ANS 4701 (Fall 2021)
Physiology of the Mammary Gland and Lactation

Instructor
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Office Hours: by appointment.

Time and Location: Tu, Th; 12:50 - 1:40 PM; 2250 Shealy Drive, Room 102 (Animal Sciences Bldg. #459).

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

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 in livestock species, particularly the dairy cow. (**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.
- 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 Tu 24: Evolution of the mammary gland & origin of lactation
August Th 26: Mammary anatomy I: macrostructure, microstructure

Week 2. August Tu 31: Mammary anatomy II: circulatory, lymphatic and neural systems
Sept Th 2: Endocrinology of lactation I: hormones & receptors, hypothalamus, pituitary

Week 3. Sept Tu 7: Endocrinology of lactation II: reproductive & metabolic hormones
Sept Th 9: Mammary gland development I: fetal through puberty (on- line)

Week 4. Sept Tu 14: Mammary gland development II: post-puberty through involution (on-line)
Sept Th 16: Neuroendocrine control of lactation

Week 5. Sept Th 21: Lactogenesis
Sept Tu 23: Review section I

Week 6. Sept Th 28: Mid-term I
Sept Tu 30: Galactopoiesis

Week 7. Oct Tu 5: Metabolic support of lactation
Oct Th 7: Colostrum and milk composition

Week 8. Oct Tu 12: Milk carbohydrate: synthesis and secretion
Oct Th 14: Milk protein and fat: synthesis and secretion

Week 9. Oct Tu 19: Involution
Oct Th 21: Milking system designs

Week 10. Oct Tu 26: Factors affecting milk yield I: manipulation of milk production
Oct Th 28: Factors affecting milk yield II: manipulation of milk production

Week 11. Nov Tu 2: Review section II
Nov Th 4: Mid-term II

Week 12. Nov Tu 9: Ten habits of a successful milking routine
Nov Th 11: Veteran's day (no class)

Week 13. Nov Tu 16: Mammalian variation in milk and lactation (Casarotto)
Nov Th 18: Mammary gland immunology & mastitis (Toledo)

Week 14. Nov Tu 23: Mammary gland immunology & mastitis (Toledo)
Nov Th 25: Thanksgiving (no class)

Week 15. Nov Tu 30: Special topic class debate
Dec Th 2: Review section III

Week 16. Dec Tu 7: 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 management, among others.

Grades
Students can earn a maximum of **375 pts**. The final grade will be based on three mid-terms (100 pts each), review and debate participation (25 pts) and ten homework assignments throughout the course (50 pts).

Review participation: Contribution of questions for review sessions. Some mid-term questions will be formulated using the content of these questions.
Homework format: weekly (e-learning) short answer, multiple choice or T/F questions will be formulated from lectures and reading materials.

Grading scale

A ≥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!

- August 24 - First day of class
- September 23 – Review I questions due
- **September 28 - First mid-term**
- November 2 – Review II questions due
- **November 4 – Second mid-term**
- November 30 – Graduate student's debate presentations
- December 2 – Review III questions due
- **December 7 – 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 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 and present 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 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). 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

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/
  Counseling Services
  Groups and Workshops
  Outreach and Consultation
  Self-Help Library
  Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/
- *Career Resource Center,* First Floor JWRU, 392-1601, www.crc.ufl.edu/

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 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.