

# COMPARATIVE BIOMEDICAL SCIENCES, PH.D.

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 (SMPH), 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 over 100 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 55 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.

## ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 1
Spring Deadline	June 1

Summer Deadline	December 1
GRE (Graduate Record Examinations)	Not required but may be considered if available.
English Proficiency Test	Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements ( <a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

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. Historically, most students start in the fall semester.

## FUNDING

### GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

### PROGRAM RESOURCES

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 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 GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirements>), in addition to the program requirements listed below.

## MAJOR REQUIREMENTS MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

### Mode of Instruction Definitions

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

**Evening/Weekend:** Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW–Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

## CURRICULAR REQUIREMENTS

### Requirement Detail

Minimum Credit Requirement

Minimum Residence Credit Requirement

Minimum Graduate Coursework Requirement

Overall

Graduate GPA Requirement

Other Grade Requirements

**Assessments and Examinations** After the committee is chosen, the student must submit certification paperwork that details the intended coursework 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.

**Language Requirements** No language requirements.

**Breadth Requirement** A minor or Graduate/Professional certificate is no longer required but may be completed by students who wish to receive one. The decision to fulfill a minor or certificate should be requested at the time of certification. In general, most minors or certificates require a minimum of 9 didactic credits in a single degree program (e.g., neuroscience, population health, genetics). Focused minors or certificates usually require approval from the related program or department and may involve additional rules or credits. Check with the program in which you have an interest early in the process.

## REQUIRED COURSES

Choose your coursework in consultation with your major professor. The Graduate School requires a minimum of **32** total credits prior to taking the CBMS prelim B and **51** credits to graduate (any combination of didactic or lab courses, seminars and research).

- 20 didactic credits.
- PhD students must register for four semesters of PATH-BIO 930 Advanced Seminar and present twice after the first two semesters. One presentation must be completed prior to passing to dissertator status. The second presentation may take place after reaching dissertator status, but no later than the semester prior to the student's dissertation defense. PhD students will take the course P/S/U (Progress/Satisfactory/Unsatisfactory) unless they are presenting.
- 27 Research 990 credits (minimum, unless you take more didactic or laboratory courses).

## 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.

Code	Title	Credits
<b>Recommended Course</b>		
SURG SCI 812	Research Ethics and Career Development	2
Any other science-based ethics course		
<b>Core Courses</b>		
These courses are chosen by many students to fulfill their major coursework plan		
GENETICS 466	Principles of Genetics	3
BIOCHEM 501	Introduction to Biochemistry	3
BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology	3
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	3
BIOCHEM/ PHMCOL-M/ ZOOLOGY 630	Cellular Signal Transduction Mechanisms	3
ZOOLOGY 570	Cell Biology	3
PATH 750	Cellular and Molecular Biology/ Pathology	2-3
PATH 751	Biology of Aging	2
STAT/F&W ECOL/ HORT 571 & STAT/F&W ECOL/ HORT 572	Statistical Methods for Bioscience I and Statistical Methods for Bioscience II	8
<b>Courses from which Students Build Disciplinary Strength</b>		
<i>Epidemiology</i>		
PATH-BIO 512	Introduction to Veterinary Epidemiology	2
POP HLTH/ SOC 797	Introduction to Epidemiology	3
<i>Physiology</i>		
AN SCI/DY SCI 434	Reproductive Physiology	3
COMP BIO 551	Veterinary Physiology A	4
COMP BIO 506	Veterinary Physiology B (spring)	4
ZOOLOGY 611	Comparative and Evolutionary Physiology	3
ZOOLOGY/AN SCI/ OBS&GYN 954	Seminar in Endocrinology- Reproductive Physiology	1
<i>Infectious Disease and Immunology</i>		
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 528	Immunology	3
PATH-BIO/ M M & I 750	Host-Parasite Relationships in Vertebrate Viral Disease	3
M M & I/PATH- BIO 720	Advanced Immunology: Critical Thinking	3
<i>Neuroscience</i>		
COMP BIO 505	Veterinary Neuroanatomy and Neurophysiology	3
ZOOLOGY/ PSYCH 523	Neurobiology	3
NTP/ NEURODPT 610	Cellular and Molecular Neuroscience	4
NTP/NEURODPT/ PSYCH 611	Systems Neuroscience	4
<i>Toxicology and Pharmacology</i>		
COMP BIO 555	Veterinary Toxicology	2
<i>Oncology</i>		
ONCOLOGY 675	Advanced or Special Topics in Cancer Research	1-3
ONCOLOGY 703	Carcinogenesis and Tumor Cell Biology	3
<i>Virology</i>		
PATH-BIO 513	Veterinary Virology	2
BIOCHEM/ M M & I 575	Biology of Viruses	2
ONCOLOGY/ PL PATH 640	General Virology-Multiplication of Viruses	3
M M & I/PATH- BIO 750	Host-Parasite Relationships in Vertebrate Viral Disease	3

## POLICIES

### GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

### MAJOR-SPECIFIC POLICIES

#### PRIOR COURSEWORK

##### 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.

##### 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 graduate 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.

### **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 graduate 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.

### **PROBATION**

This program follows the Graduate School's Probation policy. (<https://policy.wisc.edu/library/UW-1217/>)

### **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 member of the faculty from UW–Madison or from another institution. All committee members of your final oral examination committee will be designated as readers.

### **CREDITS PER TERM ALLOWED**

15 credits

### **TIME LIMITS**

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 five years after passing preliminary examination B may be required to take another preliminary examination to be admitted to candidacy a second time.

This program follows the Graduate School's Time Limits policy. (<https://policy.wisc.edu/library/UW-1221/>)

### **GRIEVANCES AND APPEALS**

These resources may be helpful in addressing your concerns:

- Employee Disability Resource Office (<https://employeeabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
  - Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
  - Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
  - Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
  - Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
  - Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)
- If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance. Students' concerns about unfair treatment are best handled directly with the person responsible for the objectionable action. If the student is uncomfortable making direct contact with the individual(s) involved, they should contact the advisor or the person in charge of the unit where the action occurred (program or department chair, section chair, lab manager, etc.). For more information see the Graduate School Academic Policies & Procedures: Grievances & Appeals: <https://grad.wisc.edu/acadpolicy/#grievancesandappeals>
- Procedures for proper accounting of student grievances:
1. The student is encouraged to speak first with the person toward whom the grievance is directed to see if a situation can be resolved at this level.
  2. Should a satisfactory resolution not be achieved, the student should contact the program's Grievance Advisor or Director of Graduate Study to discuss the grievance. The Grievance Advisor or Director of Graduate Study will facilitate problem resolution through informal channels and facilitate any complaints or issues of students. The first attempt is to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties if necessary. University resources for sexual harassment, discrimination, disability accommodations, and other related concerns can be found on the UW Office of Compliance website (<https://compliance.wisc.edu/>).
  3. If the issue is not resolved to the student's satisfaction, the student can submit the grievance to the Grievance Advisor in writing, within 60 calendar days of the alleged unfair treatment.
  4. On receipt of a written complaint, a faculty committee will be convened by the Grievance Advisor to manage the grievance. The program faculty committee will obtain a written response from the person toward whom the complaint is directed. This response will be shared with the person filing the grievance.
  5. The faculty committee will determine a decision regarding the grievance. The Grievance Advisor will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.
  6. At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty

committee, the party may file a written appeal. Either party has 10 working days to file a written appeal to the School/College.

7. Documentation of the grievance will be stored for at least 7 years. Significant grievances that set a precedent will be stored indefinitely.

## OTHER

Most students must be accepted by a major professor in the CBMS Graduate Program before they can be fully admitted to the program. Rotations are offered to a limited number of entering students (1–2) in the fall semester.

17. Recognizes and applies ethical conduct and professional guidelines.
18. Fosters ethical conduct and professional guidelines.

## PEOPLE

**Faculty:** See Comparative Biomedical Sciences (<https://www.vetmed.wisc.edu/education/ms-phd/trainers/>) faculty list.

## PROFESSIONAL DEVELOPMENT

## GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

## LEARNING OUTCOMES

1. Articulates, critiques, or elaborates the theories, research methods, and approaches to inquiry and/or schools of practice in the field of study.
2. Articulates sources and assembles evidence pertaining to questions or challenges in the field of study.
3. Assesses and/or applies methodologies and practices in the field of study.
4. Articulates challenges involved in practicing the field of study, elucidates its leading edges, and delineates its current limits with respect to theory, knowledge, and/or practice.
5. Appreciates the implication of the primary field of study in terms of challenges, trends, and developments in a broader scientific context.
6. Initiates, assembles, arranges and/or reformulates ideas, concepts, designs, and/or techniques in carrying out a project beyond conventional boundaries.
7. Engages diverse cultural, historical or scientific perspectives and articulates how these perspectives contribute to a project, paper or performance.
8. Demonstrates abilities to apply knowledge through critical thinking, inquiry, and analysis to solve problems, engage in scholarly work, and/or produce creative products.
9. Evaluates, assesses or refines information resources or an information base within the field.
10. Communicates clearly in styles appropriate to the field of study.
11. Develops hypothesis, creates research, scholarship or performance that makes a substantive contribution to the field of study.
12. Demonstrates breadth within their learning experiences.
13. Implements methodologies and/or practices to test hypotheses and illustrates the implications of the experimental outcome to the field of study and its relationship to allied fields.
14. Develops new concepts and methodologies and/or identifies new research opportunities.
15. Communicates complex and/or ambiguous ideas clearly.
16. Evaluates the implications of one's own scholarship/research/performance to broader scientific advancement.