Microbiology, Ph.D.

The Department of Bacteriology in the College of Agricultural and Life Sciences and the Department of Medical Microbiology and Immunology in the School of Medicine and Public Health (see separate course listings) administer the interdepartmental microbiology doctoral training program (MDTP). Incoming students have the opportunity to do laboratory rotations with any of the primary faculty, affiliate faculty, and trainers from multiple departments. This group includes more than 90 faculty members in numerous departments and programs involved in microbiology research and graduate training. In addition to this breadth of opportunities in microbiology research training, the program also encompasses graduate courses offered by both departments.

The Ph.D. program prepares graduates for research and teaching positions in universities and colleges, for industry or government, and for clinical microbiology.

Research emphasis includes, but is not limited to, prokaryotic (bacteria and archaea), viral and lower eukaryotic systems (fungi, oomycetes, and parasites); antibiotics and antibiotic resistance, biofilm formation; bioinformatics and computational biology; biotechnology and industrial microbiology, including biofuels; cell–cell signaling; cell motility and chemotaxis; DNA, including nucleic acid synthesis, DNA replication and recombination; food microbiology; fungal development, pathogenesis, and metabolism; gene expression and its regulation; immunology; microbial physiology and metabolism; macrophage activation and other cell immune systems; mechanisms of microbial persistence; mechanisms of pathogenesis; microbial cell division; microbial ecology; microbial microbiota and metagenomics; nitrogen fixation; quorum sensing; RNA, including molecular structure–function relationships of transfer RNA, small RNAs, RNA polymerase, and other components of transcription and translation; secondary metabolism; structural microbiology; symbioses, including host–microbe symbioses, plant–microbial interactions, animal–microbial interactions, microbe–microbe interactions; and virology, including host–virus interactions. Dissertation research emphasizes creative and innovative problem-solving using basic knowledge acquired through scientific interactions and collaborations in addition to a thorough understanding of the scientific literature.

In order to better train MDTP students for microbiology-related professions, students need a chance to gain knowledge and experience not just in academic research, but also in other fields where their microbiology education may be put to good use.

The professional development options encompass many professional development opportunities for MDTP students beyond academic research and teaching. Opportunities for professional development can consist of course work, an internship, a summer workshop, outreach experiences, or a second teaching-practicum experience.

Double Degree

Students may complete a double Ph.D. degree in MDTP and another program on campus under the following conditions. The student must apply for admission to MDTP by the program’s yearly deadline and be admitted using the same criteria applied to other applicants. The student must complete all requirements of the MDTP program in addition to the requirements for the other program sponsoring the double degree. The student must pass a different preliminary examination in each program. The student’s dissertation committee and preliminary examination must adhere to MDTP guidelines. The Ph.D. advisor must be a trainer in the MDTP. A significant portion of the student’s dissertation research must be completed in the laboratory of the Ph.D. advisor. The student’s program, including any deviations, must be approved by the steering committee.

Funding

Research assistantships are available for most students from department and college-level funding sources or from competitive fellowship and traineeship awards, with continued support contingent upon adequate progress in classes and research. Applicants with outstanding records will be nominated for special fellowships or for traineeships on one of several NIH training grants awarded to UW–Madison.

Requirements

Minimum Degree Requirements and Satisfactory Progress

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

Doctoral Degrees

Ph.D.

Minimum Graduate Degree Credit Requirement

51 credits

Minimum Graduate Residence Credit Requirement

32 credits

Minimum Graduate Coursework (50%) Requirement

At least 50% of credits applied toward the graduate degree credit requirement must be in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

Prior Coursework Requirements from: Graduate Work from Other Institutions

With program approval, up to 9 credits of coursework may be accepted from other graduate institutions. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

Prior Coursework Requirements from: UW–Madison Undergraduate

For well-prepared advanced students, the program may decide to accept up to 7 credits numbered 300 or above completed at UW–Madison toward fulfillment of minimum degree and minor credit requirements. This work would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.
PRIOR COURSEWORK REQUIREMENTS FROM: UW--MADISON UNIVERSITY SPECIAL
The program may decide to accept up to 9 University Special student credits as fulfillment of the minimum graduate residence, graduate degree, or minor credit requirements on occasion as an exception (on a case-by-case basis). UW–Madison coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED
15 credits

PROGRAM-SPECIFIC COURSES REQUIRED
Contact the program for information on any additional required courses.

DOCTORAL MINOR/BREADTH REQUIREMENTS
Doctoral students must complete a doctoral minor.

OVERALL GRADUATE GPA REQUIREMENT
3.00

OTHER GRADE REQUIREMENTS
The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

PROBATION POLICY
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR
Every graduate student is required to have an advisor. An advisor is a faculty member, or sometimes a committee, from the major department responsible for providing advice regarding graduate studies. An advisor generally serves as the thesis advisor. In many cases, an advisor is assigned to incoming students. Students can be suspended from the Graduate School if they do not have an advisor.

To ensure that students are making satisfactory progress toward a degree, the Graduate School expects them to meet with their advisor on a regular basis. A committee often accomplishes advising for the students in the early stages of their studies.

ASSESSMENT AND EXAMINATIONS
Doctoral students are required to take a comprehensive preliminary/oral examination after they have cleared their record of all Incomplete and Progress grades (other than research and thesis). Deposit of the doctoral dissertation in the Graduate School is required.

TIME CONSTRAINTS
Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

LANGUAGE REQUIREMENTS
Contact the program for information on any language requirements.

ADMISSIONS
Admission to MDTP is highly competitive. To qualify for admission to the microbiology program, an applicant should have a bachelor’s degree from an accredited institution with a GPA of at least 3.0 (on a 4.0 scale) that includes two semesters of biology (can include microbiology); one semester of genetics; four semesters of chemistry, including two semesters of organic chemistry with lab component; one semester of biochemistry; two semesters of physics; and two semesters of calculus or one semester of calculus and one semester of statistics. Deficiencies in excess of six semester credits should be removed before enrollment. An on-line application must be accompanied by a thoughtful essay, strong letters of recommendation from three persons who are familiar with the applicant’s academic ability and who can assess the applicant’s potential for a research career, transcripts from all undergraduate and graduate institutions attended, and an academic resume or CV. Previous research experience is strongly recommended. All applicants must provide scores from the general Graduate Record Exam (GRE), the subject test in a related discipline is not required; students whose undergraduate degree was obtained in an institution in which English was not the primary language of instruction must provide evidence of English proficiency by taking the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) exam.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• Gain a broad understanding of the microbiology principles that underlie all biological processes.
• Articulate, discuss and define limits to the theory and knowledge in microbiology.
• Think critically to address research challenges using a broad range of the theories, research methods, and approaches to scientific inquiry.
• Communicates complex ideas in a clear and understandable manner.
• Collaborate with investigators within the program, university, and beyond to advance the science of microbiology.

PROFESSIONAL CONDUCT
• Foster professional and ethical conduct in the sciences.
• Ethical design of experimental protocols.
• Reproducibility of experimental results.
• Professional behavior in industrial, government and academic settings.
**ADDITIONAL LEARNING GOALS**

- Develop communication skills that enable the articulation of research to fellow scientists and non-scientists.
- Develop teaching and mentoring skills in both lecture and laboratory settings.
- Explore career development opportunities in industry, government, academia and private industry to realize professional goals.

**PEOPLE**

**Faculty:** Professors Nancy Keller (program director, Medical Microbiology and Immunology), and Garret Suen (vice-director, Bacteriology) lead the current MDTP Steering Committee. For a list of more than 90 participating faculty, see the program website (http://www.microbiology.wisc.edu) or contact the program office.