

## ANS 4701/6702 Physiology of the Mammary Gland and Lactation

Spring, 2026  
In-person- 2 credits

Monday from 10:40am– 12:35 pm (Periods 4 and 5)  
Department of Animal Sciences, Classroom 201 (Dairy Sciences Bldg. 499).

### Instructor

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### Teaching Assistant

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### Course Description

The Physiology of the Mammary Gland and Lactation course offers insights into the endocrinology and physiology of the defining characteristics of mammals: the mammary gland and lactation. The course focuses on the anatomy and development of the mammary gland with an overview of the biochemical, cellular and molecular processes controlling lactation, with emphasis in livestock species, particularly the dairy cow.

### Course Learning Objectives

Upon completion of the course, the student will be able to:

- 1.** Describe the anatomy and physiology of the mammary gland.
- 2.** Outline the prenatal development of the mammary gland and its changes throughout the lactation cycle controlled by systemic (hormonal) and local (autocrine/paracrine) mechanisms.
- 3.** Discuss the physiological, biochemical, cellular and molecular processes controlling the process of milk formation, milk ejection and factors affecting milk yield.
- 4.** Distinguish the major components of mammalian milk and their functions for the neonate.
- 5.** Apply learned concepts to critically evaluate management issues related to lactation in farm animals.

**6.** Read, interpret, and discuss scientific articles related to mammary gland biology.

## Course Prerequisites

BSC 2011 and BSC 2011L, ANS 3319C, and 4AG or permission from instructor. Please contact me by email to discuss your case.

## Textbooks, Learning Materials, and Supply Fees

There is no assigned textbook for this class. The following reading materials are recommended for the students' consultation:

- Lactation and the Mammary Gland. R. Michael Akers. 2002. Iowa State Press.
- Capuccio and Akers (2009) The origin and evolution of lactation
- Weaver and Hernandez (2015) Autocrine-paracrine regulation of the mammary gland
- Stein, et al. 2007. Mammary Gland Involution as a Multi-step Process

**Course website** – Power point lectures, reading materials, syllabus, homework and grades will be available in Canvas: <http://elearning.ufl.edu/>.

## Communication Guidelines

All communication between the instructor/TA and students will be through the Canvas page and/or emails.

## Technical Support

UF Computing Help Desk & Ticket Number: All technical issues require a UF Helpdesk Ticket Number. The UF Helpdesk is available 24 hours a day, 7 days a week. <https://helpdesk.ufl.edu/> | 352-392-4357

## Weekly Course Schedule

[required, but format can be adapted for each unique course]

Week	Topic	Assignments, Labs, Quizzes and Exams
1 Jan 12	Introductions, orientation to class delivery and syllabus Evolution of the mammary gland, origin of lactation and mammalian variation Mammary anatomy I: macrostructure, microstructure	
2 Jan 19	NO CLASS- HOLIDAY	
3 Jan 26	Endocrinology of lactation I: hormones and receptors, hypothalamus, pituitary Endocrinology of lactation II: reproductive and metabolic hormones	Quiz 1

Week	Topic	Assignments, Labs, Quizzes and Exams
4 Feb 2	Mammary anatomy II: circulatory, lymphatic and neural systems Mammary gland development I: fetal through puberty	Quiz 2 Mammary gland anatomy lab
5 Feb 9	Mammary gland development II: post-puberty through involution Colostrogenesis and Lactogenesis	Summary due Review Quiz 3
6 Feb 16	MID-TERM I	
7 Feb 23	Human lactation physiology Milk production management on a commercial dairy farm	Quiz 4
8 Mar 2	Galactopoiesis Involution	Quiz 5
9 Mar 9	Milk carbohydrate: synthesis and secretion Milk protein and fat: synthesis and secretion	Graduate student lecture Review Summary due Quiz 6
10 Mar 16-20	SPRING BREAK	
11 Mar 23	MID-TERM II	
	Colostrum composition and management	Colostrum quality test lab
12 Mar 30	Metabolic support of lactation Factors affecting milk yield I: Photoperiod	Quiz 7
13 Apr 6	Factors affecting milk yield II: Heat Stress Factors affecting milk yield III: Milk frequency	Quiz 8
14 Apr 13	Mammary gland immunology and mastitis I Mammary gland immunology and mastitis II	Quiz 9 CMT lab

Week	Topic	Assignments, Labs, Quizzes and Exams
15 Apr 20	Grad students' essay and presentations Undergrad students debate	Review Summary due Quiz 10
16 Apr 27		MID-TERM III

## Grading Policy

Course grading is consistent with [UF grading policies](#).

## Course Grading Structure

### *Undergraduate Students*

Students can earn a maximum of **450 pts**. The final grade will be based on three mid-terms (100 pts each), 3 summaries (15 pts), 3 labs participation (15 pts), 10 quizzes (50 pts- 5 points each), 1 debate (20 pts) and class attendance and participation (50 pts- 2 pts/lecture + 2 extra points at the end of the semester for those that attended and participated in all classes).

**Summaries**: Contribution to review sessions. Some mid-term questions will be formulated using the content of these summaries. Copy and paste from slides won't be accepted.

**Quiz format**: (online- in class) short answers, multiple choice or true/false questions will be formulated from lectures and reading materials.

**Exams format**: (online- in class) short answers, fill in the blank, matching the right answer, multiple choice, and essay questions.

### *Graduate Students*

Students can earn a maximum of **450 pts**. The final grade will be based on three mid-terms (100 pts each), 3 summaries (10 pts), 3 labs participation (15 pts), 10 quizzes (50 pts- 5 pts each), 1 lecture presentation (5 pts) and 1 essay + presentation (20 pts), and class attendance and participation (50 pts- 2 pts/lecture + 2 extra points at the end of the semester for those that attended and participated in all classes).

**Summaries**: Contribution to review sessions. Some mid-term questions will be formulated using the content of these summaries. Copy and paste from slides won't be accepted.

**Quiz format**: (online-in class) short answers, multiple choice or true/false questions will be formulated from lectures and reading materials.

**Exams format**: (online- in class) short answers, fill in the blank, matching the right answer, multiple choice, and essay questions.

\*The Syllabus is subjected to changes/updates by the instructor throughout the semester.

## Grading Scale

Grade	Points	Percentage
A	$\geq 418.5$	$\geq 93\%$
A-	$\geq 405$ to $< 418.5$	$\geq 90$ to $< 93\%$
B+	$\geq 391.5$ to $< 405$	$\geq 87$ to $< 90\%$
B	$\geq 373.5$ to $< 391.5$	$\geq 83$ to $< 87\%$
B-	$\geq 360$ to $< 373.5$	$\geq 80$ to $< 83\%$
C+	$\geq 346.5$ to $< 360$	$\geq 77$ to $< 80\%$
C	$\geq 328.5$ to $< 346.5$	$\geq 73$ to $< 77\%$
C-	$\geq 315$ to $< 328.5$	$\geq 70$ to $< 73\%$
D+	$\geq 301.5$ to $< 315$	$\geq 67$ to $< 70\%$
D	$\geq 283.5$ to $< 301.5$	$\geq 63$ to $< 67\%$
D-	$\geq 270$ to $< 283.5$	$\geq 60$ to $< 63\%$
S	$< 270$	$< 60$

## Attendance, Make-up Work

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Students are required to attend all the classes from start to finish each week. Attendance will be taken by the instructor/TA. If a student misses (part of) a class, either excused or unexcused, it is the responsibility of the student to catch up on the material covered. Talk with your classmates or find the handouts on the course website. Use of cell phones is not allowed during class time without permission. These policies are in place to make learning as successful and pleasant as possible for everyone. Exceptions to these rules are unlikely granted and should not be expected. Every student is allowed **one** unexcused class absence; any additional absence will reflect on your final grade. 50 points are allocated to class attendance and participation. A student missing an exam or a quiz will be allowed to make up the exam/quiz if a documented, valid reason as outlined in UF's policy for excused absences exists. This should be discussed with the instructor in advance (when possible), by email or Canvas message. A missed exam for an unexcused absence will be considered as a "0". Summaries, essays and presentations that are not turned in at the required due date will be considered as a "0".

The use of cell phones is not allowed during the class period, and it will reflect on your "attendance and participation" grade.

## Academic Policies and Resources

Academic policies for this course are consistent with university policies. See <https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/>

## Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently on each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams).

All work submitted on this course must be accomplished on your own. Contributions from others must be properly quoted and cited every time they are used. Artificial intelligence text-generating sources (such as ChatGPT, Marmot or Botowski) will be treated as plagiarism and when used in essays, quizzes or exams the grade given will be "0". Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

## Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email, they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## Campus Health and Wellness Resources

Visit <https://one.uf.edu/whole-gator/topics> for resources that are designed to help you thrive physically, mentally, and emotionally at UF.

Please contact [UMatterWeCare](#) for additional and immediate support.

## Software Use

All faculty, staff and students at the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal

penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

## Privacy and Accessibility Policies

[required for online courses, list all technology used]

- Instructure (Canvas)
  - [Instructure Privacy Policy](#)
  - [Instructure Accessibility](#)
- Zoom
  - [Zoom Privacy Policy](#)
  - [Zoom Accessibility](#)

## Additional information

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission from the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section.

Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.