

Molecular Pathogenesis

Department Information

- **Interim Department Head:**
John McEvoy, Ph.D.
- **Graduate Coordinator:**
Peter Bergholz, Ph.D.
- **Department Location:**
Van Es Hall
- **Department Phone:**
(701) 231-7667
- **Department Web Site:**
www.ndsu.edu/vetandmicro/
- **Application Deadline:**
February 1
- **Credential Offered:**
Ph.D., M.S.
- **Test Requirement:**
GRE
- **English Proficiency Requirements:**
TOEFL iBT 71; IELTS 6

Program Description

The Department of Veterinary and Microbiological Sciences offers graduate study leading to an M.S. in Microbiology and a Ph.D. in Molecular Pathogenesis. 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 Molecular Pathogenesis integrates microbial genetics, mechanisms of pathogen-host interaction, and immunology to better understand the molecular basis of disease.

M.S. in Microbiology

A Master's degree in Microbiology at NDSU emphasizes research methodology and laboratory techniques. Student research and academic programs 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 are encouraged to visit with each faculty member and spend time in each laboratory to acquaint themselves with the department's research programs.

Ph.D. in Molecular Pathogenesis

The Ph.D. in Molecular Pathogenesis encompasses the study of molecular pathogenesis of infectious and non-infectious diseases with an emphasis on zoonotic diseases and public health. The comprehensive doctoral degree in Molecular Pathogenesis integrates the study of microbial genetics, mechanisms of pathogen-host interaction, and cellular immunology to better understand the molecular basis of disease. Doctoral candidates in Molecular Pathogenesis focus on research and utilize the expertise of one or more departmental faculty members. As an outcomes-based program, course work is tailored to the student's training needs and career plans.

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.

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.

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

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.

Dissertation Research

In addition to the defense of the written dissertation in the final oral examination, the candidate will present a public seminar based on the dissertation research.

Peter Bergholz, Ph.D.

Michigan State University, 2007

Research Interests: Population Genomics and Evolutionary Ecology

Teresa Bergholz, Ph.D.

Michigan State University, 2007

Research Interests: Functional Genomics of Foodborne Pathogens

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