

# Microbiology



Department of Natural Sciences  
College of Arts, Sciences, and Letters

## The Program

Microbiology is the study of organisms that usually require the aid of a microscope in order to be seen. Micro-organisms include viruses, bacteria, archaea bacteria, algae, fungi, and protozoa. Microbiologists seek to understand the interactions between these organisms and components of our biosphere. Many micro-organisms are essential for life, as we know it, to exist on earth. Many of these organisms produce useful biologically active products, such as enzymes and antibiotics. A small number of them cause diseases in plants and animals, including humans. The study of micro-organisms has led to many important discoveries concerning:

- the complexities, universality and mechanism of expression of the genetic code
- the transfer of genetic information between species and modulation of the gene pool
- the mechanism of antigen-antibody reactions and cellular immunity
- the synthesis of proteins, nucleic acids and other cellular constituents
- the structure, function and biogenesis of membranes
- the process of molecular and cellular differentiation

Specialty areas in microbiology include microbial genetics, microbial physiology, environmental microbiology, food microbiology, virology, and biotechnology. Microbiology also provides a foundation for studies such as molecular and cell biology, molecular genetics, biochemistry, genomics, and bioinformatics. With the sequencing of the human genome and the genomes of a number of micro-organisms, scientists are beginning to understand the functions of many genes and the genetic relationships among bacteria and higher plants and animals, including humans. For many years to come, the analysis of these genomes (genomics) and the information encoded in their DNA sequences (bioinformatics) will play a major role in the development of microbiology and the other biological sciences.

At the University of Michigan–Dearborn, the program in microbiology provides a broad-based survey of the discipline, an excellent foundation whether you desire employment immediately following completion of the bachelor's degree or plan to enter graduate or professional schools. Our alumni are employed as research assistants and associates, professors at the university level, physicians, dentists, optometrists, and a variety of other related biomedical occupations. They are employed by organizations such as major pharmaceutical companies, the federal government (FDA and FBI, for example), and major universities around the country.

## Preparing to Study Microbiology

If you are a high school student preparing for a major in microbiology, you should have four years of English and four years of mathematics. In addition, courses in biology and chemistry are desirable. Upon entering the University, you should complete at least one calculus course, the introductory biology sequence, and the general chemistry sequence before taking the first course in microbiology.

If you are a transfer student, you should have a background similar to that required of high school students, and have completed at least one year of general biology and general chemistry at the college level. However, if you lack some of this background work, you may still elect to major in microbiology as long as you elect the appropriate classes following your transfer to the University.

## Research Opportunities with Faculty

The microbiology faculty routinely engage undergraduates in their research programs and this independent research provides an important part of the undergraduate educational experience. Students have the opportunity to work one-on-one with faculty in the laboratory setting. Students will have the opportunity to develop critical thinking skills and laboratory techniques that better prepare them for a scientific career. Some of the projects in which our students have participated included:

- cloning and sequencing of the genomes of marine microbes
- analysis of the coronavirus genome
- microbial community analysis and profiling of biosolid wastes
- isolation and enrichment of extremophiles
- cloning a vitamin receptor gene
- analysis of fecal bacteria at sites along the Rouge River
- screening bacteria isolated from the Rouge River for antibiotic resistance
- studying the genes of plant viruses

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## The Microbiology Concentration

### General Information

Requirements are subject to change. Degree-seeking students will be subject to the requirements in effect at the time that they are admitted or re-admitted.

### Prerequisites

Students working for a bachelor of science degree in Microbiology must complete two-course sequences in introductory biology (Biol 130 and 140), general chemistry (Chem 124 and 136), organic chemistry (Chem 225 and 226), physics (Phys 125 and 126), and calculus (Math 113 and 114 or Math 115 and 116). In addition, organic chemistry laboratory (Chem 227) is required.

### Concentration Requirements

At least 7-8 courses (29 credit hours) in microbiology and/or biological sciences are selected from these courses:

Micro/Biol 309	Mycology <sup>†</sup>
Micro/Biol 380	Epidemiology
Micro/Biol 385	Microbiology*
Micro/Biol 390	Topics in Microbiology
Micro/Biol 405	Applied and Environmental Microbiology <sup>†</sup>
Micro/Biol 406	Microbial Genetics*
Micro 430	Medical Virology
Micro/Biol 440	Microbial Genetics & Physiology Lab*
Micro/Biol 450	Virology
Micro/Biol 455	Immunology
Micro/Biol 459	Pathogenic Microbiology
Micro/Biol 485	Physiology of Microorganisms*
Micro/Biol 495	Off-campus research <sup>‡</sup>
Micro/Biol 497	Seminar in Microbiology <sup>‡</sup>
Micro/Biol 498	Independent Study in Microbiology <sup>‡</sup>
Micro/Biol 499	Laboratory in Microbiology Research <sup>‡</sup>
Biol 301	Cell Biology
Biol 306	General Genetics
Biol 310	Histology
Biol 380	Epidemiology
Biol/Bchm/Chem 370	Principles of Biochemistry
Biol/Bchm/Chem 470	Biochemistry I
Biol/Bchm/Chem 471	Biochemistry II
Biol/Bchm/Chem 472	Biochemistry I Laboratory
Biol/Bchm/Chem 473	Biochemistry II Laboratory
Biol/Bchm/Chem 474	Molecular Biology

\* required course

<sup>†</sup> one of these is required

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### Cognates

A minimum of six credits from the following:

- Any 300- or 400-level course in chemistry, biochemistry, geology, physics, environmental sciences, or environmental studies
- Other appropriate 300- or 400-level courses with approval of concentration advisor, including such courses as statistics, physiological psychology, medical ethics, and medical anthropology.

### Minor requirements

A student can earn a minor in microbiology by electing 12 credit hours of courses in microbiology.

## The Faculty

### Richard Adler, Ph.D.

(The Pennsylvania State University). Associate Professor. Specializes in study of coronaviruses and history of science. He teaches courses in immunology, microbiology, virology, and epidemiology.

### John Thomas, Ph.D.

(University of Arizona). Professor. Research program emphasizes understanding of molecular responses to NaCl and heavy metal stress, phytoremediation of metals and polycyclic aromatic hydrocarbons, crop biotechnology (anti-viruses and biomonitors), and the role of alkaloids as anti-insect and anti-cell proliferation compounds. Dr. Thomas teaches a variety of courses including Introduction to Molecular and Cellular Biology (BIOL 140), General Genetics (BIOL 306) and Cell Biology (BIOL 301).

### Sonia M. Tiquia, Ph.D.

(The University of Hong Kong) Assistant Professor.

Specializes in waste processing biology and microbiology, microbial community structure and dynamics in natural environments and the use of genomic technology in environmental microbiology and microbial ecology. She teaches courses in microbiology, microbial genetics, microbial physiology, and applied and environmental microbiology.

### For More Information

For more specifics about the microbiology program, please contact: Richard Adler, Ph.D., Microbiology Concentration Advisor  
University of Michigan-Dearborn  
Department of Natural Sciences  
115E Science Building  
Dearborn, MI 48128-2406  
E-mail: [radler@umd.umich.edu](mailto:radler@umd.umich.edu)  
Office phone: 313-593-5288  
Department: 313-593-5277  
Fax: 313-593-4937  
[casl.umd.umich.edu/natsci/microbio/index.htm](http://casl.umd.umich.edu/natsci/microbio/index.htm)

To request an application or obtain more information about admission to the University:

Office of Admissions and Orientation  
University of Michigan-Dearborn  
4901 Evergreen Road  
Dearborn, MI 48128-2406  
313-593-5100  
[admissions@umd.umich.edu](mailto:admissions@umd.umich.edu)  
[www.umd.umich.edu](http://www.umd.umich.edu)