The comparative biomedical sciences (CBMS) graduate program emphasizes an integrated approach to contemporary biology that combines molecular and cellular techniques with the analysis of complex whole animal systems. Faculty provide exceptional graduate and undergraduate interdisciplinary research training opportunities in core areas of animal and human health including immunology, molecular and cellular biology, physiology, neuroscience, genomics, oncology, virology, medical technology, infectious diseases and toxicology and pharmacology. They also contribute extensive public services, both nationally and internationally, within related faculty disciplines.

The graduate program serves as a focal point for graduate research training in the School of Veterinary Medicine (SVM) and is administered by the Department of Pathobiological Sciences. Trainers in CBMS have their tenure homes in all four departments of the School of Veterinary Medicine as well as in the College of Agricultural and Life Sciences (CALS), the School of Medicine and Public Health, the College of Engineering, and the College of Letters & Science. Faculty in the CBMS program also serve in or interface with other campus training programs including bacteriology, biocore, cellular and molecular biology, endocrinology and reproductive physiology, medical microbiology and immunology, molecular and environmental toxicology, and the Primate Center.

Currently, there are approximately 85 faculty trainers in the comparative biomedical sciences program. Affiliate faculty outside the School of Veterinary Medicine have their tenure homes in the Departments of Anatomy, Animal Sciences, Biochemistry, Dermatology, Entomology, Human Oncology, Medical Microbiology and Immunology, Medicine, Neurosurgery, Ophthalmology and Visual Sciences, Pathology and Laboratory Medicine, Population Health Sciences, Radiology, and Surgery. The program is currently comprised of approximately 50 graduate students, most of whom are pursuing the Ph.D. degree. The program is recognized as a premier research and graduate training program for students with or without a degree in veterinary medicine.

Funding

Most graduate students receive financial support through fellowships, research assistantships through their major professor, and/or National Research Service Awards. Faculty in the program are PIs for four Training Grants (Parasitology and Vector Biology Training Program, Comparative Biomedical Sciences Research Training for Veterinarians, and Research Training for Veterinary Medical Students) for which students with the appropriate background and credentials may compete.

Requirements

Minimum Degree Requirements and Satisfactory Progress

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

Doctoral Degrees

Ph.D., Ph.D./DVM dual degree

Minimum Graduate Degree Credit Requirement

51 credits

Minimum Graduate Residence Credit Requirement

32 credits

Minimum Graduate Coursework (50%) Requirement

At least 50% of credits applied toward the graduate degree credit requirement must be completed in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

Prior Coursework Requirements: Graduate Work from Other Institutions

With program approval, students may transfer no more than 9 credits of advanced graduate coursework from other institutions. These courses may not be used toward the Graduate School's Minimum Graduate Residence Credit. Coursework earned ten or more years prior to admission to the doctoral degree is not allowed to satisfy requirements.

Prior Coursework Requirements: UW–Madison Undergraduate

With program approval, students may count up to 7 credits of advanced undergraduate coursework taken at UW–Madison in lieu of or in combination with credits transferred from another institution. These courses must meet the Graduate School's criteria as graduate coursework and may not be used toward the 50% graduate coursework requirement unless taken at the 700 level or above.

Prior Coursework Requirements: UW–Madison University Special

With program approval, students may count up to 9 credits of coursework numbered 400 or above taken as a UW–Madison special student in lieu of or in combination with credits transferred from another institution or as a UW–Madison undergraduate. Coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to the doctoral degree is not allowed to satisfy requirements.

Credits per Term Allowed

8 to 15 credits maximum for fall and spring; 2 credits required in summer if student is supported as RA, TA, or PA. Dissertators must register for 3 credits in all semesters. International students supported by government scholarships need not register for summer.

Program-Specific Courses Required

Four semesters of Pathobiological Sciences Student Seminar (PATH-BIO 930) prior to dissitator status.
DOCTORAL MINOR/BREADTH REQUIREMENTS
No minor required.

OVERALL GRADUATE GPA REQUIREMENT
3.00 GPA required.

OTHER GRADE REQUIREMENTS
Students must earn a B or above in all major coursework.

PROBATION POLICY
A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full or part-time enrollment the student may be dismissed from the program or allowed to continue based on advisor appeal to the Graduate School.

ADVISOR / COMMITTEE
All students must have an advisor prior to final admission unless offered a rotation. A dissertation committee consisting of five members, the advisor plus two program trainers and two outside members, must be chosen by the end of the first year. The fifth member may be a scientist, industry expert or faculty from another institution.

ASSESSMENTS AND EXAMINATIONS
After the committee is chosen, the student must submit certification paperwork that details the intended course work plan, the committee members’ names and signatures, a short explanation of why they were chosen and an appended research plan. Certification plans will be reviewed and approved by the program academic committee.

Students are expected to meet with their committee at least once per year until degree completion.

There are two preliminary examinations. The first (A) consists of a take-home exam of questions authored by the student’s dissertation committee, followed by an oral exam. The student may retake the exam once if they fail on the first attempt.

The second preliminary examination (B) requires that the student write their research plan in the form of a major grant application and defend it orally before the committee.

Candidates must present broad-based evidence of general proficiency in research and the ability to conduct independent investigation as demonstrated in a written dissertation presenting original research.

A final public presentation, followed by an oral exam in front of their committee and official deposit of the dissertation with the Graduate School is required.

TIME CONSTRAINTS
Certification should be completed by the end of the first year of enrollment.

Preliminary examination A should be taken by the end of the second year.

Preliminary examination B should be taken by the end of the third year.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within 5 years after passing preliminary examination B may be required to take another preliminary examination to be admitted to candidacy a second time.

Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements, but that coursework may not count toward Graduate School credit requirements.

LANGUAGE REQUIREMENTS
No language requirements.

COURSES

REQUIRED COURSES
PATH-BIO 930 Advanced Seminar
Master’s students must register for two semesters of PATH-BIO 930 Advanced Seminar and present once during their second semester. They must take the course pass/fail if not presenting and must attend a minimum of 75 percent of the seminars led by students.

Ph.D. students must register for four semesters of PATH-BIO 930 Advanced Seminar and present twice after their first two semesters. PhD students will take the course pass/fail unless they are presenting. Both presentations must be completed prior to passing to dissertation status. Students must attend a minimum of 75 percent of the student-led seminars.

APPROVED AND RECOMMENDED COURSES
The following is a list of core courses taken by many students and recommended courses that are appropriate to specific research areas. These courses are suggestions only; the student and their committee ultimately decide the best coursework plan for each student’s specific program, with final approval from the program’s academic committee. Students are responsible for determining that the coursework chosen meets the Graduate School’s criteria for graduate work.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURG SCI 812</td>
<td>Research Ethics and Career Development</td>
<td>2</td>
</tr>
<tr>
<td>Any other science-based ethics course</td>
<td></td>
<td></td>
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</tbody>
</table>

Core Courses
These courses are chosen by many students to fulfill their major coursework plan

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>GENETICS 466</td>
<td>Principles of Genetics</td>
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<tr>
<td>PATH-BIO/HORT 500</td>
<td>Molecular Biology Techniques</td>
<td>3</td>
</tr>
<tr>
<td>PATH-BIO/MM &amp; I 773</td>
<td>Eukaryotic Microbial Pathogenesis</td>
<td>3</td>
</tr>
<tr>
<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOCHEM/GENETICS/</td>
<td>Prokaryotic Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>MICROBIO 612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/GENETICS/</td>
<td>Eukaryotic Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>MD GENET 620</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/PHMCOL/MZOOLOGY 630</td>
<td>Cellular Signal Transduction Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>PATH 750</td>
<td>Cellular and Molecular Biology/Pathology</td>
<td>2-3</td>
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</tbody>
</table>
PATH 751  Cell and Molecular Biology of Aging  3
STAT/F&W ECOL/HORT 571 & STAT/F&W ECOL/HORT 572  Statistical Methods for Bioscience I and Statistical Methods for Bioscience II  8

**Courses from which Students Build Disciplinary Strength**

**Epidemiology**

PATH-BIO 512  Introduction to Veterinary Epidemiology  2
POP HLTH/SOC 797  Introduction to Epidemiology  3
POP HLTH 802  Advanced Epidemiology: Etiology and Prevention  3

**Physiology**

AN SCI/DY SCI 434  Reproductive Physiology  3
COMP BIO 551  Veterinary Physiology A  4
COMP BIO 506  Veterinary Physiology B (spring)  4
ZOOGOLOGY 611  Comparative and Evolutionary Physiology  3
ZOOGOLOGY/AN SCI/OBS&GYN 954  Seminar in Endocrinology-Reproductive Physiology  1

**Infectious Disease and Immunology**

M M & I 701  Infection and Immunity I  4
PATH-BIO 510  Veterinary Immunology  3
PATH-BIO 513  Veterinary Virology  2
PATH-BIO 514  Veterinary Parasitology  3
PATH-BIO 517  Veterinary Bacteriology and Mycology  4
PATH-BIO/M M & I/MICROBIO 528  Immunology  3
PATH-BIO/M M & I 750  Host-Parasite Relationships in Vertebrate Viral Disease  3
PATH-BIO/M M & I 773  Eukaryotic Microbial Pathogenesis  3
M M & I/PATH-BIO 720  Advanced Immunology: Critical Thinking  3
M M & I/MICROBIO/PATH-BIO 790  Immunology of Infectious Disease  3

**Neuroscience**

COMP BIO 505  Veterinary Neuroanatomy and Neurophysiology  3
ZOOGOLOGY/PSYCH 523  Neurobiology  3
NTP/PHMCO-M/PHYSIO 610  Cellular and Molecular Neuroscience  4
NTP/ANATOMY/PHMCO-M/PHYSIO/PSYCH 611  Systems Neuroscience  4
NTP/ZOOGOLOGY 635  Neurobiology of Disease  2
ZOOGOLOGY/NT/PHYSL/PSYCH 524  Neurobiology II: An Introduction to the Brain and Behavior  3

**Toxicology and Pharmacology**

COMP BIO 555  Veterinary Toxicology  2

**Oncoology**

PATH/M&ENVTOX/MEDICINE/ONCOLOGY/PHMSCI/PHMCO-M/POP HLTH 625  Toxicology I  3
PATH/M&ENVTOX/MEDICINE/PHMSCI/PHMCO-M/POP HLTH 626  Toxicology II  3
ONCOLOGY 675  Advanced or Special Topics in Cancer Research  1-3
ONCOLOGY 703  Carcinogenesis and Tumor Cell Biology  3

**Virology**

PATH-BIO 513  Veterinary Virology  2
BIOCHEM/M M & I 575  Biology of Viruses  2
ONCOLOGY/MICROBIO/PL PATH 640  General Virology-Multiplication of Viruses  3
M M & I/PATH-BIO 750  Host-Parasite Relationships in Vertebrate Viral Disease  3

**ADMISSIONS**

Admission is competitive. Applicants must hold a B.S., DVM., M.S., M.A. or M.D. from an approved institution and have a strong background in biology and chemistry. Applications are judged on the basis of previous academic record, graduate record exam (GRE) scores, letters of recommendation, and the personal statement. Before admission, most students must be accepted by an eligible program faculty member who agrees to serve as the major professor. A limited number of students may be offered rotations.

**LEARNING OUTCOMES**

**KNOWLEDGE AND SKILLS**

- Regardless of whether an individual is awarded a master's degree, the doctoral-level learning goals are inclusive of the master's level learning goals.

**KNOWLEDGE**

- Initiates, assembles, arranges and/or reformulates ideas, concepts, designs, and/or techniques in carrying out a project beyond conventional boundaries.
- Engages diverse cultural, historical or personal perspectives and articulates how these perspectives contribute to a project, paper or performance.

**SKILLS**

- Creates research, scholarship or performance that makes a substantive contribution to the field of study.
- Demonstrates breadth within their learning experiences.
- Implements methodologies and/or practices and illustrates their relationships to allied fields.
- Develops new concepts and methodologies and/or identifies new research opportunities.
• Communicates complex and/or ambiguous ideas clearly.
• Evaluates the implications of one’s own scholarship/research/performance to broader social concerns.

PROFESSIONAL CONDUCT

• Recognizes and applies ethical conduct and professional guidelines.

PEOPLE

Faculty: See Comparative Biomedical Sciences (http://www.vetmed.wisc.edu/ms-phd/current-students/faculty-trainers) faculty list.