



Department of Microbiology, Immunology and Pathology M.S.-Thesis and Ph.D. Program Overview

I. Introduction

The research programs of the Department of Microbiology, Immunology and Pathology (MIP) provide excellent opportunities for graduate training at the M.S., Ph.D., D.V.M./Ph.D. and combined Ph.D. and M.S./residency levels in fundamentals of modern investigative microbiology, immunology and pathobiology. Areas of research strength in the department include bacteriology, mycobacterial diseases, prion biology, vector-borne infectious diseases, virology and the emerging area of computational biology. An emphasis is placed on a multi-disciplinary approach to research problems. This is facilitated by collaborations with major research groups within the College of Veterinary Medicine and Biomedical Sciences. Interpretive diagnostic expertise training is also provided in conjunction with the Veterinary Teaching Hospital and the Veterinary Diagnostic Laboratory.

II. Graduate Student Advisers and the First Year of Study

Unless a student is supported by funds from an individual investigator, the Associate Department Head for Graduate Education serves as a temporary advisor for first year students. The temporary advisor assists in selection of courses and helps the student identify faculty members whose academic and research interests coincide with the student's educational goals.

A. Teaching

Students admitted into the MIP graduate program may be assigned teaching duties in the undergraduate courses offered by MIP. These students are required to attend the GTA Workshop presented by the Institute for Learning and Teaching (TILT) and the Graduate School, which is held the week before Fall semester classes begin.

Colorado State University offers a [Graduate Teaching Certificate Program](#), which you can work towards during your teaching assistantship in the first year of your M.S. or Ph.D. This is a great opportunity to get credit for your teaching hours and to put together a teaching portfolio with help from experienced faculty.

B. Laboratory Rotations

Students admitted into the MIP graduate program contact [faculty members](#) to arrange two laboratory rotations during the first semester; each rotation is approximately 8 weeks in length. Students have an opportunity to perform a 3rd or 4th rotation during their second semester, as needed. The Associate Department Head for Graduate Education will assist students in the selection of research laboratories. By the end of the first two semesters of study, a permanent faculty research advisor is identified and approved by the GEC and Department Head.

III. University and Department Course Requirements and Program of Study

The student and the student's graduate committee share responsibility for formulating the coursework in the students' program of study. The program of study for students is based on the student's academic background, area of specialization, and recommendations of the graduate committee. Students must fulfill the core area requirements for their degree program. **The core**

departmental areas are defined as bacteriology, virology, molecular genetics (molecular biology), immunology, vector biology and pathobiology (includes prion biology, toxicology, and cancer biology).

A. The Student's Graduate Committee

After identifying a faculty research advisor, the student and major advisor will propose the membership of a graduate committee.

Composition of the Graduate Committee

The student's graduate committee is composed of at least three members for the M.S. program and at least four members for the Ph.D. program, including the major advisor. The students' major advisor chairs the committee. The committee must have at least one member from outside the MIP Department who holds a faculty role in another department on campus. The chair must be a member of the MIP faculty. In consultation with the major advisor and the graduate committee, a program of study will be formulated.

The student's graduate committee is responsible throughout the remainder of the student's graduate career for advice on course work and evaluation of progress in the program. The committee will advise and guide the student in the execution of the research program.

B. Master of Science Degree

Credit requirements

Each Master of Science (M.S.) student shall acquire an in-depth knowledge in an area of research and breadth of knowledge by completing formal coursework in two of the core areas defined above. A minimum of 30 credits in courses (numbered 300 or above) and research is required. At least 24 credits must be earned at Colorado State University; 16 of the 24 must be in courses numbered 500 or above and 12 credits should be in regular courses (excludes MIP698 research, MIP699 thesis, MIP700 topics in microbiology, MIP784 supervised teaching, and MIP792 seminars). The department requires that 9 of the 12 credits be earned in MIP courses.

M.S. Graduate Program minimum course requirements

MIP700- Topics in Microbiology, 1 credit each year (MS- at least 2 semesters)

MIP792A- Seminar- Research/Graduate, 1 credit each semester

MIP654- Research Policies and Regulations or GRAD544- Ethical Conduct in Research

M.S. Graduate Program average time to completion is 2.5-3 years.

C. Doctor of Philosophy Degree

Credit Requirements

Each Ph.D. student shall acquire in-depth knowledge in the selected area of research specialization(s) and breadth of knowledge by completing formal coursework in three of the core areas defined above. Adequate knowledge in general biological and physical sciences is also required. To be recommended for candidacy, in addition to completing the required coursework, students must demonstrate to the satisfaction of their graduate committee that they possess the knowledge, abilities and skills essential for the specialization chosen.

For the Ph.D. degree a minimum of 72 credits in courses (numbered 300 or above) and research is required. An appropriate master's degree or DVM/VMD or equivalent from an accredited college or university may be recommended for approval for a maximum of 30 credits. At least 21 credits beyond the M.S./DVM degree are to be earned in courses numbered 500 and above and 16 credits

should be in regular courses (excludes MIP798 research, MIP799 dissertation, MIP700 topics, MIP784 supervised teaching, and MIP792 seminars). The department requires that 13 of the 16 credits be earned in MIP courses.

Ph.D. Graduate Program minimum course requirements

Required courses:

MIP700- Topics in Microbiology, 1 credit each year (PhD- at least 4 semesters)

MIP792A- Seminar- Research/Graduate, 1 credit each semester

MIP654- Research Policies and Regulations, 1 credit

or GRAD544- Ethical Conduct in Research

or CM666- Science and Ethics

Highly recommended:

MIP540- Biosafety in Research Laboratories, 2 credits

MIP643- Grant Writing for Microbiology/Pathology, 1 credit

MIP666- Writing Scientific Manuscripts, 3 credits

Ph.D. Graduate Program average time to completion is 4.5-5 years.

Preliminary Examination for Admission to Candidacy for the Ph.D.

The Doctor of Philosophy student gains admission to candidacy by passing a comprehensive preliminary examination. The preliminary examination consists of preparation of a written research proposal and an oral exam, which covers the candidate’s entire program of study. The preliminary examination is to be administered by the end of the 5th semester in the graduate program (Fall semester of the third year).

D. Graduate Seminars and Presentations

All graduate students are required to register for graduate seminar (MIP792A) and regularly attend weekly seminars during the fall and spring semesters. Graduate students are required to present a seminar every other academic year during their graduate studies, beginning in the second year. Final defense seminars may be presented as part of the weekly graduate seminar series or separately.

E. MIP Graduate Curriculum -MS-Thesis and PhD Programs

MS-Thesis & PhD Credit Requirements

MS-Thesis	PhD
30 credits total	72 credits total
24 credits at CSU	24 credits at CSU (30 credits can be applied from MS or DVM degree)
16 credits must be 500+	21 credits must be 500+ (beyond MS/DVM if applicable)
12 credits must be regular courses*	16 credits must be regular courses*
9 credits must be regular courses* with MIP prefix	13 credits must be regular courses* with MIP prefix

*Regular course work is defined as courses other than seminars, topics, independent or group studies, research credits, thesis/dissertation credits, and supervised college teaching.

<i>Course Number and Title</i>	<i>Offered</i>	<i>Credits</i>
Required Courses		
MIP700 -Topics in Microbiology, Immunology and Pathology	Fall and Spring	1
MIP792A - Graduate Student Seminar	Fall and Spring	1
MIP654 - Research Policies and Regulations	Fall	1
General Electives		
MIP470 -Graduate Fellowship Proposal Preparation	Fall	1
MIP540 -Biosafety in Research Laboratories	Spring	2
MIP643 -Grant Writing for Microbiology/Pathology	Spring	1
MIP666 -Writing Scientific Manuscripts	Fall even years	3
MIP710 –Research Teams Mentoring	Spring	1
MIP780A4 -Post DVM Research Training Seminar	Fall	1
Virology Electives		
MIP533 -Epidemiology of Infectious Disease	Spring	3
MIP543 -RNA Biology	Fall odd years	3
MIP555 -Principles and Mechanisms of Disease	Fall	3
MIP581A5 -Advanced Virology - Fundamentals/New Insights	Spring even years	1
MIP581A6 -Advanced Virology - Mechanisms of Viral Disease	Spring even years	1
MIP581A7 -Advanced Virology - Discovery Tools and Control	Spring even years	1
MIP680A4 -Fundamentals of Infectious Disease Immunity	Spring odd years	1
MIP680A5 –Immunity to Viruses	Spring odd years	1
Bacteriology Electives		
MIP550 -Microbial and Molecular Genetics Laboratory	Spring	4
MIP555 -Principles and Mechanisms of Disease	Fall	3
MIP580B1 -Intro to Mechanisms of Bacterial Pathogenesis	Spring odd years	1
MIP580B2 -Bacterial Pathogenesis Mechanisms & Lifestyle	Spring odd years	1
MIP580B3 -Bacterial Pathogenesis –Evading Host Defenses	Spring odd years	1
MIP680A4 -Fundamentals of Infectious Disease Immunity	Spring odd years	1
MIP680A6 -Immunity to Bacteria and Parasites	Spring odd years	1
MIP681A5 -Introduction to Advanced Microbial Physiology	Fall even years	1
MIP681A6 -Advanced Microbial Physiology Experimentation	Fall even years	1
MIP681A7 -Microbial Physiology –Translational Discover	Fall even years	1
Vector Biology Electives		
MIP525 -Mosquito Collection and Identification Methods	Fall odd years	1
MIP580A5 -Introduction to Biology of Disease Vectors	Spring even years	1
MIP580A6 -Biology of Arbovirus Vectors/Genetics	Spring even years	1
MIP580A7 -Biology of Parasite/Bacteria Vectors	Spring even years	1
Molecular and Genomic Approaches Electives		
MIP543 -RNA Biology	Fall odd years	3
MIP545 -Microbial Metagenomics/Genomics Data Analysis	Fall	2
MIP565 -Next Generation Sequencing Platform/Libraries	Spring	1
MIP570 -Functional Genomics	Fall	3

Immunology Electives

MIP525 -Flow Cytometry for Immunology	Fall	1
MIP651 -Immunobiology	Fall even years	3
MIP730 -Principles of Flow Cytometry & Cell Sorting	Spring	2
MIP580B4 -Pillars of Immunology	Fall odd years	1
MIP680A4 -Fundamentals of Infectious Disease Immunity	Spring odd years	1
MIP680A5 -Immunity to Viruses	Spring odd years	1
MIP680A6 -Immunity to Bacteria and Parasites	Spring odd years	1
MIP681A4 -B Cells Development and Function	Spring even years	1

Prion Biology Electives

MIP520 -Fundamentals of Prion Biology	Fall	1
MIP620 -Advanced Prion Biology	Spring	1

Pathology Electives

MIP675 -Advanced Bioanalytic Pathology	Spring odd years	2
MIP765 -Comparative Neuropathology	Spring even years	2
MIP766 -Cytopathology	Spring	1
MIP767 -Advanced General Pathology	Fall	1
MIP768 -Advanced Clinical Pathology	Spring	1
MIP778 -Pathobiology of Laboratory Animals	Fall odd years	3
MIP779 -Laboratory Animal Pathology Rotation	Spring even years	1

Courses offered by other CSU Departments

BC563 -Molecular Genetics	Fall	4
BC565 -Molecular Regulation of Cell Function	Spring	4
BC663 -Gene Expression	Spring	2
BIOM525 -Cell and Tissue Engineering	Spring even years	3
BMS500 -Mammalian Physiology I	Fall	4
BMS501 -Mammalian Physiology II	Spring	4
ERHS510 -Cancer Biology	Spring	3
ERHS611 -Cancer Genetics	Fall	2
CM666 -Science and Ethics	Spring	3
GRAD544 -Ethical Conduct in Research	Fall and Spring	1
GRAD550 -STEM Communication	Fall and Spring	1
NSCI575 -Ethical Issues with Big Data	Fall	1
DSCI510 -Linux as a Computational Platform	Fall	1
DSCI511 -Genomics Data Analysis in Python	Fall	2
DSCI512 -RNA-Seq Data Analysis	Fall	1
STAR511 -Design and Data Analysis for Researchers I	Fall	4
STAR512 -Design and Data Analysis for Researchers II	Spring	4
STAT544 -Biostatistical Methods for Quantitative Data	Spring	3
VS562 -Applied Data Analysis	Spring	3

More curriculum details and MIP course syllabi are available by request from cymbs-mip_microbio@mail.colostate.edu

IV. Research Teams

In order to facilitate research conducted by our faculty, development of mentoring skills of our graduate students and research experience for our undergraduate students, MIP has formally implementing a strategy to foster research teams. Research teams are composed of faculty principal investigators (PIs), their students working toward a PhD or MS degree or postdoctoral fellows acting as research mentors (RMs), and students seeking research experience as research trainees (RTs). While we believe that these research teams will greatly advance and enhance our research, mentoring and training opportunities and strongly encourage participation, research team development is completely voluntary.

The research team will be led by a faculty mentor who is acting as a PI on a research project in their laboratory. Research mentors will coordinate with their PIs to identify interested and motivated undergraduate students to join their research team. With consent from their faculty mentor, graduate student RMs can enroll to receive transcribed credit towards their graduate degree for mentoring RTs. Graduate student RMs can also apply these credits toward fulfilling the requirements for the TILT [Graduate Teaching Certificate Program](#).

Research mentors are expected to enroll in a mentoring class for formal instruction on how to mentor a RT. MIP offers MIP780A3- Research Teams Mentoring, a course that teaches graduate students techniques to effectively mentor in a research laboratory setting. It is also expected that research mentors will mentor their RT(s) at least 9 hours per week, including mentor them to present their work to the broader community, such as Celebrate Undergraduate Research and Creativity, Multicultural Undergraduate Research, Leadership and Art Symposium, Science on Tap, or some similar opportunity.

V. Graduate Student Funding and Assistantships

A. Graduate Assistantships

Students admitted to the MIP graduate program are awarded Graduate Teaching Assistantships (GTA) during the first year of the program as they perform teaching duties in the undergraduate courses offered by MIP and complete laboratory rotations. By the second year of the program, when a permanent advisor has been identified, students will transition to Graduate Research Assistants (GRA) for the remainder of the program. Both GTA and GRA positions receive a monthly stipend at the current NIH-NRSA pre-doctoral level, and tuition coverage.

B. Other Funding Opportunities

The department is committed to funding GTA and GRA students, but also encourages students to apply for outside funding in the form of fellowships. Students in MIP have a successful track record of fellowship awards including NIH-F31 and NSF-GRFP awards. The department provides a number of resources, including grant writing workshops and courses to aid students in submission of proposals.

VI. Student Health Insurance

Health Insurance is a university requirement for graduate students. Students can either enroll in the university Student Health Insurance Plan or submit a waiver of comparable comprehensive coverage.

A. Graduate Assistantship Health Insurance Contribution

The Graduate School provides a health insurance contribution to help offset the cost of health insurance to graduate assistants who meet the following criteria each fall and/or spring semester: 1.) Appointed to a 25% (10 hours per week) or more assistantship (GTA, GRA), 2.) Enrolled in CSU health insurance, and 3.) Enrolled in five or more resident-instruction credits (Audits, Continuous Registration, and CSU Online credits do not meet the Resident Instruction enrollment criteria for this policy). Students do not need to apply for this benefit. Qualified students are automatically enrolled in the GA Health Insurance Contribution Program. The health insurance contribution will be applied to student accounts and taxed through payroll approximately one week after the end of the regular add/drop period each semester qualified.

VII. Student Involvement Opportunities

A. Graduate Student Organization

The Microbiology Graduate Student Organization (MIP-GSO) is a student organization within the Department of Microbiology, Immunology, and Pathology (MIP); comprised of students from the MS-PhD, Combined DVM/PhD, and Combined Veterinary Residency/PhD program who provide a number of valuable resources for students within the Department. Participation is an excellent opportunity for students to get involved and make a difference within MIP.

MIP-GSO organizes a number of events and programs throughout the year, including:

Professional Development Workshops:

- Career Opportunities, especially focusing on non-academia options
- Teaching/Pedagogy
- Financial Planning
- Professional Networking

Student Invited Speaker:

- Organizing two guest speakers, chosen by the student population, each year to visit campus to give talks and meet with interested students

Student Mentorship Program:

- Pairing incoming students with more senior students to foster valuable relationships

Social and Networking Events:

- FACs (Friday Afternoon Club)
- Hikes in the natural areas surrounding Fort Collins
- Outings to sporting events, such as Colorado Rockies (MLB) and Colorado Eagles (ECHL)
- Intramural sports
- Department-wide March Madness pool

And much more...

B. Student Representation on Graduate Education Committee

The Graduate Education Committee (GEC) is responsible for formulating policy and establishing standards relating to graduate education. They play a major role in recruiting and selecting the students enrolled in our programs. Two student representatives serve as members on GEC each year. The committee highly values the input and insight that the student representatives provide.