DEPARTMENT OF MICROBIOLOGY AND MOLECULAR GENETICS

http://www.uvm.edu/microbiology/

The College of Agriculture and Life Sciences shares this department with the Larner College of Medicine (LCOM). Undergraduate studies are in CALS while graduate studies are in the LCOM. The department offers a B.S. in Microbiology or a B.S. in Molecular Genetics.

CALS MICROBIOLOGY AND MOLECULAR GENETICS MAJOR

Undergraduates who undertake studies in the Department of Microbiology and Molecular Genetics receive instruction in the classroom and in state-of-the-art teaching and research laboratories. If you are interested in attending medical school or graduate school, then majoring in Microbiology (MICR) or Molecular Genetics (MGEN) may be appropriate. Fascinating recent developments in medicine and biomedical sciences, such as stem cell research, emerging microbial infectious diseases, genetic engineering, and cancer therapeutics, have emerged from a detailed understanding of the molecular events that underlie the routine functions of cells and organisms. Microbiology majors study in detail the microbes involved in infectious disease, human health, industrial manufacturing, ecology, and basic science research. Molecular genetics majors investigate the chemical, biological, and genetic principles that underlie all living processes at the molecular level.

Small classes, hands-on/intensive classroom laboratory experiences, and a strong commitment to undergraduate advising give students many opportunities to interact with the faculty, including a First-year Colloquium in which students meet directly with the faculty to discuss on-going research projects and contemporary issues in microbiology and molecular genetics. Undergraduates are encouraged to get involved in cutting-edge research projects in the department and the College of Medicine in such areas as DNA repair, infectious diseases, bioinformatics, structural biology, developmental genetics, and other fields. Internship opportunities outside of UVM with the local hospital, The University of Vermont Medical Center, the Department of Health, and the Office of the Chief Medical Examiner are also available to pre-med students. Approximately 85 percent of MICR and MGEN majors take advantage of either research or internship opportunities.

The program is flexible enough to allow students to minor in another scientific discipline such as animal sciences, biochemistry, biological sciences, chemistry, computer science, mathematics, medical technology, nutrition, and pharmacology -- or in a field that is altogether different. Students have graduated with minors in French, business administration, psychology, and statistics, allowing them to put together a career plan that spans a wide range of opportunities. The program is also flexible enough to allow students to experience a study abroad semester.

MAJORS

MICROBIOLOGY AND MOLECULAR GENETICS MAJORS

Microbiology B.S. (http://catalogue.uvm.edu/undergraduate/agricultureandlifesciences/microbiologyandmoleculargenetics/microbiologybs/)

Molecular Genetics B.S. (http://catalogue.uvm.edu/undergraduate/agricultureandlifesciences/microbiologyandmoleculargenetics/moleculargeneticsbs/)

MINORS

MICROBIOLOGY AND MOLECULAR GENETICS MINORS

Bioinformatics (http://catalogue.uvm.edu/undergraduate/agricultureandlifesciences/microbiologyandmoleculargenetics/bioinformaticsmminor/)

Microbiology (http://catalogue.uvm.edu/undergraduate/agricultureandlifesciences/microbiologyandmoleculargenetics/microbiologyminor/)

Molecular Genetics (http://catalogue.uvm.edu/undergraduate/agricultureandlifesciences/microbiologyandmoleculargenetics/moleculargeneticsminor/)

GRADUATE

Cellular, Molecular, and Biomedical Sciences M.S.

Cellular, Molecular, and Biomedical Sciences Ph.D.

Microbiology and Molecular Genetics M.S.

Microbiology and Molecular Genetics Ph.D.

See the online Graduate Catalogue (http://catalogue.uvm.edu/graduate/) for more information

Courses

MMG 001. First Year Colloquium. 1 Credit.

Colloquium is designed to enhance faculty-student interactions in Microbiology and Molecular Genetics and to inform first-year majors about the educational and research opportunities in MMG. Instructor's permission for non-majors. Fall.

MMG 002. SU:Unseen Wrlds:Microbes & You. 3 Credits.

Examination of current topics in Microbiology, such as antibiotic resistance, vaccinations, sexually transmitted diseases, and the human microbiome, focusing on the impact of microbes on human and animal health, the environment, agriculture, and modern culture around the world.
MMG 065. Microbiology & Pathogenesis. 0 or 4 Credits.
Overview of microbiology, emphasizing the relationships between
the structure, metabolism, and genetics of microorganisms and their
roles in nature and in pathogenesis. Prerequisite: One semester
chemistry. Not intended for students who have completed BIOL 001
and BIOL 002 or equivalent. Fall.

MMG 090. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured
academic learning plan directed by a faculty member or a faculty-staff
team in which a faculty member is the instructor of record, for which
academic credit is awarded. Offered at department discretion.

MMG 092. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student,
which occurs outside the traditional classroom/laboratory setting
under the supervision of a faculty member, for which credit is
awarded. Offered at department discretion.

MMG 095. Special Topics. 1-18 Credits.
An approved area of study or project under the guidance of an MMG
faculty member and the Academic advisor.

MMG 096. Special Topics. 1-18 Credits.
An approved area of study or project under the guidance of an MMG
faculty member and the Academic advisor.

MMG 101. Microbiol & Infectious Disease. 0 or 4 Credits.
An introduction to basic microbiology and microbes that cause
infectious diseases, with a focus on microbial structure, function,
metabolism, ecology, and pathogenesis. Pre/co-requisites: One
semester Biology and Chemistry. Fall.

MMG 104. Intro Recombinant DNA Tech. 3 Credits.
Introduction to the basic principles and techniques used in
recombinant DNA technology. Pre/co-requisites: BCOR 011/
BCOR 012; Microbiology & Molecular Genetics major or minor
restriction. Spring.

MMG 106. Intr Biomedical Research Meth. 3 Credits.
Introduces life science majors/minors to the scientific processes
involved in biomedical research and to current research techniques
and approaches, also introduces reading and interpreting primary
literature articles, as well as discussing current topics regarding the
ethical concerns of biomedical research. Prerequisite: BCOR 11,
BCOR 12 or BCOR 021.

MMG 190. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured
academic learning plan directed by a faculty member or a faculty-staff
team in which a faculty member is the instructor of record, for which
academic credit is awarded. Offered at department discretion.

MMG 192. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student,
which occurs outside the traditional classroom/laboratory setting
under the supervision of a faculty member, for which credit is
awarded. Offered at department discretion.

MMG 193. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in
an introductory level course in the discipline, for which credit is
awarded. Offered at department discretion.

MMG 195. Intermediate Special Topics. 1-18 Credits.
An approved area of study or project under the guidance of an MMG
faculty member and the Academic advisor. Prerequisite: Instructor
permission. Credits negotiable.

MMG 196. Intermediate Special Topics. 1-18 Credits.
An approved area of study or project under the guidance of an MMG
faculty member and the Academic advisor. Prerequisite: Instructor
permission. Credits negotiable.

MMG 197. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research
projects under the supervision of a faculty member, for which credit
is awarded. Undergraduate Program Director approval. Offered at
department discretion.

MMG 198. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research
projects under the supervision of a faculty member, for which credit
is awarded. Undergraduate Program Director approval. Offered at
department discretion.

MMG 201. Molecular Cloning Lab. 4 Credits.
Intensive advanced laboratory course in the fundamentals
of recombinant DNA technology through the isolation and
characterization of a unique gene. Prerequisite: MMG 104 or
BIOL 207 or Instructor permission. Fall.

MMG 205. Biochemistry I. 3 Credits.
Introduction to chemistry and structure of biological
macromolecules; examination of mechanisms of chemical processes
in biological systems, including enzyme catalysis, biosynthesis,
regulation, and information transfer. Prerequisite: CHEM 048
or CHEM 142 or CHEM 144. Cross-listed with: BIOC 205,
CHEM 205. Fall.

MMG 206. Biochemistry II. 3 Credits.
Continuation of Biochemistry I. Biochemistry of nucleic acids;
nucleic acid based processes, such as replication and transcription;
cellular information transfer, genomics, and proteomics. Prerequisite:

MMG 207. Biochemistry Lab. 3 Credits.
Introduction to biochemical tools, including spectrometry,
chromatography, and electrophoresis; natural and recombinant
enzyme isolation; assays of DNA-modifying enzymes; computer-
based structure/function exercises. Prerequisite: BIOC 205 or
CHEM 205 or MMG 205. Cross-listed with: BIOC 207, CHEM 207.

MMG 211. Prokaryotic Molecular Genetics. 3 Credits.
The organization, replication, and expression of genes in prokaryotes,
focusing on the genetics of Escherichia coli and its viruses.
Prerequisite: Introductory microbiology, biochemistry, genetics,
and/or cell biology courses. Fall.
MMG 220. Environmental Microbiology. 3 Credits.
The activities of microorganisms, primarily bacteria, in air, soil, and water. Prerequisites: MMG 101 and Organic Chemistry Alternate years.

MMG 222. Advanced Medical Microbiology. 4 Credits.
Comprehensive study of human pathogenic bacteria and their disease states in humans. Laboratory sessions provide practical experience in handling and identifying these pathogens. Alternate years. Spring. Prerequisites: MMG 065 or MMG 101 or equivalent or Instructor permission.

MMG 223. Immunology. 3 Credits.
Analysis of the immune response with respect to structure and function of immunoglobulins and the T-cell receptor, tolerance, innate and adaptive immunity, the Major Histocompatibility Complex, hypersensitivity states, transplantation, cancer, and AIDS. Prerequisite: Instructor permission. Alternate years, Spring.

MMG 225. Eukaryotic Virology. 3 Credits.
An in-depth analysis of eukaryotic virus-mammalian cell interactions emphasizing mechanisms by which viruses modulate gene expression in infected cells. Prerequisite: MMG 101 or MMG 104 or equivalent. Alternate years. Fall.

MMG 230. D2: SU: Adv St Emerg Infec Dis. 3 Credits.
Presents an interdisciplinary approach to understanding the emergence, and re-emergence, of infectious diseases in a rapidly changing global environment. Historical, cultural, environmental and biological perspectives are incorporated into the analysis of emerging bacterial, viral and protozoal pathogens. Prerequisites: MMG 101; MMG 225 recommended.

MMG 231. Bioinformatics & Data Analysis. 3 Credits.
Methodological survey of bioinformatics in the -omics era, focusing on genomics data of medically relevant microbes. Topics include data mining, metagenomics, phylogenetics, and comparative genomics. Mix of lecture and hands-on interaction utilizing analysis tools on the Vermont Advanced Computing Core. Prerequisite: Instructor permission.

MMG 232. QR: Advanced Bioinformatics. 3 Credits.
Advanced data processing and genome assembly analysis, data integration, and machine learning. Python, R, and Linux-scripting are used to assemble genomes, integrate large data sets, and build complex biological models. Topics include genomics, meta-data management, and multi-omics analyses at systems biology levels. Alternate Years. Spring. Prerequisites: MMG 104 or BCOR 101; MMG 231, or Instructor permission.

MMG 233. Genetics and Genomics. 3 Credits.
Integrated entry into both genome science and modern genetic analysis. Students will develop skills needed to access, organize and interpret emerging genomic information. Fall. Prerequisite: Junior/ Senior/Graduate standing in biological or computational sciences.

MMG 235. Bioterrorism. 3 Credits.
Covers the microbiological, epidemiological, social and political aspects of bioterrorism. Also examines potential strategies for bioweapon preparedness and response, with a specific focus on ethical and social issues. Prerequisites: MMG 101 or MMG 002 and PSS 133.

MMG 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

MMG 292. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MMG 293. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

MMG 295. Advanced Special Topics. 1-18 Credits.
Supervised investigations in microbiology or molecular genetics. Prerequisite: Instructor permission. Credit as arranged.

MMG 296. Advanced Special Topics. 1-18 Credits.
Supervised investigations in microbiology or molecular genetics. Prerequisite: Instructor permission. Credit as arranged.

MMG 297. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Undergraduate Program Director approval. Pre/co-requisite: MMG 197, MMG 198 or Advisor Permission. Offered at department discretion.

MMG 298. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Undergraduate Program Director approval. Pre/co-requisite: MMG 197 or MMG 198 or Advisor Permission. Offered at department discretion.

MMG 299. Senior Seminar. 1 Credit.
This required capstone course for Microbiology and Molecular Genetics majors involves written and oral presentations by graduating seniors on current topics in microbiology/molecular genetics. Prerequisites: MMG 101; second semester Senior standing. Spring.