

# ANS 6702 (2019)

## Physiology of the Mammary Gland and Lactation



### Instructor

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### Teaching Assistants

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**Office Hours:** by appointment

**Time and Location:** MW; 10:40 - 11:30 am; 2250 Shealy Drive, Room 102 (Animal Sciences Bldg.)

**Pre-requisites:** ANS 6704 (Mammalian Endocrinology) or permission from advisor.

### Course description

This course will offer insights into the endocrinology and physiology of the defining characteristics of mammals: the mammary gland and lactation, focusing on the anatomy and development of the mammary gland with an overview of the biochemical, cellular and molecular processes controlling lactation emphasizing on livestock species. **(2 credits)**

### 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.
- Lactation Biology Website: University of Illinois ([access link here](#))
- Lactation on the NIH website ([access link here](#))
- 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.** August W 21: Evolution of the mammary gland & origin of lactation

**Week 2.** August M 26: History of Dairy cattle domestication & milk consumption  
August W 28: Mammary anatomy I: macrostructure

**Week 3.** Sept M 2: Holiday (no class)  
Sept W 4: Mammary anatomy II: microstructure

**Week 4.** Sept M 9: Mammary anatomy III: circulatory, lymphatic and neural systems  
Sept W 11: Mammary gland development I: fetal through puberty

**Week 5.** Sept M 16: Mammary gland development II: post-puberty through involution  
Sept W 18: Neuro-endocrine control of lactation

**Week 6.** Sept M 23: Review section I  
**Sept W 25: Mid-term I**

**Week 7.** Oct M 30: Endocrinology of lactation  
Oct W 2: Lactogenesis & Galactopoiesis

**Week 8.** Oct M 7: Presentations I: "*My favorite mammal in 3 minutes*"  
Oct W 9: Colostrum and milk composition

**Week 9.** Oct M 14: Milk carbohydrate: synthesis and secretion  
Oct W 16: Milk protein: synthesis and secretion

**Week 10.** Oct M 21: Milk fat: synthesis and secretion  
Oct W 23: Involution

**Week 11.** Oct M 28: Review section II  
**Oct W 30: Mid-term II**

**Week 12.** Nov M 4: Milking parlor designs  
Nov W 6: Ten habits of a successful milking routine

**Week 13.** Nov M 11: Holiday (no class)  
Nov W 13: Mammary gland immunology & mastitis

**Week 14.** Nov M 18: Factors affecting milk yield: manipulation of milk production  
Nov W 20: Special topic class debate

**Week 15.** Nov M 25: Special topic class debate  
Nov W 27: Thanksgiving (no class)

**Week 17.** Dec M 2: Review section III  
**Dec W 4: Mid-term III**

Debate topics: organic vs. conventional dairy farming, skim vs. whole milk consumption, robotic vs. conventional milking, plant vs animal based "milk", use of hormones in dairy farming, among others.

## Grades

Students can earn a maximum of **475 pts**. The final grade will be based on three mid-terms (100 pts each), one oral presentation (25 pts), one short essay or paper (50 pts), one debate presentation (50 pts), and ten homework assignments through the semester (50 pts).

Presentation format: 3 min. presentation "my favorite mammal". Mid-term questions will be formulated with the content of these presentations (rubrics will be provided).

Essay: on a chosen mammal's characteristics and lactation strategies (rubrics will be provided).

Debates: individual or group presentation (10 min.) on a debate topic (rubrics will be provided).

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

## Grading scale

<b>A</b> ≥93%	<b>B-</b> ≥ 80 to < 83%	<b>D+</b> ≥67 to < 70%
<b>A-</b> ≥ 90 to < 93%	<b>C+</b> ≥77 to < 80%	<b>D</b> ≥63 to < 67%
<b>B+</b> ≥ 87 to < 90%	<b>C</b> ≥ 73 to < 77%	<b>D-</b> ≥60 to < 63%
<b>B</b> ≥ 83 to < 87%	<b>C-</b> ≥ 70 to < 73%	<b>E</b> <60

## Important dates!

- August 21 - First day of class
- **September 25 - First mid-term**
- October 7 – My favorite mammal presentations
- **October 30 – Second mid-term**
- November 20 & 25 – Graduate student's debate presentations
- **December 4 – Third mid-term**

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 4701**.

The undergraduate students will be required to perform all the graded tasks listed above (including mid-terms, homework and a group presentation) but they will not be required to write the essay or present the debate topics.

**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 to attend to class; 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, preferably by email. A missed exam with an unexcused absence will be considered as a "0".

## University of Florida Complaints Policy

Please visit: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

### 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/](http://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). 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>.

### Software use

All faculty, staff and students of 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.

### Campus helping resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)*
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Wellness Coaching
- U Matter We Care, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)
- *Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)*