MICROBIOLOGY... NOW WHAT?

What is Microbiology?
Microbiology is the study of organisms, most of which are too small to be seen with the naked eye, including bacteria, algae, protozoa, and fungi, as well as acellular agents, such as viruses and prions. Microbiologists study the interaction of microorganisms with people and how they affect our lives, as well as the roles these organisms play in the environment. Aspiring microbiologists acquire knowledge and laboratory skill in the structure, physiology, genetics, pathogenicity, ecology, and taxonomy of microorganisms. Specialties are sometimes pursued in human and animal infectious diseases, immunology, bacteriology, virology, molecular genetics, and environmental and industrial processes. Microbiologists work in hospitals, universities, medical schools, government laboratories, and almost every industry, specializing in a variety of areas, from agriculture to the space industry. About 40% of microbiology majors continue on to graduate, professional, or medical school.

Quick Facts: Microbiologists

<table>
<thead>
<tr>
<th>Metric</th>
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<tbody>
<tr>
<td>2020 Median Pay</td>
<td>$ 84,400 per year</td>
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<tr>
<td>Entry-Level Education</td>
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<tr>
<td>Work Experience in a Related Occupation</td>
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<td>On-the-job Training</td>
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<td>Number of Jobs, 2019</td>
<td>20,200</td>
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<td>Job Outlook, 2019-29</td>
<td>3% (Average)</td>
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<td>Employment Change, 2019-29</td>
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What Does A Microbiologist Typically Do?

- Plan and conduct complex research projects, such as developing new drugs to combat infectious diseases
- Supervise the work of biological technicians and other workers and evaluate the accuracy of their results
- Isolate and maintain cultures of bacteria or other microorganisms for future study
- Identify and classify microorganisms found in specimens collected from humans, water, food, and other sources
- Monitor the effect of microorganisms on plants, animals, and other microorganisms and on the environment
- Keep up with findings from other research groups by reading research reports and attending conferences
- Prepare technical reports, research papers, and recommendations based on their research findings
- Present research findings to scientists, non-scientist executives, engineers, other colleagues, and the public

Microbiologists study microorganisms such as bacteria, viruses, algae, fungi, and some types of parasites. Microbiologists work in laboratories and offices, where they conduct scientific experiments and analyze the results. Most microbiologists work full time and keep regular hours. Most
microbiologists work in research and development. Many conduct basic research with the aim of increasing scientific knowledge. Others conduct applied research, using knowledge from basic research to develop new products or solve particular problems.

**What Can I Do With A Bachelor’s Degree in Microbiology?**

- Quality Assurance Analyst
- Technical Sales Representative
- Water Quality Inspector
- Fermentation Plant Biologist
- Plant Tissue Culture Technician
- Environmental Technician
- Diagnostic Account Specialist
- Research Assistant
- Photomicrographer
- Pharmaceutical Sales Rep
- Brewmaster
- Laboratory Technician
- Forensic Technician
- Pest Control Consultant
- Associate Scientist
- Fish and Wildlife Technician
- Technical Analyst or Writer
- Microbiologist

**Where Might I Do An Internship?**

*UMass Amherst Microbiology Majors Have Done Internships At The Following Sites:*

- Alnylam Pharmaceuticals
- Amgen Scholars Program/Yale School of Med (Amherst (Town of))
- ARIAD Pharmaceuticals, Inc
- BTF Biomériux
- Brigham and Women’s Hospital
- Concord Health Care Center
- EcoOrganics
- Experium Science Academy
- Genocea Biosciences
- Giner, Inc
- Glaxo Smith Kline (SmithKline Beecham)
- Harvard Medical School
- Henry Gets Moving
- Hertz Corporation (The)
- Holobiome, Inc.
- Merck & Co.
- Natick Soldier Research Development
- MicroTest Laboratories
- Northeast Sustainable Energy Association
- SABIC Innovative Plastics
- Sanofi Group: Pasteur, & Genzyme
- Schepens Research Institute
- St. Mary’s Hospital
- Tufts University-Microbial Community Assembly
- UMass Amherst
- UMass Amherst Emergency Medical Services
- UMass Medical School
- University Health Services
- Verax Biomedical
- Wyeth Biotech

**Career Planning Resources & Websites**

- UMass Amherst Career Services Events Calendar: www.umass.edu/careers
- FOCUS2 Career and Education Planning: www.umass.edu/careers/planning  to sign-in
- What Can I Do With This Major? (Click on “What Can I do with this Major” icon on the right-hand column.)
- O-Net: “Microbiologists” https://www.onetonline.org/
- Massachusetts Career Information System (Click Mass Resident to login with “Amherst/01003” Then click “Occupations” or “Assessments”) www.masscis.intocareers.org
Microbiology Job Search Resources  (* = of particular note)

UMass Amherst Specific Job Search Resources
* UMass Handshake Database of Internships & Jobs  https://umass.joinhandshake.com/
* UMass Microbiology Research Opportunities  https://www.micro.umass.edu/
* Finding Independent Lab Research on Campus  www.umass.edu/biochem/undergraduate/lab
BioScience Club  http://sites.google.com/site/biosciumass/home

General Biology And Science Jobs
* Mass Bio  www.massbio.org
* Mass Life Sciences Internship Program  www.masslifesciences.com/programs
* Life Sciences Recruiters for multiple companies  www.propelcareers.com
New Scientist Jobs  jobs.newscientist.com/jobs/microbiology
* Jobs in MicroBio & Life Sciences  https://jobs.sciencecareers.org/jobs/microbiology/
Bio Space  www.biospace.com/jobs/homepage/
Biology Jobs  www.BiologyJobs.com
Hire Bio  www.hirebio.com
* More sites for Life Science Jobs  www.masslifesciences.com/resources
Forensic Science Jobs  webdata.aafs.org
Microbiologist Jobs  environmentalchemistry.com/microbiology

Bio-Tech
Biotech Careers  https://www.biotech-careers.org/careers
Mass Medical Device Industry Council  https://business.massmedic.com/jobs

Government Agencies
National Institutes of Health  www.jobs.nih.gov/vacancies/scientific/
Health and Human Services Jobs  https://www.hhs.gov/careers/
Food & Drug Administration  www.fda.gov/AboutFDA/WorkingatFDA
US Navy Microbiology  https://www.navy.com/careers/microbiology

Pharmaceuticals
International Society of Pharmaceutical Engineers  www.ispeboston.org
UMass Amherst ISPE chapter!  www.ecs.umass.edu/ispe
American Assoc of Pharma Scientists Jobs Board  https://careefair.aaps.org/
GET YOUR $40 AAPS STUDENT MEMBERSHIP!
Current jobs       biopharmguy.com
Sample (expired) entry level job descriptions,
and a list of New England pharma companies.       biopharmguy.com

Who Could I Work For?
Some of the major industries, companies & government agencies that hire microbiology majors include:

**Academic**
Medical, Dental, and Veterinary Schools
College and University
Institutes and not-for-profit research centers

**Agriculture**
Genetic crop modification
Biomass production

**Energy**
Biofuels production and refinement
Environmental Remediation

**Government**
Centers for Disease Control (CDC)
National Institutes of Health (NIH)
Local and state government
Public health
Grant management
Law enforcement and counter-terrorism

**Military (all branches)**
Waste and wastewater management
Food and Drug Administration (FDA)
US Department of Agriculture (USDA)
NASA
Environmental Protection Agency

**Health Care**
Medical Technology
Clinics and Hospitals
Diagnostic Testing Labs

**Health Care Management**
Quality Control

**Industry**
Positions include management, quality control, research, and product development. Many know of big pharma and biotechnology but there are numerous other opportunities in the cosmetics, breweries, and oil industries. Identifying such a position may require searching job postings in individual companies.

Industrial Production antibiotics
Chemical companies
Cosmetics and toiletries
Food and beverage research
Consulting
Breweries

**Biotechnology**
Pharmaceuticals and Vaccines
Oil industry and mining
Microbials research
Sales or technical representative
Dairies

**Legal**
Law firms (Patent Law)
Technology transfer
Intellectual property

**Scientific Publishing**
Journal Editor
Academic Journalism
Popular Press

**Teaching**
A microbiology degree combined with instruction in education can lead to a career in teaching.
Professional Organizations in Microbiology
Many professional organization’s websites have career information on them. You can often use them to search for networking events, meet a mentor in your field of study, find current research, search for internships or jobs, and gain insight into what direction within the field you may wish to pursue.

Career Services has additional lists of professional organizations and resources in specialty areas such as animal sciences, health services, ecology, and science communication. Ask your career advisor!

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<tr>
<th>MICROBIOLOGY</th>
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<tr>
<td>American Microscopical Society</td>
<td><a href="http://amicros.org">http://amicros.org</a></td>
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<td>American Society for Microbiology</td>
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<td>Microscopy Society of America</td>
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<td>Society for General Microbiology</td>
<td><a href="http://www.sgm.ac.uk">www.sgm.ac.uk</a></td>
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<td><a href="http://www.simbhq.org">www.simbhq.org</a></td>
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<td>American Society for Biochem &amp; Molecular Bio</td>
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<td>American Society for Cell Biology</td>
<td><a href="http://www.ascb.org">www.ascb.org</a></td>
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<td>International Cell Death Society</td>
<td><a href="http://www.celldeath-apoptosis.org">www.celldeath-apoptosis.org</a></td>
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<td>Microbiology Society</td>
<td><a href="http://www.microbiologysociety.org">www.microbiologysociety.org</a></td>
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<td>Society for In Vitro Biology</td>
<td><a href="http://www.sivb.org">www.sivb.org</a></td>
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<td>Biotechnology Industry Organization</td>
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<td>Massachusetts Biotechnology Council</td>
<td><a href="http://www.massbio.org/">www.massbio.org/</a></td>
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<tr>
<td>Society for Industrial Microbio and Biotech</td>
<td><a href="http://www.simbhq.org/">www.simbhq.org/</a></td>
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<td>American Academy of Forensic Science</td>
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<tr>
<td>American Academy of Forensic Psychology</td>
<td><a href="http://aafpforensic.org">http://aafpforensic.org</a></td>
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<td>American Board of Forensic Psychology</td>
<td><a href="http://abfp.com">http://abfp.com</a></td>
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<td>American Academy of Psychiatry and the Law</td>
<td><a href="http://www.aapl.org">www.aapl.org</a></td>
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<td>American Board of Criminalistics</td>
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<td>American Board of Forensic Anthropology</td>
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<td>American Board of Forensic Entomology</td>
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<td><a href="http://www.abfde.org">www.abfde.org</a></td>
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<td>American Board of Forensic Toxicology</td>
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<td>American Board of Medico-Legal Death Investigators</td>
<td><a href="http://www.slu.edu/organizations/abmdi/">www.slu.edu/organizations/abmdi/</a></td>
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<td>American Board of Pathology</td>
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<td>American Society of Crime Laboratory Directors</td>
<td><a href="http://www.asclld.org">www.asclld.org</a></td>
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<td>American Society of Questioned Document Examiners</td>
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<td>Association of Forensic DNA Analysts and Administrators</td>
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<td>International Association of Forensic Toxicologist</td>
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<td>Technology Programs of the National Institute of Justice</td>
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<td>Zeno's Forensic Site</td>
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<td><strong>WOMEN IN BIOLOGY</strong></td>
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<td>Women in Biology</td>
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Important Transferable Qualities To Include On Your Resume

Communication skills. Microbiologists should be able to effectively communicate their research processes and findings so that knowledge may be applied correctly.

Detail oriented. Microbiologists must be able to conduct scientific experiments and analyses with accuracy and precision.

Interpersonal skills. Microbiologists typically work on research teams and thus must work well with others toward a common goal. Many also lead research teams and must be able to motivate and direct other team members.

Logical-thinking skills. Microbiologists draw conclusions from experimental results through sound reasoning and judgment.

Math skills. Microbiologists regularly use complex mathematical equations and formulas in their work. Therefore, they need a broad understanding of math, including calculus and statistics.

Observation skills. Microbiologists must constantly monitor their experiments. They need to keep a complete, accurate record of their work, noting conditions, procedures, and results.

Perseverance. Microbiological research involves substantial trial and error, and microbiologists must not become discouraged in their work.

Problem-solving skills. Microbiologists use scientific experiments and analysis to find solutions to complex scientific problems.

Speaking skills. Microbiologists frequently give presentations and must be able to explain their research to others.

Time-management skills. Microbiologists usually need to meet deadlines when conducting research and laboratory tests. They must be able to manage time and prioritize tasks efficiently while maintaining their quality of work.

Writing skills. Microbiologists write memos, reports, and research papers that explain their findings.

What Do Employers Look For? (NACE 2020 Job Outlook for Students)