Biochemistry and Molecular Biology

lsalati@hsc.wvu.edu

Degrees Offered

• Doctor of Philosophy
• Joint Doctor of Medicine and Doctor of Philosophy

The disciplines of biochemistry and molecular biology seek to understand biology by exploring the functions of the molecular components of cells. A major goal of this program is to foster ability for independent thought. To this end, our faculty cultivates an open, collegial relationship with one another and with our students. Close collaboration between scientists, the sharing of ideas, and open inquiry are critical components of our training plan. Our goal is to develop independence as a scientist.

The hallmarks of graduate training in biochemistry and molecular biology are the emphasis placed on the use of the scientific literature in advanced coursework and on protecting time for laboratory research. In addition, students will have time for professional development through seminar presentation, attendance at national meetings, teaching opportunities, and seminar programs both within the department and throughout the Health Sciences Center.

Faculty research in the program can provide the student with training in multiple basic sciences areas:

• Regulation of gene expression
• Chromatin silencing
• RNA processing
• Cell survival mechanisms
• Intermediary metabolism
• Regulation of signal transduction by nutrients and metabolites
• Nutritional biochemistry
• Cell proliferation and cell cycle regulation
• Cell adhesion
• Ion channel biochemistry
• Kinases and phosphatases in signal transduction mechanisms involved in cancer cell metabolism
• Spirochete biology
• Oxidant-induced cellular stress
• Structure/function relationships of proteins
• Molecular genetics of visual and auditory development
• G protein-mediated signaling in retina photoreceptors
• Molecular basis of age-related blindness

These research areas provide fundamental knowledge toward both the normal health-state and the amelioration of multiple diseases: atherosclerosis, blindness, cancer, deafness, diabetes, and metabolic disorders.

FACULTY

GRADUATE PROGRAM DIRECTOR

• Lisa Salati - Ph.D. (University of Minnesota)

Doctor of Philosophy

A major goal of the doctoral program in Biochemistry and Molecular Biology is to foster the student’s ability for independent thought, in preparation for a career as an independent scientist. To that end, faculty cultivate an open, collegial relationship with each other and graduate students which facilitates the sharing of ideas and open inquiry. Emphasis on use of scientific literature and laboratory research characterize the curriculum after successful completion of the undifferentiated first year. During the second year, specialized courses in biochemistry are offered as students continue their research projects. During subsequent years, students emphasize independent dissertation research, and a few formal courses may be taken.

Students have access to training in multiple topics related to the field. For a more comprehensive list, please visit the department web site at: http://medicine.hsc.wvu.edu/Biochemistry/Education/Graduate
Completion of the Ph.D. program is realized when the student successfully presents the research results to both the department and their graduate advisory committee. Typically, four to five years are required to realize this goal.

**Biomedical Sciences Integrated Core Curriculum**

NOTE: The graduate curriculum is finalized with a plan of study once the mentor and laboratory have been selected in the second year. The plan of study developed by the graduate committee, in consultation with the student, is the definitive curriculum necessary for award of the graduate degree. The courses listed below include the required courses of the undifferentiated first year and a representation of electives necessary for the student to finalize their plan of study. As the student enters years 3-5 of their graduate education and transfers most of their study to work in the laboratory of their doctoral mentor, repetitive enrollments in research, seminars and colloquia are typical and will determine total hours necessary for degree completion.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BMS 700</td>
<td>Scientific Integrity</td>
<td>1</td>
</tr>
<tr>
<td>BMS 705</td>
<td>Cell Structure/Metabolism</td>
<td>1-4</td>
</tr>
<tr>
<td>BMS 710</td>
<td>Fund Integrated Systems</td>
<td>1-4</td>
</tr>
<tr>
<td>BMS 715</td>
<td>Molecular Genetics</td>
<td>1-3</td>
</tr>
<tr>
<td>BMS 720</td>
<td>Scientific Writing</td>
<td>2</td>
</tr>
<tr>
<td>BMS 791</td>
<td>ADTP:Biomedical Sci Rotations</td>
<td>1-6</td>
</tr>
<tr>
<td>BMS 796</td>
<td>Graduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td>BMS 797</td>
<td>Research</td>
<td>1-6</td>
</tr>
<tr>
<td>BMS 799</td>
<td>Graduate Colloquium</td>
<td>1-6</td>
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Electives from at least TWO of the courses below

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BMS 730</td>
<td>Cancer Cell Biology</td>
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<tr>
<td>BMS 732</td>
<td>Cardiovasc/Respirat Biol</td>
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<tr>
<td>BMS 734</td>
<td>Cell Signaling Metabolism</td>
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<tr>
<td>BMS 736</td>
<td>Immunology &amp; Microbial Patho</td>
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<tr>
<td>BMS 738</td>
<td>Muscle Structure/Function</td>
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<tr>
<td>BMS 740</td>
<td>Neuroscience 2</td>
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<tr>
<td>BMS 793</td>
<td>SPTP:Transltnl Cardiovsclr Sci</td>
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**BIOCHEMISTRY AND MOLECULAR BIOLOGY CURRICULUM**

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOC 750</td>
<td>Protein Chemistry/Enzymology</td>
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<tr>
<td>BIOC 751</td>
<td>Advance Molecular Biology</td>
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One additional Advanced Course

Required every semester beginning in Year 2

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<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>BIOC 785</td>
<td>Biochem Mol Bio Journal Club</td>
</tr>
<tr>
<td>BIOC 797</td>
<td>Research</td>
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**SEMINARS AND RESEARCH FORUM**

The student will present three seminars during their graduate study. One seminar will be the dissertation proposal which is the background and proposed research for the dissertation project.

**JOURNAL CLUB**

Students are required to enroll in Journal Club each semester. The course involves presentation and discussion of current research papers and will help acquaint students with the variety of methods used in scientific research.

**DOCTORAL RESEARCH**

Students will work with a dissertation advisor during time in the program. Students register for research credits each semester, and their performance is graded by their dissertation advisor.

**PHD CANDIDACY AND DISSERTATION**

Admission to candidacy occurs following successful completion of the qualifying exams, which have both written and oral components. The written qualifying exam is given prior to beginning the second year of study. The dissertation proposal is completed by the end of the third year of study.
DISSERTATION PREPARATION, SEMINAR, AND DEFENSE

Students will not be allowed to defend their dissertation without a minimum of one paper in press in a peer-reviewed journal, on which the student is first author. The final examination for the PhD will consist of presenting a dissertation seminar before the advisory committee and others before continuing on with the dissertation defense before the advisory committee. Satisfactory performance in the oral defense will result in recommendation for granting of the PhD.

COURSES

BIOC 531. General Biochemistry. 4 Hours.
PR: General chemistry, organic chemistry. (For pharmacy students; others by consent.) Consisting of the lecture portion of BIOC 705, this course is designed to be a general introduction to biochemical compounds, processes and concepts for students in the pharmacy program. Master's program students and others by consent. Four lectures per week.

BIOC 551. Cell/Molecular Biochemistry 1. 4 Hours.
PR: General Chemistry and Organic Chemistry. Part I of a two-semester graduate-level course that instills comprehension of biochemistry, molecular biology and cell biology necessary for bio-medical research. This course covers biochemical principles, proteins, and molecular biology.

BIOC 552. Cell/Molecular Biochemistry 2. 4 Hours.
PR: BIOC 351. Part II of a two-semester graduate-level course that instills comprehension of biochemistry, molecular biology and cell biology necessary for bio-medical research. This course covers metabolism, metabolic regulation, cell structure and cellular communication.

BIOC 595. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

BIOC 650. Supervised Teaching. 1-6 Hours.
PR: Consent. Supervised college teaching of biochemistry.

BIOC 652. Journal Club. 1-6 Hours.
Discussions of recent important topics in scientific literature.

BIOC 690. Teaching Practicum. 1-3 Hours.
PR: Consent of chairperson. Supervised practice in college teaching of biochemistry. (Graded as S/U.).

BIOC 693A-Z. Special Topics. 1-18 Hours.
A study of contemporary topics selected from recent developments in the field.

BIOC 697. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper, or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

BIOC 698. Thesis. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

BIOC 699. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use the University’s facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department’s 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.

BIOC 705. General Biochemistry. 5 Hours.
PR: General chemistry, organic chemistry. (For dental students.) General introduction to biochemical compounds, processes and concepts as part of the training for the practice of dentistry, including passage of the Dental Board Exam. Four lectures and one clinical correlation or small group discussion per week.

BIOC 750. Protein Chemistry/Enzymology. 4 Hours.
PR: Consent. Advanced topics in protein structure function relationships and enzymology. Emphasis is placed on emerging topics in the literature.

BIOC 751. Advance Molecular Biology. 4 Hours.
PR: Consent. A study of contemporary topics in molecular biology. This is an advanced seminar-style class using material from the current literature.

BIOC 785. Biochem Mol Bio Journal Club. 1 Hour.
(May be repeated for a maximum of 16 credit hours.) Guided reading and critiquing of the current scientific literature for graduate students in the Biochemistry and Molecular Biology Graduate Programs.

BIOC 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of biochemistry. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.).
BIOC 791A-Z. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

BIOC 792A-Z. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

BIOC 793A-Z. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

BIOC 794A-Z. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

BIOC 796. Graduate Seminar. 1 Hour.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

BIOC 797. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

BIOC 798. Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

BIOC 799. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use the University’s facilities, and participate in its academic and cultural programs. Note: graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department’s 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.