

MAJOR IN BIOMEDICAL SCIENCES, MICROBIOLOGY AND INFECTIOUS DISEASE CONCENTRATION

Microbiology is the study of organisms, many of which are too small to be seen with the naked eye, including fungi, protists, and bacteria, as well as acellular agents such as viruses and prions. Microbiology emerged as a distinct science in the late nineteenth century, with the discovery that microorganisms are the cause of many infectious diseases, and that they play essential roles in ecosystems (such as the microbiome) and in industrial processes. Much work in this field is directed toward the cure, control, or eradication of disease in humans and animals, as well as understanding how microbes support health and life. Genetically engineered microorganisms can also be used for the production of improved foods, new drugs and vaccines, and for removing toxic wastes and spills from the environment. Unfortunately, some microbes have received considerable attention as potential agents of bioterrorism and biowarfare, and consequently much work is being done to counter such threats.

Students completing the undergraduate Biomedical Sciences degree program with a concentration in Microbiology and Infectious Diseases acquire knowledge and laboratory skills in the structure, physiology, genetics, pathogenicity, ecology, and taxonomy of microorganisms, as well as immunological techniques. Students engage in authentic hypothesis-driven research problems in inquiry-based laboratory courses. Required courses in biological sciences, chemistry, physics, and mathematics support the major. Ample opportunities exist for undergraduates to obtain laboratory research experience and many student researchers have presented at conferences and have been awarded research grants or fellowships.

A Bachelor of Science degree in Biomedical Sciences with a concentration in Microbiology and Infectious Disease prepares graduates well for continued education in a professional or graduate degree program or for employment in the field.

Learning Objectives

1. **Core Knowledge:** Students will apply and integrate the fundamentals of chemistry, microbial biology, and biochemistry and key principles from the following five core areas of the discipline: immunology, bacteriology, virology, microbial physiology, and microbial genetics.
2. **Relevance/Impact:** Students will demonstrate an awareness of issues at the forefront of the discipline and will evaluate the important interaction between microbes and society, from their beneficial use in industrial, biotechnological, and clinical applications to their role as etiologic agents of infectious disease in humans and animals.
3. **Communication Skills:** Students will assimilate factual and conceptual information and effectively communicate disciplinary knowledge to both science literate and general audiences through written or verbal presentations.
4. **Laboratory Skills:** Students will demonstrate proficiency using microbiological and immunological laboratory techniques employed in clinical, industrial, and research laboratories, and will be able to explain the principles behind the procedures, employ mathematical

computations, properly execute the procedures, interpret the results correctly, and analyze the results to draw a conclusion.

Potential Occupations

The curriculum, with the proper selection of departmental electives, meets the requirements for entrance into most professional programs in veterinary and human medicine, and is ideal preparation for students desiring a career as a veterinarian, physician, physician assistant, pharmacist, medical laboratory scientist, optometrist, or dentist. The degree also prepares students for graduate (PhD or MS) studies in various biological sciences, and also provides students with the knowledge and skills to go directly into a career. Career opportunities will continue to grow because microbiology is at the center of complex issues facing our world today, as well as at the forefront of fast-paced innovation and development. Employment opportunities exist in biotechnology (vaccine and therapeutics, pharmaceutical, food, beverage, and medical device industries); government public health agencies (CDC, FDA, and state and municipal health departments); and primary research institutions, such as universities.

For more information about the Microbiology & Infectious Disease concentration under the Biomedical Sciences Major, please visit the College of Veterinary Medicine and Biomedical Sciences (<https://vetmedbiosci.colostate.edu/degree-programs/undergraduate/>).

Accelerated Program

The Microbiology and Infectious Disease concentration includes an **accelerated program option** for students to graduate on a faster schedule. Accelerated programs typically include 15-16 credits each fall and spring semester for three years, plus 6-9 credits over two to three **summer sessions**. Students who enter CSU with prior credit (AP, IB, transfer, etc.) may use applicable courses to further accelerate their graduation. Visit the Office of the Provost website for additional information about **Accelerated Programs**.

Learn more about the Health Promotion concentration on the Department of Microbiology, Immunology, and Pathology website.