

Microbiology

Microbiologists study all aspects of the biology and activities of organisms that cannot be seen with the naked eye, including viruses, bacteria, protozoa, fungi, and algae. Microorganisms are often mistakenly feared because some do cause disease, but just as many are beneficial and even essential for the existence of all other forms of life, including ours.

Microorganisms clean the environment and, in fermentations, they are used to produce foods, drinks, antibiotics, and industrial chemicals. They are also used as the basic tools of genetic engineering and therefore have important applications in many medical, agricultural, and commercial biotechnologies.

The microbiology major provides students with an education in a variety of topics that together form a dynamic science. Microbiology offers many opportunities for students to pursue advanced studies in health-related fields and practical applications of microorganisms. Participation in 'hands-on' laboratory experiments and frontier research is emphasized so that when students graduate they have the practical experience and expertise needed for careers in microbiology and related sciences.

Pursuing Microbiology at Ohio State

The best preparation for the microbiology major is a strong math and science program with biology and chemistry courses. Enriched, advanced, or honors courses, courses with an associated laboratory, and research experience are encouraged. If possible, computer literacy should be included. Good written and oral communication skills are also important.

All Ohio State freshman applicants are considered within a competitive admission process for the Columbus campus. The primary criteria for admission are the completion of the applicant's high school college preparatory program, performance in that program as indicated by class rank and/or grade-point average, and performance on either the ACT or SAT. Upon admission to the university, students can declare a major in microbiology within the College of Biological Sciences. Interested students should contact the undergraduate advisor for microbiology and an Undergraduate Student Academic Services (USAS) counselor.

Microbiology Requirements

Required supportive courses include two quarters of general biology, math through calculus II, one year of general chemistry, one year of organic chemistry, and one year of general physics. Some of the necessary supportive courses must be taken before starting the major (biology, general chemistry, also recommended

for calculus), and others may be completed while also taking microbiology courses (organic chemistry and physics).

The microbiology major consists of a core of four upper level courses in biochemistry, general microbiology and microbial genetics. The major also includes a minimum of 20 additional credit hours, which may be selected from advanced courses offered by the Department of Microbiology or from an approved list of advanced courses offered by other life sciences departments. Credit toward the major can also be obtained by undertaking an independent research project. These additional courses are chosen in consultation with the advisor to meet the individual needs and interests of the student. Once students decide they want to major in microbiology, they should contact the Department of Microbiology for the current major requirements.

Co-Curricular Opportunities

Microbiology majors at Ohio State are strongly encouraged to do a research project with a faculty member. Ohio State offers well-equipped laboratories containing sophisticated instrumentation for microbiological research. Information about choosing an undergraduate research laboratory is available on the Microbiology Department web page and on the College of Biological Sciences web page at www.biosci.ohio-state.edu/undergrad/undergrad-research.php.

The Microbiology Club and the College of Biological Sciences honorary student organization enhance learning opportunities and the quality of the undergraduate experience for students in microbiology. These clubs provide opportunities for students to interact with faculty, discuss careers and research areas with scientists from the Ohio State campus and beyond, and participate in service activities.

Honors & Scholars Programs

The Honors Program in the Colleges of the Arts and Sciences provides high-ability students opportunities to pursue challenging academic programs. Honors students in microbiology are encouraged to meet with their faculty advisor on a regular basis and to construct an enhanced curriculum that includes honors courses, upper-division courses to meet general requirements, rigorous sequences, honors seminars, and a strong major, including a significant research experience.

The Ohio State Scholars Programs feature residential communities for students who share academic interests and career goals. Two of the Scholars programs of interest to microbiology majors are the Biological Sciences and Health Sciences Scholars Programs. The Biological Sciences Scholars Program emphasizes research,

For more information, check these web sites:

Microbiology: www.osumicrobiology.org

College of Biological Sciences: www.biosci.ohio-state.edu

Ohio State: www.osu.edu

Admissions: undergrad.osu.edu

Multicultural Center: multiculturalcenter.osu.edu

First Year Experience Program: fye.osu.edu

Curriculum Sample

This is a sample list of the classes a student will take to pursue a degree in Microbiology. Since university students need more than specific education in a narrow field, they also will take classes to complete the General Education Curriculum (GEC). The GEC will allow students to develop the fundamental skills essential to collegiate success across major programs. Course work options satisfying the GEC often come from a variety of academic areas of study allowing students to tailor their GEC toward their interests. Note: This sample represents one of several possible paths to a degree in Microbiology. Consult the departmental web site, www.osumicrobiology.org, for details on each specific track.

Freshman Year:

Biological Sciences Survey	1
General Chemistry	15
Calculus	15
General Biology	5
GEC (English composition)	5
GEC (social sciences)	10
Freshman Seminar	1
Total hours	52

Sophomore Year:

General Biology	5
General Microbiology	5
Introductory Biochemistry	5
Organic Chemistry	8
GEC (foreign language)	15
GEC (second writing course)	5
Elective	5
Total hours	48

Junior Year:

General Microbiology	5
Microbial Genetics	5
Microbiology elective	5
General Physics	15
GEC (arts and humanities)	10
GEC (foreign language)	5
GEC (social sciences)	5
Total hours	50

Senior Year:

Microbiology electives/ Independent	
Research	20
GEC (arts and humanities)	10
Electives	15
Total hours	45

with individualized advising and significant lab and field experience. The Health Sciences Scholars Program is focused on preparing students for careers in health sciences and health care.

Career Prospects in Microbiology

The microbiology major prepares students directly for employment. The diversity of required courses provides a breadth of learning and technical experiences. With this education, especially the technical training learned in the laboratories, students can readily find employment in research, quality control, or hospital laboratories and work with advanced techniques and instruments. Specifically, recent graduates of the Department of Microbiology work in research and government laboratories that develop genetic engineering and biotechnology; solve health and environmental problems; and create food and industrial technologies and use microbial processes to produce new products.

The microbiology major is also an appropriate, frequently chosen undergraduate degree program for medical, dental, optometry, veterinary, and pharmacy students. While a major in microbiology is not a requirement for medical school (or other professional schools in the health sciences), it has many advantages, with its exposure to the basic principles of life processes, the mode of action of many pathogens, and the theoretical underpinnings of sophisticated medical procedures.

The microbiology major provides the academic preparation needed to pursue a graduate degree in almost any biology-related field. Many jobs in microbiology involve high-level research and require advanced training leading to an M.S. or a Ph.D. degree. For positions designing or directing research projects, a Ph.D. is a must. Keep in mind that most Ph.D. students, as part of their training, serve as research and teaching assistants and thereby earn a large part of their living and educational expenses while they are in graduate school.

An undergraduate major in microbiology does not limit one's options to careers in medicine or biological research. Because the microbiology major provides the academic preparation and strong science background appropriate for students who plan careers in marketing, business, or management in high technology industries, some microbiology students choose to use their science background to pursue a professional degree in business or law. A few students choose to put their microbiology training to use by obtaining a master's degree in education and becoming science teachers.

Salaries are commensurate with level of education and prior job experiences. Students who complete graduate and professional degrees can expect to earn substantially more than students with a bachelor's degree. Salaries in general are dependent upon a variety of economic factors and change with market trends.

For more information about careers in microbiology, call or write the Arts and Sciences Career Services Office, 06 Denney Hall, 164 West 17th Avenue Columbus, Ohio 43210-1371, (614) 292-1868.

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