

# Microbiology

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## Department Information

- **Interim Department Head:**  
John McEvoy, Ph.D.
- **Graduate Coordinator:**  
Glenn Dorsam, Ph.D.
- **Department Location:**  
Van Es Hall
- **Department Phone:**  
(701) 231-7512
- **Department Web Site:**  
[www.ndsu.edu/microbiology/](http://www.ndsu.edu/microbiology/)
- **Application Deadline:**  
February 1 for fall
- **Credential Offered:**  
Ph.D., M.S.
- **Test Requirement:**  
GRE
- **English Proficiency Requirements:**  
TOEFL iBT 71, IELTS 6

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## Program Description

The Department of Microbiological Sciences offers graduate study leading to an M.S. in Microbiology and a Ph.D. in Microbiology. Faculty in the department have expertise in medical microbiology, ecology, genomics, virology, immunology, parasitology, microbial physiology, and food safety. The M.S. in Microbiology emphasizes research methodology and laboratory techniques. The Ph.D. in Microbiology is an outcomes-based program focused on developing young project leaders in a number of possible career directions.

## M.S. in Microbiology

A Master's degree in Microbiology at NDSU emphasizes research methodology and laboratory techniques. Student research and academic programs support a strong foundation of knowledge in microbiology and are individually tailored to meet the needs and interests of each student. Graduates are prepared for positions in research or commercial laboratories or for further graduate study. Students shall select a major adviser by the end of the first semester in residence. By the end of the first year in residence, the student and major adviser will select a supervisory committee. Students can earn an M.S. in Microbiology by completing a research thesis under the advisement of a research faculty member or by completing a comprehensive research paper in the program.

## Ph.D. in Microbiology

The Ph.D. program in Microbiology encompasses many subdisciplines, including microbial ecology and evolution, virology, vaccine development, food microbiology, soil microbiology, plant-microbe and animal-microbe interactions, microbiome research, biofilm research, immunology, and host-pathogen interactions. The program trains students in the foundation of knowledge, process of inquiry, and philosophy of microbiology. It breaks with traditional programs by focusing training on seven well-defined learning outcomes that can be attained with or without supporting coursework. This includes outcomes for professional, ethical and civic development. Under this system, we expect that a graduating doctoral student will be able to:

1. Demonstrate professional and ethical behavior consistent with the expectations of the discipline
2. Independently formulate hypotheses based on current concepts in the field
3. Conduct and interpret their own research projects relevant to societal challenges and the field of study
4. Demonstrate proficiency with a variety of classical and modern microbiology and/or immunology techniques
5. Disseminate scientific research results
6. Develop professional soft skills to be competitive in the job market
7. Demonstrate civic responsibility, citizenship and inclusiveness.

Required coursework in the typical program (five years) is 18 credit hours with the remaining 72 credits customizable to the student's training needs.

In the absence of course requirements, the program holds students accountable for year-over-year progress toward the learning goals via annual assessments of student progress by the mentor and research advisory committee.

In addition to the Graduate School requirements (<https://bulletin.ndsu.edu/graduate/admission-information>), applicants must have evidence of a strong academic record in the biological sciences. The following science courses are required or recommended:

### **Biology**

- One year of general biology with laboratory (required)
- One course in genetics (required)
- At least one course in cellular biology, cellular physiology, animal physiology, or bacterial physiology (required)
- Microbiology and immunology (recommended)

### **Chemistry**

- One year of general chemistry with laboratory (required)
- Two sequential terms of organic chemistry with a laboratory course (required)
- Biochemistry (required)

### **Physics**

- Two sequential terms of physics with a laboratory (required)

### **Additional application requirements**

The statement of purpose should include the following:

- An explanation of how obtaining a Graduate degree in our program fits your career goals.
- A description of the qualities you possess that will contribute to your success in your chosen field.
- A description of any research experiences you have had. If you have had a research experience, it is important to include a letter of recommendation from your research adviser.
- A list of the areas of research in the department that interest you.

## **Financial Assistance**

The student must first apply to the Graduate School and be accepted in full or conditional status before he/she is eligible for an assistantship. Research and teaching assistantships are contingent upon availability of funds and are awarded competitively. Applicants are considered on the basis of scholarship, potential to undertake advanced study and research, and financial need.

## **M.S. in Microbiology**

The Master's program requires 24 months of full-time study, completing a minimum of 30 semester credits with an overall GPA of 3.0 or better.

Students are required to select from a list of core courses for eight to nine didactic credits toward their degree.

**Plan A (Thesis-based) MS:** Of the 30 credits, 16 credits must be in didactic graduate courses. Plan A (Thesis-based) MS students can apply 6 to 10 credits towards MICR 798 research. This degree in microbiology requires a research-based thesis, a public seminar of the thesis research, and a final oral defense of the thesis. The supervisory committee administers the oral thesis examination.

**Plan B (Paper-based) MS:** Of the 30 credits, 21 credits must be in didactic graduate courses. Plan B (Paper-based) MS students can apply 2 to 4 credits towards MICR 797 paper-based research. This degree in microbiology requires the presentation of a thoroughly researched paper. The supervisory committee administers a oral examination at the culmination of the student's progress.

Students with inadequate undergraduate training in microbiology will be required to complete undergraduate courses in microbiology in addition to the required minimum 30 semester credits.

## **Examinations**

**Final Thesis Exam (Plan A, M.S. only):** The final examination will be an oral defense of the student's research results. The student's research advisory (thesis) committee will administer the exam after a public presentation of the work.

**Paper-based Exam (Plan B, M.S. only):** M.S. students in this option will produce an in-depth research paper on a specific topic in Microbiology. The paper will be reviewed by the student's graduate committee and approved when completed.

## **Ph.D. in Molecular Pathogenesis**

The Ph.D. in Molecular Pathogenesis program is based on defined training outcomes. Degree requirements are in agreement with NDSU Graduate School requirements. The student and major adviser will prepare a plan of study by the end of the first year in residence. The Graduate School requires the plan of study for the Ph.D. degree to include no less than 90 semester graduate credits. Of these 18 credits are in required courses, and the

remainder can be tailored to the student's needs. An overall GPA of 3.0 or higher must be maintained. Please refer to the department website for more information on course requirements for this program.

## Examinations

**Qualifying Exam:** Two preliminary examinations must be completed successfully before advancement to candidacy for the doctoral degree. The first, which is generally taken at the end of the first year in residence, examines fundamental areas of knowledge that will be essential for success as a doctoral candidate. The second requires the student to write a research proposal targeted at a program administered by NIH, NSF, or NIFA and defend the proposal in an oral examination. After successful completion of the comprehensive written and oral preliminary examinations, the student will be formally admitted to candidacy for the Doctor of Philosophy degree.

**Final Exam:** The final examination will be an oral defense of the student's research results. The student's research advisory committee will administer the exam after a public presentation of the work.

### **Samiran Banerjee, Ph.D.**

University of Saskatchewan, 2012

Research Interests: Soil and Plant Microbiome, Agricultural Intensification, Climate Change

### **Glenn Dorsam, Ph.D.**

Virginia Commonwealth University, 1998

Research Interests: Molecular Pathogenesis

### **Penelope S. Gibbs, Ph.D.**

University of Georgia, 2001

Research Interests: Avian *E. coli*, Bacterial Molecular Pathogenesis, Antimicrobial Resistance, Food Safety

### **John M. McEvoy, Ph.D.**

University of Ulster, 2002

Research Interests: *Cryptosporidium* Ecology, Evolution and Host-Parasite Interactions; Environmental Microbiology

### **Birgit Pruess, Ph.D.**

Ruhr-Universität Bochum, 1991

Research Interests: Global Gene Regulation in Enteric Bacteria, Complex Regulatory Networks

### **Sheela Ramamoorthy, Ph.D.**

Virginia Polytechnic Institute and State University, 2006

Research Interests: Virology and Vaccinology

### **Jane M. Schuh, Ph.D.**

North Dakota State University, 2000

Research Interests: Immunology; Biomedical Significance of the Initiation and Maintenance of Allergic Asthma; The Innate Immune Response in Health and Disease; Murine Models of Human Asthma; *Aspergillus fumigatus*-Induced Immune Response