

ANIMAL BIOSCIENCES

In addition to a core group of faculty members, the Department of Animal Biosciences works closely with professionals from the Ontario Ministry of Agriculture and Food (OMAF), Agriculture and Agri-Food Canada (AAFC), and other affiliated organizations. The graduate program encompasses MSc by course work, MSc by thesis, and PhD options in four main fields:

- **Animal Breeding and Genetics** (quantitative or molecular)
- **Animal Nutrition** (monogastric or ruminant)
- **Animal Physiology** (environmental and reproductive)
- **Animal Behaviour and Welfare**

Administrative Staff

Chair

Christine Baes (146 ANNU, Ext. 53363)
cbaes@uoguelph.ca

Graduate Program Coordinator

Wendy Pearson (227 ANNU, Ext. 53652)
wpearson@uoguelph.ca

Graduate Program Assistant

Jacob Harwood (144 ANNU, Ext. 56215)
harwood@uoguelph.ca

Graduate Faculty

This list may include Regular Graduate Faculty, Associated Graduate Faculty and/or Graduate Faculty from other universities.

Christine Baes

B.Sc. Guelph, M.Sc. Hohenheim, PhD Christian-Albrechts - Professor and Chair
Graduate Faculty

Renée Bergeron

B.Sc., M.Sc. Laval, PhD Illinois - Associate Professor
Graduate Faculty

Dominique P. Bureau

B.Sc., M.Sc. Laval, PhD Guelph - Professor
Graduate Faculty

Grégory Bédécarrats

Licence de Biochimie, M.Sc., Dipl. Rennes (France), PhD McGill - Professor
Graduate Faculty

John P. Cant

B.Sc. Nova Scotia, MS, PhD California - Professor
Graduate Faculty

Angela Cánovas

B.Sc. Lledia, M.Sc. Valencia, PhD Lledia - Associate Professor
Graduate Faculty

Eduardo de Souza Ribeiro

B.V.M. Santa Catarina State, M.Sc., PhD Florida - Associate Professor
Graduate Faculty

Trevor DeVries

B.Sc., PhD British Columbia - Professor
Graduate Faculty

Marcio Duarte

B.Sc., M.Sc., D.Sc. Federal De Vicosa - Assistant Professor
Graduate Faculty

Jennifer Ellis

B.Sc., M.Sc., PhD Guelph - Assistant Professor
Graduate Faculty

Ming Z. Fan

BS Xinjiang, MS Harbin, PhD Alberta - Professor
Graduate Faculty

Alexandra Harlander

DVM, D.V.Sc. Vienna, PhD Germany - Associate Professor
Graduate Faculty

Lee-Anne Huber

B.Sc., M.Sc., PhD Guelph - Assistant Professor
Graduate Faculty

David Huyben

B.Sc., M.Sc. Guelph, PhD Sweden - Assistant Professor
Graduate Faculty

Niel A. Karrow

B.Sc. Guelph, M.Sc., PhD Waterloo - Professor
Graduate Faculty

Elijah Kiarie

B.Sc., M.Sc. Nairobi, PhD Manitoba - Associate Professor
Graduate Faculty

Julang Li

M.Sc. Changchun Veterinary College (China), PhD Ottawa - Professor
Graduate Faculty

Katrina Merkies

B.Sc., PhD Guelph - Associate Professor
Graduate Faculty

Vern R. Osborne

B.Sc., M.Sc., PhD Guelph - Professor
Graduate Faculty

Wendy Pearson

B.Sc., M.Sc., PhD Guelph - Associate Professor
Graduate Faculty

J. Andrew B. Robinson

B.Sc., M.Sc. Guelph, PhD Cornell - Associate Professor
Graduate Faculty

Flavio S. Schenkel

BBA, B.Sc., M.Sc. Brazil, PhD Guelph - Professor
Graduate Faculty

Anna Kate Shoveller

B.Sc. Guelph, PhD Alberta - Professor
Graduate Faculty

E. James Squires

B.Sc., M.Sc., PhD Memorial - Professor
Graduate Faculty

Michael Steele

B.Sc., M.Sc., PhD Guelph - Professor

Graduate Faculty

Stephanie Torrey

B.Sc. Worcester Polytechnic Inst, M.Sc. Purdue, PhD Guelph - Research Scientist, Trouw Nutrition Canada
Associated Graduate Faculty

Dan Tulpan

B.Sc. Burcharest, PhD British Columbia - Assistant Professor
Graduate Faculty

Tina M. Widowski

BS, MS, PhD Illinois - Professor
Graduate Faculty

Katie Wood

B.Sc., M.Sc., PhD Guelph - Associate Professor
Graduate Faculty

MSc Program

Admission Requirements

An honours baccalaureate, with a minimum average grade of 'B' during the last 2 years of full-time equivalent study. For Canadian degrees, we interpret this as the last 20 semester courses, however we do not split a semester and we will not consider any fewer than 16 courses.

Program Requirements

The MSc program involves advanced courses and the completion of a research project. These are means of developing the skills and intellectual curiosity that may further qualify the student for a leadership role within animal organizations and industries or serve as a prerequisite for doctoral studies. Students enrol in one of two study options:

1. thesis, or
2. course work and major research paper.

Thesis

Candidates for the thesis-based MSc degree must successfully complete a prescribed series of courses, prepare and submit a thesis proposal to their advisory committee, conduct a research project, prepare a thesis based on their results and defend this in a final examination. The number of course credits required in this option will be decided by the student's advisory committee in consultation with the student, and may exceed the minimum 1.5 credits required by the Faculty of Graduate Studies. Generally, 4 or 5 courses (1.5-2.0 credits) will be taken, including the mandatory ANSC*6610 Scientific Communication, Knowledge Dissemination and Professional Development (0.50 credits)

Course Work and Major Research Paper (MRP)

Candidates for the MSc degree by course work and major paper option must complete a minimum of 4.0 credits (7 courses). Of these courses, one will be ANSC*6900 Major Paper in Animal Biosciences and another must be the mandatory ANSC*6610 Scientific Communication, Knowledge Dissemination and Professional Development (0.50 credits). The major paper will be a detailed, critical review of an area of study related to the specialization chosen by the student and should include analyses and interpretations of relevant data.

At the beginning of the program, the student and student's advisory committee will design the coursework program according to the program guidelines and the aspirations and background of the student. Students will normally choose a minimum of 4 courses in the area of specialization, and a minimum of two courses outside the area of

specialization. These latter courses can be offered by departments other than Animal Biosciences.

A maximum of one approved senior-level undergraduate course can be included in the list of prescribed courses. Recommended graduate courses in the three areas of specialization are as follows:

Code	Title	Credits
Animal Breeding and Genetics		
ANSC*6900	Major Paper in Animal Biosciences	1.00
ANSC*6210	Principles of Selection in Animal Breeding	0.50
ANSC*6370	Quantitative Genetics and Animal Models	0.50
ANSC*6390	QTL and Genetic Markers	0.50
ANSC*6450	Topics in Animal Biotechnology	0.50
Animal Nutrition and Metabolism		
ANSC*6900	Major Paper in Animal Biosciences	1.00
ANSC*6010	Topics in Comparative Animal Nutrition	0.50
ANSC*6030	Modelling Metabolic Processes	0.50
ANSC*6360	Techniques in Animal Nutrition Research	0.50
ANSC*6450	Topics in Animal Biotechnology	0.50
ANSC*6460	Lactation Biology	0.50
ANSC*6470	Advanced Animal Nutrition and Metabolism I	0.50
ANSC*6480	Advanced Animal Nutrition and Metabolism II	0.50
Animal Behaviour and Welfare		
ANSC*6900	Major Paper in Animal Biosciences	1.00
ANSC*6440	Advanced Critical Analysis in Applied Ethology	0.50
ANSC*6700	Animals in Society: Historical and Global Perspectives on Animal Welfare	0.50
ANSC*6710	Assessing Animal Welfare in Practice	0.50
ANSC*6720	Scientific Assessment of Affective States in Animals	0.50
ANSC*6730	Applied Environmental Physiology and Animal Housing	0.50
ANSC*6740	Special Topics in Applied Animal Welfare Science	0.50
UNIV*6030	Seminars and Analysis in Animal Behaviour and Welfare	0.50

The MSc by course work and major paper degree will require a minimum of three semesters of full-time study (or the equivalent).

PhD Program

Admission Requirements

Students entering a PhD program should show potential for independent, productive, and original research. A PhD program can be entered by three routes: following completion of an MSc program; following transfer prior to completion of an MSc program; and directly from a bachelor degree.

In general, a minimum average grade of 'B' for a completed MSc program plus strong letters of reference are required. Students wishing to be considered for transfer to a PhD program prior to completion of the MSc program must request the transfer before the end of the fourth semester and have an excellent academic record as well as a strong aptitude for research.

Direct admission to the PhD program may be permitted for applicants who hold a bachelor's degree and have an excellent academic history and strong indications of research potential.

Program Requirements

The PhD program is research oriented and provides instruction and experiences that develop the student's ability to independently formulate hypotheses and design and execute experiments or conduct observational studies to reach definitive conclusions.

Satisfactory completion of a PhD program requires a comprehensive knowledge of the area of emphasis and the ability to conduct original research in this area, plus a sound general background in two related areas of study. This competence is demonstrated in a qualifying examination and through the preparation and submission of a thesis proposal to their advisory committee that outlines the design and plans to execute a substantial and original research project. Based on this research, a thesis is prepared and defended in a final examination.

The number of courses required for a PhD program will be decided by the student's advisory committee in consultation with the student. All PhD students are required to complete the mandatory ANSC*6610 Scientific Communication, Knowledge Dissemination and Professional Development (0.50 credits). Students taking this course as an MSc student are not required to take it as a PhD student.

Collaborative Specializations

Neuroscience

The Department of Animal Biosciences participates in the MA/MSc/PhD collaborative specialization in neuroscience. Please consult the Neuroscience (calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/neuroscience/) listing for a detailed description of the MA/MSc/PhD collaborative specialization.

One Health

The Department of Animal Biosciences participates in the collaborative specialization in One Health. Master's and Doctoral students wishing to undertake thesis research or their major research paper/project with an emphasis on one health are eligible to apply to register concurrently in Animal Biosciences and the collaborative specialization. Students should consult the One Health (calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/one-health/) listing for more information.

Toxicology

The Department of Animal Biosciences participates in the masters/doctoral collaborative specialization in toxicology. The research and teaching expertise of these faculty include aspects of toxicology; they may serve as advisors for masters and doctoral students in Toxicology. Students choosing this option must meet the requirements of the Toxicology collaborative specialization, as well as those of their home department. Please consult the Toxicology (calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/toxicology/) listing for a detailed description of the masters/doctoral collaborative specialization.

Courses

Some courses are only offered when there is a certain minimum enrolment.

ANSC*6010 Topics in Comparative Animal Nutrition Fall Only [0.50]

Current topics in the feeding and nutrition of agricultural, companion and captive animal species. Emphasis is placed on the influence of nutrients on metabolic integration at tissue, organ and whole-animal levels. A nutritional case study will be conducted to allow students to solve practical feeding problems by applying basic nutritional principles.

Offering(s): Annually

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6030 Modelling Metabolic Processes Fall Only [0.50]

Building and testing of mathematical models of metabolic processes using continuous simulation software to assist in weekly assignments. Choice of model based on students' research interests (e.g. protein synthesis, nutrient uptake, rumen fermentation). Term project to reproduce model from scientific knowledge.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6070 Metabolic Regulation of Reproduction Fall Only [0.50]

Reproductive function in mammals demands substantial amounts and adequate balance of nutrients and energy. Consequently, reproductive physiology is tightly regulated by systemic and tissue-specific metabolism. This course uses a multidisciplinary approach to explore the metabolic regulation of reproduction and its implications to reproductive health, fertility, and developmental biology. Students should have a strong background in reproductive physiology and a good understanding of molecular and cellular biology and scientific methods prior to enrolling.

Offering(s): Odd-numbered years

Prerequisite(s): ANSC*3040

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6100 Special Project Summer, Fall, and Winter [0.50]

Supervised program of study in some aspect of animal and poultry science that can involve an experimental project and/or detailed analysis of the literature.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6210 Principles of Selection in Animal Breeding Winter Only [0.50]

Definition of selection goals, prediction of genetic progress and breeding values, and the comparison of selection programs.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6240 Topics in Animal Genetics and Genomics Winter Only [0.50]

Current literature and classical papers pertaining to quantitative genetics, animal breeding and animal genomics are reviewed in detail through presentation, discussion and critical analysis.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6250 Growth and Metabolism Winter Only [0.50]

Animal growth and metabolism are considered at the cellular level in a manner that extends beyond the basic disciplines of biometrics and biochemistry with attention focused on the main carcass components - muscle, fat and bone.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6330 Topics in Computational Biology and Bioinformatics Fall Only [0.50]

Major topics and methods in bioinformatics and computational biology for animal sciences will be covered. Topics include alignments, phylogenetics, genomics, data mining, databases, DNA, RNA and protein structures, DNA sequence analysis, data curation, pipeline construction and data visualization.

Offering(s): Offered annually

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6360 Techniques in Animal Nutrition Research Winter Only [0.50]

Theory and/or practices of techniques to evaluate feedstuffs and determine nutrient utilization in poultry, swine and ruminants is covered through lectures, short laboratories and a major project.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6370 Quantitative Genetics and Animal Models Fall Only [0.50]

The course covers quantitative genetics theory associated with animal models; linear models applied to genetic evaluation of animals; estimation of genetic parameters for animal models; and computing algorithms for large datasets.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6390 QTL and Genetic Markers Winter Only [0.50]

Advanced training in QTL mapping and selection assisted by genetic markers.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6400 Mammalian Reproduction Winter Only [0.50]

Discussions and applications of methodology for collection and examination of gametes and embryos and for measurements of hormones in biological fluids.

Offering(s): Odd-numbered years

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6440 Advanced Critical Analysis in Applied Ethology Fall Only [0.50]

Students explore the process of scientific inquiry and experimental design within the context of applied ethology research. Discussions include the peer review process, critical analyses and applications of methods for applied animal behaviour research.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6450 Topics in Animal Biotechnology Fall Only [0.50]

The course will explore current methods and recent advances of biotechnology, innovation, and emerging translational products of significance to animal production and human health.

Prerequisite(s): MCB*2050 or MBG*2040 or ANSC*4050

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6460 Lactation Biology Fall Only [0.50]

An in-depth systems analysis of lactation, comparing the cow, pig, rat, human and seal. Mammary development from conception through to lactogenesis, lactation and involution will be covered. Hypotheses of regulation of the biochemical pathways of milk synthesis will be tested in relation to experimental observations.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6470 Advanced Animal Nutrition and Metabolism I Fall Only [0.50]

A systematic review of key aspects of energy, protein, amino acid and carbohydrate utilization and metabolism in farm animals.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6480 Advanced Animal Nutrition and Metabolism II Winter Only [0.50]

A systematic review of key aspects of lipid, vitamin and mineral utilization and metabolism in farm animals.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6490 Advanced Dairy Management Winter Only [0.50]

A comprehensive systems science and integrative capstone course that encompasses the "closing of the loop" education of dairy production systems. Students will be exposed to real-time issues relating to dairy production from, environment, economics, nutrition, housing, health, welfare, society and agrology. This course will allow the student to practice their training from the courses they have been exposed to as undergraduates into many case study evaluations on farms provincially, nationally and internationally.

Restriction(s): Instructor consent required.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6550 Systematic Review and Meta-Analysis for Animal Biosciences Winter Only [0.50]

Major topics and methods in the systematic review of the scientific literature, meta-analysis, and empirical modeling for animal sciences will be covered. Students learn via hands-on 'doing' with reflection on their work via the execution of a meta-analysis in their topic area and preparation of a meta-analysis manuscript.

Offering(s): Annually

Prerequisite(s): Take UNIV*6020 or ANSC*6050.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6610 Scientific Communication, Knowledge Dissemination and Professional Development Fall Only [0.50]

This course helps to foster graduate student career success in academia, government or industry by enhancing student skills in scientific communication and knowledge dissemination and by providing opportunities for personal growth in a chosen area of professional development.

Offering(s): Annually

Restriction(s): Restricted to Animal Biosciences students.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6700 Animals in Society: Historical and Global Perspectives on Animal Welfare Fall Only [0.50]

A seminar course covering society's duties to animals. Students will learn about the major ethical theories that deal with society's duties towards animals, the main scientific approaches to animal welfare, and the relationship of science to ethics. A brief history of human-animal relationships will be covered and cultural differences described. Students will use this to analyze some current issues.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6710 Assessing Animal Welfare in Practice Winter Only [0.50]

A lecture/seminar course covering the principles of applied animal welfare assessment. Students will learn what influences an animal welfare assessment and will understand the components necessary to create an effective and targeted animal welfare program for industry or regulatory application.

Offering(s): Winter offering on-campus, Summer offering Distance Education.

Prerequisite(s): ANSC*6700

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6720 Scientific Assessment of Affective States in Animals Winter Only [0.50]

Graduate students will explore the biology and validity of behavioural and physiological techniques used in animal welfare assessment such as: sympathetic activation, HPA functioning, stereotypic behaviour and preference responses. A combination of lecture, instructor-led discussion and student-led discussion will explore these methods of animal welfare assessment.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6730 Applied Environmental Physiology and Animal Housing Winter Only [0.50]

A lecture/seminar course covering the principles of applied environmental physiology including temperature regulation, space requirements, animal responses to light and other aspects of the physical environment. Students pursue a topic in depth to develop or update recommended codes of practice and resource-based standards.

Restriction(s): Cannot take if credit received for ANSC*4080 or ANSC*4100.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6740 Special Topics in Applied Animal Welfare Science Winter and Summer [0.50]

A lecture/seminar course covering in depth topics in applied animal welfare science. The course will review the scientific research into the welfare of a specific animal species or a specific animal welfare problem common across species, focusing on the main threats to welfare, relevant indicators of welfare, and possible solutions to improve welfare.

Offering(s): Annually.

Department(s): Department of Animal Biosciences

Location(s): Guelph

ANSC*6900 Major Paper in Animal Biosciences Summer, Fall, and Winter [1.00]

A detailed, critical review of an area of study related to the specialization of students in the MSc by course work and major paper option that includes analysis and interpretation of relevant data.

Department(s): Department of Animal Biosciences

Location(s): Guelph

Code	Title	Credits
UNIV*6030	Seminars and Analysis in Animal Behaviour and Welfare	0.50