

ANS 4701/ ANS 6702 (Spring 2025)
Physiology of the Mammary Gland and Lactation- 2 credits
Course Syllabus



Instructor

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Office Hours: by appointment.

Time and Location:

Monday and Wednesday from 10:40 – 11:30 am (4th period); 2250 Shealy Drive, Classroom 201 (Dairy Sciences Bldg. #499).

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

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 focus 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 and expected outcomes.

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.

Recommended reading material and textbooks

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.
- Capuco 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/>.

COURSE SCHEDULE

Week 1

- **Jan 13:** Introductions, orientation to class delivery and overall view of lactation physiology
- **Jan 15:** Evolution of the mammary gland and origin of lactation

Week 2

- **Jan 20: NO CLASS- HOLIDAY**
- Jan 22: Mammary anatomy I: macrostructure, microstructure

Week 3

- **Jan 27:** Mammary anatomy II: circulatory, lymphatic and neural systems/ **Mammary gland anatomy lab**
- **Jan 29:** Endocrinology of lactation I: hormones & receptors, hypothalamus, pituitary

Week 4

- **Feb 3:** Endocrinology of lactation II: reproductive and metabolic hormones
- **Feb 5:** Mammary gland development I: fetal through puberty/ **Endocrinology summary due**

Week 5

- **Feb 10:** Mammary gland development II: post-puberty through involution/ **Review section I/ Summary due**
- **Feb 12: Mid-term I**

Week 6

- **Feb 17: Guest lecture**
- **Feb 19: Guest lecture**

Week 7

- **Feb 24:** Colostrogenesis and Lactogenesis
- **Feb 26:** Galactopoiesis

Week 8

- **March 3:** Involution
- **March 5:** Milk carbohydrate: synthesis and secretion/ **Grad student lecture**

Week 9

- **March 10:** Milk protein and fat: synthesis and secretion/ **Grad student lecture/ Review section II/ Summary due**
- **March 12:** **Mid-term II**

Week 10

- **March 17-19: NO CLASS- Spring Break**

Week 11

- **March 24:** Colostrum composition and management/ **Colostrum quality test lab**
- **March 26:** Metabolic support of lactation

Week 12

- **March 31:** Factors affecting milk yield I: Photoperiod
- **April 2:** Factors affecting milk yield II: Heat stress

Week 13

- **April 7:** Factors affecting milk yield III: Milking frequency
- **April 9:** Milking system designs and protocols

Week 14

- **April 14:** Mammary gland immunology and mastitis I
- **April 16:** Mammary gland immunology and mastitis II/ **CMT lab**

Week 15

- **April 21:** **Grad students' essay due and presentations**
- **April 23:** **Undergrad students debate/ Review section III/ Summary due**

Week 16

- **April 28:** **Mid-term III**

Grades

Undergraduate Students

Students can earn a maximum of **400 pts**. The final grade will be based on three mid-terms (100 pts each), 4 lecture summaries (20 pts), 3 labs participation (15 pts), 10 quizzes (50 pts) and 1 debate (15 pts) assignments throughout the course.

Summaries: Contribution for review sessions. Some mid-term questions will be formulated using the content of these summaries.

Quiz format: weekly (e-learning) short answer, multiple choice or T/F questions will be formulated from lectures and reading materials.

Graduate Students

Students can earn a maximum of **400 pts**. The final grade will be based on three mid-terms (100 pts each), 4 summaries (10 pts), 3 labs participation (15 pts), 10 quizzes (50 pts), 1 lecture presentation (5 pts) and 1 essay + presentation (20 pts) assignments throughout the course.

Summaries: Contribution for review sessions. Some mid-term questions will be formulated using the content of these summaries.

Quiz format: weekly (e-learning) short answer, multiple choice or T/F questions will be formulated from lectures and reading materials.

Grading scale

A $\geq 93\%$	B- ≥ 80 to $< 83\%$	D+ ≥ 67 to $< 70\%$
A- ≥ 90 to $< 93\%$	C+ ≥ 77 to $< 80\%$	D ≥ 63 to $< 67\%$
B+ ≥ 87 to $< 90\%$	C ≥ 73 to $< 77\%$	D- ≥ 60 to $< 63\%$
B ≥ 83 to $< 87\%$	C- ≥ 70 to $< 73\%$	E < 60

Important dates!

- January 13 - First day of class
- January 27- Mammary gland anatomy lab
- February 5- Endocrinology summary due
- February 10 – Review I/ Summary due
- **February 12 – Mid-term I**
- March 10 – Review II/ Summary due
- **March 12 – Mid-term II**
- March 24- Colostrum quality test lab
- April 16- CMT lab
- April 21- Grad student essay + presentation due
- April 23- Undergrad debate/ Review III/Summary due
- **April 28- Mid-term III**

Information regarding University Policy on grade point equivalencies and calculation of grade points is located at the following web address: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Please note: This course is taught concomitant with the graduate version **ANS 6702**.

The graduate students will be required to perform all of the graded tasks listed above (including mid-terms, homework and review questions) and will be required to write an essay on a current topic related to lactation biology.

Attendance and 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>. It is highly recommended that you do not miss class as your final grade will be positively correlated with attendance. A student missing an exam will be allowed to make up the exam 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), preferably by email. A missed exam for an unexcused absence will be considered as a "0".

Services for students with disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/.

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 in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams).

All work submitted in 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. 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 Helping Resources

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: [Visit the Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).

University Police Department: [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

Academic Resources

E-learning technical support: Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information](#).

On-Line Students Complaints: [View the Distance Learning Student Complaint Process](#).

In-Class Recording

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 of 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.

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.