Immunology and Microbial Pathogenesis

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Degrees Offered
• Doctor of Philosophy
• Joint Doctor of Medicine and Doctor of Philosophy

Faculty members and students explore diverse areas of inquiry related to the medical implications of microbes and the human body’s response to them.

Current Research Areas
• Immunology
• Effects of man-made pesticides and herbicides on the immune system
• Effects of heavy metals on the immune system
• Biochemistry of inflammatory cytokines
• Immune response in bacterial and viral diseases
• Regulation of signal transduction in immune responses
• Molecular aspects of cell signaling as it relates to cancer chemotherapy and cell growth
• Peptide and DNA vaccines for contraception
• Microbiology
• Physiology of pathogenic microbes
• Microbial genetics
• Mechanisms of bacterial pathogenesis
• Chemotaxis and motility
• Interactions between microbes and their hosts
• Molecular mimicry and structure-function relationship of bacterial virulence factors
• Microbial biofilms

The major purpose of graduate education in the program is research training. The basic philosophy of the program is that students acquire a strong foundation in the basic concepts of immunology and microbial pathogenesis and have flexibility in choosing advanced coursework in their specific areas of interest. A major emphasis of the graduate program is extensive laboratory research in microbiology, immunology, microbial pathogenesis, and cell biology. Each student will complete an original, in-depth research investigation. The overall aim of the program is to produce students capable of designing and doing independent research and teaching.

Program Requirements
Every student must take the required courses in the first year common core curriculum. Once students acquire a strong foundation in the core biomedical concepts, we offer flexibility in choosing advanced coursework in specific areas of interest. The remainder of the coursework is selected by the student and the Advisory Committee. Enrollment in MICB 796 Graduate Seminar and MICB 785 Immunol Micro Journal Club is required each semester that the student is in residence. All full-time students in this graduate program are required to participate in teaching at least one semester a year for two years (MICB 790 Teaching Practicum).

FACULTY

GRADUATE PROGRAM DIRECTOR
• John Barnett - Ph.D. (University of Louisville)

PROFESSORS
• Nyles Charon - Ph.D. (University of Minnesota)
• Christopher Cuff - Ph.D. (Temple University)
• Thomas Elliott - Ph.D. (University of California San Diego)
• Laura F. Gibson - Ph.D. (West Virginia University)
• Kenneth Landreth - Ph.D. (University of Washington)
• Rajesh Naz - Ph.D. (All India Institute of Medical Sciences, New Delhi)
• Vazhaikkurichi Rajendran - Ph.D. (University of Madras)
ASSOCIATE PROFESSORS

- Slawomir Lukomski - Ph.D. (University of Lodz, Poland)
- Joan C. Olson - Ph.D. (Oregon Health Sciences University)
- Rosana Schafer - Ph.D. (Temple University)
- James M. Sheil - Ph.D. (University of Kentucky)

ASSISTANT PROFESSORS

- Kathy Brundage - Ph.D. (University of Pennsylvania)
- Ivan Martinez - Ph.D. (University of Pittsburgh)
- Valerie Watson - M.S. (West Virginia University)

ADJUNCT PROFESSOR

- David Weissman - Ph.D. (Northwestern University)

ADJUNCT ASSISTANT PROFESSORS

- Brett J. Green - Ph.D. (University of Sydney)
- David Klinke - Ph.D. (Northwestern University)

Doctor of Philosophy

After completion of the first-year, integrated core curriculum, the doctoral student takes additional coursework as determined by the student's Graduate Research Advisory Committee. Students will be expected to complete at least two additional graduate-level courses (numbered 700 or above) beyond the basic required courses taken as part of the common core curriculum in the first year of graduate school and those listed above. Where appropriate, coursework in related subjects such as computer science, cell biology, biochemistry, physical chemistry, and statistics is required. MICB 796 Graduate Seminar is a required course each semester that the student is in residence. The doctor of philosophy program requires a dissertation representing the results of an original research investigation and the passing of a written qualifying and final oral examination. The qualifying examination is given at the end of the first year of study. The final oral examination is given after completion of research and an acceptable dissertation. All full-time students are required to participate in teaching at least one semester a year for two years.

For a description of faculty research interests, guidelines for graduate study in the graduate program of immunology and microbial pathogenesis, or additional information, visit our website at, http://medicine.hsc.wvu.edu/micro/.

All applications are accepted electronically and must be submitted via the official WVU Graduate Education application, available via the link below. Please read all instructions carefully and be sure to submit your application materials directly to the Office of Admissions at:

Office of Admissions
One Waterfront Place
PO Box 6009 | Morgantown, WV 26506-6009
Phone: 304-293-2121 | Fax: 304-293-8832
Email: wvuadmissions@mail.wvu.edu

The admissions application is available here:
https://app.applyyourself.com/AYApplicantLogin/fl_ApplicantConnectLogin.asp?id=wvugrad

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</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<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>
</tbody>
</table>
**IMMUNOLOGY AND MICROBIAL PATHOGENESIS CURRICULUM**

Students wishing to pursue doctoral education in immunology and microbial pathogenesis will advance coursework and courses from the following list. The definitive list of graduation requirements is the graduate plan of study, developed by the student in conjunction with their mentor and graduate committee.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BMS 730</td>
<td>Cancer Cell Biology</td>
<td>2-3</td>
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<tr>
<td>BMS 732</td>
<td>Cardiovasc/Respirat Biol</td>
<td>3</td>
</tr>
<tr>
<td>BMS 734</td>
<td>Cell Signaling Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BMS 736</td>
<td>Immunology &amp; Microbial Patho</td>
<td>3</td>
</tr>
<tr>
<td>BMS 738</td>
<td>Muscle Structure/Function</td>
<td>2-3</td>
</tr>
<tr>
<td>BMS 740</td>
<td>Neuroscience 2</td>
<td>2-3</td>
</tr>
<tr>
<td>BMS 793</td>
<td>SPTP:Transltnl Cardiovsclr Sci</td>
<td>1-6</td>
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</tbody>
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**JOURNAL CLUB**

Students are required to enroll in the 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.

**PH.D. 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 at the end of the second year of study. The dissertation proposal is completed during the third year of study.

**DISSERTATION PREPARATION, SEMINAR, AND DEFENSE**

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**

**MICB 592A-Z. Directed Study. 1-6 Hours.**
Directed study, reading, and/or research.

**MICB 593A-Z. Special Topics. 1-6 Hours.**
A study of contemporary topics selected from recent developments in the field.

**MICB 691A-Z. Advanced Topics. 1-6 Hours.**
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

**MICB 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.)

**MICB 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.
MICB 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.

MICB 702. Microbiology. 5 Hours.
(For dental students only.) PR: Organic chemistry. Detailed study of pathogenic microorganisms. Emphasis on oral flora.

MICB 781. Advanced Immunology. 3 Hours.
PR: BMS 710 and BMS 736 or MICB 701 or permission from the instructor. Students participate in a study of contemporary topics using primary literature selected from recent developments in the field of immunology.

MICB 784A. SPPR:Microbiology. 1-6 Hours.
PR: Consent.

MICB 784B. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784C. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784D. SPPR:Cell Structure/Metabolism. 1-6 Hours.
PR: Consent.

MICB 784E. SPPR:Fundmt Integrated Systems. 1-6 Hours.
PR: Consent.

MICB 784F. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784G. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784H. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784I. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784J. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784K. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784L. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784M. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784N. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784O. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784P. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784Q. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784R. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784S. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784T. Special Problems. 1-6 Hours.
PR: Consent.
MICB 784U. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784V. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784W. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784X. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784Y. Special Problems. 1-6 Hours.
PR: Consent.

MICB 784Z. Special Problems. 1-6 Hours.
PR: Consent.

A review of contemporary topics selected from developments in the field during the current year.

MICB 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of microbiology. 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 P/F.)

MICB 791A-Z. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

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

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

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

MICB 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

MICB 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.

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

MICB 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.

MICB 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.

MICB 801. Immunity/Infection and Disease. 9 Hours.
An integrated approach to the study of infectious disease in humans, with focus on innate and acquired immunity, mechanisms of pathogenesis of infectious microorganisms, transmission, and treatment.