



Department of Animal & Dairy Sciences

UNIVERSITY OF WISCONSIN-MADISON

Subject and Catalog Number

AN SCI 336

Course Title

Animal Growth and Development

Number of Credits

3 credits

Instructional Mode

In-person

Tuesdays and Thursdays 12:05 am-1:20pm

MSABD building, Lecture Hall 1111, 1933 Observatory Dr. Madison, WI53706

Specify how credit hours are met by the course

This class meets for two, 75-minute class periods each week over the fall semester and carries the expectation that students will work on course learning activities (reading, writing, studying, etc) for about 3 hours out of the classroom for every class period.

Clear Indication of Regular and Substantive Student-Instructor Interaction

- Provide personalized comments online or in-person during the office hours every Tuesdays and Thursdays from 1:20pm to 2pm for an individual students homework, assignment and exam
- Post announcements on Canvas weekly about academic aspects of the class
- Identify students struggling to reach mastery through observation of learning process including discussion activity, assessment completion etc. and reach out to students through email or in-person meeting to discuss additional opportunities.

Course Description

Covers growth and development of an animal from a single cell to an organism and factors such as nutrition, hormone, genetics and gut microbials influencing growth and development in both cell and tissue levels. Includes the molecular and cellular basis of prenatal and postnatal growth and development. Focuses on development and growth of tissues including muscle, adipose, connective, mammary, and bone tissues that are associated with animal production. Also includes

the use of growth promotants in livestock to improve growth performance and increase the quality of carcasses and animal production.

Requisites

(BIOLOGY/BOTANY/ZOOLOGY 151 and 152), (BIOLOGY/ZOOLOGY 101 and 102), or BIOCORE 383

Course Learning Outcomes

By the end of this course, students will be able to

Describe the process of growth and development from a single cell level to a whole organism level

Describe the principles and basic biological functions associated with animal growth and development applied to animal production systems

Explain what factors affect livestock growth and development and how alteration of these factors impact growth performance of livestock

Integrate and apply multi-disciplinary knowledges acquired from this course to estimate and enhance growth and efficiency of animal products

Grading

Grading scale: 90-100%= A; 84-89%=AB; 78-83%=B; 72-77%=BC; 66-71%=C; 60-65%=D; and <60%=F.

No make-ups for exam and quizzes. Missed exam and quizzes will be scored zero. However, in some cases with justifiable reasons, students will be allowed to take missed exam or quizzes only if the instructor is informed of the need at least 1 week prior to the originally scheduled exam or if an emergency arises and a signed doctor note or equivalent is provided. Arrangements for a make-up exam must be made within 24 hours after the original scheduled exam was given.

Required Textbook, Software, and Other Course Materials

No assigned textbook. However, the following references that the student may wish to read:

1). Principles of Animal Growth and Development, Gerrard and Grant; ISBN13: 978-0-7575-2986-3; Kendall Hunt Publishing, Dubuque, Iowa 52002. 2006.

- 2). Developmental Biology, Gilbert; ISBN: 0-87893-250-x; Sinauer Associate, Inc., Publishers Sunderland, Massachusetts, USA. 8th edition 2006
- 3). Principles of Development, Wolpert and Tickle; ISBN: 978-0-19-955428-7; Oxford University Press. 4th 2011.
- 4). Hormonal Regulation of Farm Animal Growth, Hossner; ISBN-10: 0-85199-080-0; CABI Publishing, 875 Massachusetts Avenue, Cambridge, MA02139, USA. 2005.

Indication of Time Expected to be Devoted to Individual Topics and Hours of Instructor-Student Instruction and/or Discussion

Date	Lecture	Quiz	Paper reading and discussion	Guest Instructors
9/8, R	Course Introduction			
9/13, T	Growth Curves/Body composition		Paper 1	
9/15, R	Growth Curves/Body composition			
9/20, T	Prenatal Growth and Development	Quiz 1	Paper 2	
9/22, R	Fetal/Developmental Programming			
9/27, T	Epigenetics and growth		Paper 3	Dr. Hasan Khatib
9/29, R	Stem cells and Regeneration	Quiz 2		
10/4, T	Stem cells and Regeneration		Paper 4	Dr. Wan_ju Li
10/6, R	Postnatal Growth and Development			
10/11, T	Postnatal Growth and Development		Paper 5	
10/13, R	Myogenesis	Quiz 3		
10/18, T	Muscle Growth		Paper 6	
10/20, R	Muscle Growth			
10/25, T	Muscle Fiber	Quiz 4	Paper 7	

	Plasticity			
10/27, R	Muscle Fiber Plasticity			
11/1, T	Student discussion	Quiz 5	Group discussion 1-6	
11/3, R	Adipose tissue			
11/8, T	Adipose tissue		Paper 8	
11/10, R	Bone Tissue	Quiz 6		Dr. Tom Crenshaw
11/15, T	Bone Tissue		Paper 9	Dr. Tom Crenshaw
11/17, R	Mammary tissue	Quiz 7		Dr. Jimena Laporta Sanchis
11/22, T	Genetics and growth		Paper 10	Dr. Guilherme Rosa
11/24, R	Thanksgiving recess			
11/29, T	Nutrition and growth	Quiz 8		
12/1, R	Microbial effects on growth		Paper 11	Dr. Vanessa Leone
12/6, T	Hormone and growth	Quiz 9		
12/8, R	Relationship among growth, composition, and meat quality		Paper 12	Dr. Jim Claus
12/13, T	Student discussion	Quiz 10	Group discussion 7-12	
12/22	2:45 to 4:45 Final Exam			

Representative List of Readings

Readings will be subject to change each semester. Here is the list of representative readings:

Paper 1: R.N. Arnold, G.L. Bennett, Evaluation of four simulation models of cattle growth and body composition: Part I—Comparison and characterization of the models, *Agricultural Systems*, 1991, 35(4): 401-432,

Paper 2: Arnold, R. N. & Bennett, G. L. Evaluation of four simulation models of cattle growth and body composition: Part II--Simulation and comparison with experimental growth data," *Agricultural Systems*, 1991. 36(1): 17-41.

Paper 3: Reynolds LP, Borowicz PP, Caton JS, Crouse MS, Dahlen CR, Ward AK. Developmental Programming of Fetal Growth and Development. *Vet Clin North Am Food Anim Pract.* 2019; 35(2): 229-247.

Paper 4: Du M, Tong J, Zhao J, Underwood KR, Zhu M, Ford SP, Nathanielsz PW. Fetal programming of skeletal muscle development in ruminant animals. *J Anim Sci.* 2010; 88(13 Suppl): E51-60.

Paper 5: Bell, AW and Greenwood PL. Prenatal origins of postnatal variation in growth, development and productivity of ruminants. *Animal Production Science*, 2016, 56, 1217–1232

Paper 6: Chal J, Pourquié O. Making muscle: skeletal myogenesis *in vivo* and *in vitro*. *Development.* 2017; 144(12): 2104-2122.

Paper 7: Paul AC, Rosenthal N. Different modes of hypertrophy in skeletal muscle fibers. *J Cell Biol.* 2002; 156(4): 751-60.

Paper 8: Louveau I, Perruchot MH, Bonnet M, Gondret F. Invited review: Pre- and postnatal adipose tissue development in farm animals: from stem cells to adipocyte physiology. *Animal.* 2016; 10(11):1839-1847.

Paper 9: Field RA, Riley ML, Mello FC, Corbridge MH, Kotula AW. Bone composition in cattle, pigs, sheep and poultry. *J Anim Sci.* 1974; 39(3): 493-9.

Paper 10: Rexroad C, Vallet J, Matukumalli LK, Reecy J, Bickhart D, Blackburn H, Boggess M, Cheng H, Clutter A, Cockett N, Ernst C, Fulton JE, Liu J, Lunney J, Neiberghs H, Purcell C, Smith TPL, Sonstegard T, Taylor J, Telugu B, Etennaam AV, Tassell CPV, Wells K. Genome to Phenome: Improving Animal Health, Production, and Well-Being - A New USDA Blueprint for Animal Genome Research 2018-2027. *Front Genet.* 2019; 10: 327.

Paper 11: Wu G. Nutrition and Metabolism: Foundations for Animal Growth, Development, Reproduction, and Health. *Adv Exp Med Biol.* 2022; 1354: 1-24.

Paper 12: Hocquette JF. Endocrine and metabolic regulation of muscle growth and body composition in cattle. *Animal.* 2010; 4(11): 1797-809.

Exams, Quizzes, Papers, and Other Major Graded Work

The graded work includes

Final exam: 100-point and constitutes 60% of final grade

Quiz: 10 of 10-point quizzes (total 100 points) and constitutes 20% of the final grade

Paper discussion: 100 points. About 12 papers will be provided depending on how many groups we will form. The papers provided are closely related to course content. Each group will pick one paper and have about 10 minutes to discuss the following points through PPT presentation

Author's hypothesis or objectives

Major points discussed in the article

Summary of the primary findings or results

Conclusion that ties in with course material

Paper discussion constitutes 20% of the final grade.

The final grade will weigh these components as follows:

Final Exam	60%
Quizzes	20%
Paper discussion	20%

	100%

Student Rights and Responsibilities

Every member of the University of Wisconsin–Madison community has the right to expect to conduct his or her academic and social life in an environment free from threats, danger, or harassment. Students also have the responsibility to conduct themselves in a manner compatible with membership in the university and local communities. UWS Chapters 17 and 18 of the Wisconsin Administrative Code list the university policies students are expected to uphold and describes the procedures used when students are accused of misconduct. Chapter 17 also lists the possible responses the university may apply when a student is found to violate policy. The process used to determine any violations and disciplinary actions is an important part of UWS 17. For the complete text of UWS Chapter 17, see Office of Student Conduct and Community Standards website, or contact them via phone at 608-263-5700 or room 70 Bascom Hall.

No student may be denied admission to, participation in or the benefits of, or discriminated against in any service, program, course or facility of the [UW] system or its institutions or centers because of the student's race, color, creed, religion, sex, national origin, disability, ancestry, age, sexual orientation, pregnancy, marital status or parental status.

Please refer to the UW-Madison undergraduate guide for further information:

<https://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext>

Academic Integrity

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

<https://conduct.students.wisc.edu/syllabus-statement/>

Accommodations For Students With Disabilities

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

<https://mcburney.wisc.edu/instructor/>

Diversity & Inclusion

Institutional statement on diversity: Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world. <https://diversity.wisc.edu/>

Guiding Principles We Will Respect:

Diversity is a source of strength, creativity, and innovation. We expect all students in this course to value the contributions of each person and embrace the ways in which their identity, culture, background, experience, status, abilities, and opinion enrich our learning experience.

The University of Wisconsin–Madison occupies ancestral Ho-Chunk land, a place their nation has called Teejop (day-JOPE) since time immemorial. In an 1832 treaty, the Ho-Chunk were forced to cede this territory. Decades of ethnic cleansing followed when both the federal and

state government repeatedly, but unsuccessfully, sought to forcibly remove the Ho-Chunk from Wisconsin. This history of colonization informs our shared future of collaboration and innovation. Today, UW–Madison respects the inherent sovereignty of the Ho-Chunk Nation, along with the eleven *other First Nations of Wisconsin*.

As a UW-Madison student, you have the right to expect that you and other students will be graded fairly. You also have an obligation to conduct your academic work with honesty and integrity according to University standards. Academic honesty requires that the course work you present to your instructor honestly and accurately represents your own academic efforts. Work submitted under a student's name must be solely the work of that student and be carried out in the manner prescribed by the instructor. Additional information from the Dean of Students is available online

http://www.wisc.edu/students/saja/misconduct/academic_misconduct.html