT-500-05</b>
<b>Seminar Series</b>	<b>1 credit</b>	
<b>Journal Club</b>	<b>1 credit</b>	
*Committee Meeting		

Preliminary Exam Summer of 1st year  
Written and oral segments must be passed.

Qualifying Exam - Mock NIH Grant Proposal by summer of second year or no later than November 1 of third year. Written and oral segments must be passed.

*The student has the opportunity to take elective courses chosen with consent from the Advisory Committee*