***Twin Cities Campus***

# Comparative and Molecular Biosciences Ph.D.

*College of Veterinary Medicine - Adm*

**College of Veterinary Medicine**

Link to a list of faculty for this program.

**Contact Information:**
College of Veterinary Medicine, 1365 Gortner Avenue, Room 443 VMC, Saint Paul, MN 55108 (612-625-3770; fax: 612-626-2825)
Email: cvmmsphd@umn.edu
Website: http://www.cvm.umn.edu/cmb

- Program Type: Doctorate
- Requirements for this program are current for Spring 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The mission of the comparative and molecular biosciences (CMB) program is to train outstanding scientists in the basic mechanisms of animal and human health and disease.

The CMB program is transdisciplinary, bringing together basic, applied, and clinical scientists from a number of departments to provide students with individualized, cutting-edge biomedical research training. Areas of emphasis include genetic and infectious diseases, and comparative aspects of biology and pathology across animal species and humans. Students receive scientific training that prepares them for careers as independent investigators and educators in academia, industry, and government. The CMB program focuses on health that spans a wide range of species, from laboratory animal, companion animal, and livestock species to humans, and is unique within the University of Minnesota.

## Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

## Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.25.

A bachelor's degree in a biological or basic science is required. Previous research experience is expected but not required.

Other requirements to be completed before admission:
Applicants must submit a C.V. or résumé; three letters of recommendation from persons familiar with their scholarship and research potential; and a statement of any research experience, as well as career interests, goals, and objectives.

**Special Application Requirements:**
Submission of all application materials by December 15 is required to ensure consideration for admission, fellowships, and research assistantships awarded for the next academic year. http://www.cvm.umn.edu/students/ms-phd/CMB/index.htm

Applicants must submit their test score(s) from the following:

- GRE

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB

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- Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations(GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

## Program Requirements

24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires a minimum of 24 course credits and 24 thesis credits. The 24 course credits include 13 credits of CMB program courses. A statistics course is required. A minimum of 7 additional course credits from the biological sciences are also required. In addition, all students are required to complete a teaching experience. A minimum GPA of at least 3.00 is required to maintain satisfactory progress and to graduate.

**CMB program courses**

A minimum of 13 course credits are required. CMB 8100 must be taken twice and CMB 8550 must be taken twice.
CMB 5910 - Grantwriting: What Makes a Winning Proposal? (2.0 cr)
CMB 8100 - Research Rotation in Comparative and Molecular Biosciences (1.0 cr)
CMB 8134 - Ethical Conduct of Animal Research (3.0 cr)
CMB 8202 - Mechanisms of Animal Health and Disease II (3.0 cr)
CMB 8303 - Comparative Models of Disease (2.0 cr)
CMB 8550 - Comparative and Molecular Biosciences Seminar (1.0 cr)
CMB 8560 - Research and Literature Reports (1.0 cr)

**Statistics**

One of the following statistics courses is required.
CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
*or* PUBH 6450 - Biostatistics I (4.0 cr)
*or* PUBH 6451 - Biostatistics II (4.0 cr)
*or* STAT 5021 - Statistical Analysis (4.0 cr)
*or* STAT 5031 *{Inactive}*(4.0 cr)
*or* STAT 5302 - Applied Regression Analysis (4.0 cr)
*or* STAT 5303 - Designing Experiments (4.0 cr)
*or* STAT 5421 - Analysis of Categorical Data (3.0 cr)

**Additional courses**

A minimum of 7 course credits are required, selected from the following list or in consultation with the advisor. Students may take GRAD 8101 OR GRAD 8200 but not both.
MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
*or* MICA 8003 - Immunity and Immunopathology (4.0 cr)
*or* MICA 8004 - Cellular and Cancer Biology (4.0 cr)
*or* MICA 8009 - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
*or* MICA 8010 - Microbial Pathogenesis (3.0 cr)
*or* MICA 8371 - Mucosal Immunobiology (3.0 cr)
*or* BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
*or* BIOC 6021 - Biochemistry (3.0 cr)
*or* BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
*or* BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
*or* GCD 5036 - Molecular Cell Biology (3.0 cr)
*or* GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
*or* GCD 8073 - Genetics & Genomics in Human Health (2.0 cr)
*or* GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
*or* GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)

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*or* GCD 8161 - Advanced Cell Biology and Development (2.0 cr)
*or* CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
*or* CMB 5910 - Grantwriting: What Makes a Winning Proposal? (2.0 cr)
*or* CMB 8208 - Neuropsychopharmacology (3.0 cr)
*or* CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
*or* CMB 8361 - Neuro-Immune Interactions (3.0 cr)
*or* CMB 8371 - Mucosal Immunobiology (3.0 cr)
*or* CMB 8394 - Research in Comparative Biomedical Sciences (1.0 - 6.0 cr)
*or* CMB 8481 - Advanced Neuropharmaceutics (4.0 cr)
*or* GRAD 8101 - Teaching in Higher Education (3.0 cr)
*or* GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)

**Thesis Credits**

Take at least 24 doctoral thesis credits
CMB 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

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