Student learning outcomes

1. Oral communication skills: The candidate will demonstrate the achievement of an appropriate level of oral communication skills with respect to the content, organization, logical flow, presentation and appropriate use of language incorporating the use of visual aids, as measured by rubric.

2. Written communication skills: The candidate will demonstrate the achievement of an appropriate level of written communication skill with respect to grammar, syntax, spelling and use of vocabulary to effectively present information including the use of figures, tables and citations as measured by rubric.

3. Experimental design: The candidate will demonstrate the achievement of an appropriate level of competence in the ability to appraise, modify and/or create, and implement experimental protocols and to design and develop experiments as measured by rubric.

4. Problem-solving skills: The candidate will demonstrate an appropriate level of skill in the identification and selection of meaningful problems to be addressed in bioscience research, including the ability to defend said identifications and to design and develop appropriate methods to solve said problems as measured by rubric.

5. General knowledge of science: The candidate should demonstrate a general knowledge of the elements of the sciences as related to molecular/cellular bioscience and a detailed knowledge of his or her area of research, including an appropriate familiarity with the research literature.
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**Admission requirements**

<table>
<thead>
<tr>
<th>Degree</th>
<th>Semester(s) of entry</th>
<th>Deadline dates</th>
<th>Test requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.D.</td>
<td>Fall</td>
<td>Applications received prior to Jan 15</td>
<td>TOEFL if international</td>
</tr>
</tbody>
</table>

**Special requirements**

- Applications for the program must be submitted to the Biomedical Sciences Doctoral Portal – School of Medicine – Ph.D. selected from the drop-down menu of programs on the VCU online application form. In addition to the general admission requirements of the VCU Graduate School ([http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/](http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/)), successful applicants will typically have the following credentials:

1. A baccalaureate degree or its equivalent at the time of enrollment, with an undergraduate GPA of 3.5
2. TOEFL scores of 600 (pBT), 250 (cBT) or 100 (iBT) for individuals for whom English is a second language; or 6.5 on the IELTS (To report GRE or TOEFL score, use VCU Code 5570.)
3. Personal statements, which should include: long-term career goals to assess reasons behind the candidate’s application; how a Ph.D. in biomedical science helps achieve those goals; the factors motivating a career in research; research experience, including dates, places and duration
4. Three letters of recommendation that speak to the scientific competency and experience of the applicant
5. The equivalent of two semesters of general chemistry, two semesters of organic chemistry and two semesters of upper-level biology courses (e.g. cell biology, molecular biology, biochemistry, genetics, neuroscience, physiology, biophysics, etc.)

**Degree requirements**

In addition to the general VCU Graduate School graduation requirements ([http://bulletin.vcu.edu/academic-regs/grad/graduation-info/](http://bulletin.vcu.edu/academic-regs/grad/graduation-info/)), students must complete a minimum of 58 graduate credit hours. At least six credits must come from didactic 600-level courses.

The Department of Microbiology and Immunology has an outstanding faculty with diverse research interests that include cell and molecular biology, molecular genetics, molecular pathogenesis, bacteriology, immunology, immunotoxicology, virology, parasitology, mycology and oncology. The goal of the graduate program is to prepare students to become creative problem-solvers and leaders in scientific research. The Ph.D. degree is offered, as well as an M.D.-Ph.D. option for medical students interested in academic or research careers, and a master's degree.

The research experience is complemented with excellent course offerings, seminar programs, teaching opportunities, presentations at scientific meetings, writing of a grant application and writing of scientific papers. Graduate students acquire a wide range of research experience in the first year through exposure to a variety of research laboratories and investigators. The student matches with a research adviser, completes a written and oral examination and then carries out an original independent research project under the direction of the adviser. The project falls under the review of a graduate advisory committee, and a written dissertation is defended in a final examination.

A cumulative GPA of 3.0 (with no more than six credit hours of a C grade) is required to maintain satisfactory academic progress.

**Course requirements**

**Note:** First-year Ph.D. students in the Biomedical Sciences Doctoral Portal should earn a minimum of seven credits of didactic courses in the fall semester to be eligible to matriculate into Ph.D. program in microbiology and immunology. Three of these credits must come from MICR 505 or MICR 515.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBMS 600</td>
<td>Laboratory Safety</td>
<td>1</td>
</tr>
<tr>
<td>IBMS 620</td>
<td>Laboratory/Clinical Rotations (three rotations)</td>
<td>6</td>
</tr>
<tr>
<td>MICR 505</td>
<td>Immunobiology</td>
<td>3</td>
</tr>
<tr>
<td>MICR 515</td>
<td>Principles of Molecular Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MICR 690</td>
<td>Microbiology Research Seminar (taken each fall and spring semester; minimum eight credits)</td>
<td>8</td>
</tr>
</tbody>
</table>

**Required additional courses**

Select at least one of the following (satisfies three credits of six-credit 600-level didactic requirement):

- MICR 605 | Prokaryotic Molecular Genetics | 3 |
- MICR 616 | Mechanisms of Viral and Parasite Pathogenesis | 3 |
- MICR 618 | Molecular Mechanisms of Bacterial Pathogenesis | 3 |
- MICR 686 | Advanced Immunobiology | 2 |

Select one of the following journal club courses for one semester every year (four credits minimum):

- MICR 692 | Current Topics in Molecular Pathogenesis | 4 |
- MICR 693 | Topics in Molecular Biology and Genetics | 4 |
- MICR 694 | Current Topics in Immunology | 4 |
- OVPR 601 | Scientific Integrity | 1 |
- or OVPR 602 | Responsible Scientific Conduct | 1 |
- or OVPR 603 | Responsible Conduct of Research | 1 |

**Elective courses**

Select at least two credits from the following: 2

- MICR 607 | Techniques in Molecular Biology and Genetics | 2 |
- MICR/BNFO 653 | Advanced Molecular Genetics: Bioinformatics | 2 |
- MICR 684 | Molecular Biology of Cancer | 2 |

**Dissertation research**

- MICR 697 | Directed Research in Microbiology | 27 |

**Total Hours**

- 58
Offered in alternate years

May be repeated with different content to satisfy the six-credit 600-level didactic requirement.

The minimum total of graduate credit hours required for this degree is 58.

**Typical plan of study**

Many students often end up taking more than the minimum number of hours required for a degree program. The total number of hours may vary depending upon the program, nature of research being conducted by a study or in the enrollment or funding status of the student. Students should refer to their program websites and talk with their graduate program directors or advisers for information about typical plans of study and registration requirements.

**M.D.-Ph.D. opportunity**

The M.D.-Ph.D. program allows students to pursue both the M.D. and Ph.D. degrees using a coordinated program of study and apply a limited number of M.D. requirements toward fulfillment of requirements for the Ph.D. See the dual degree program page (http://bulletin.vcu.edu/graduate/dual-degree-opps/md-microimm-phd/) for additional details.

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(804) 828-9728

**Program website:** vcu.edu/micro (http://www.vcu.edu/micro/)