

ANSC 619
PHYSIOLOGICAL CHEMISTRY OF LIVESTOCK SPECIES
Spring 2015
Lecture: AGLS 113 MW 3:00-4:15
3 credits

INSTRUCTOR: Stephen B. Smith
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COURSE DESCRIPTION: Integration of biochemical concepts with physiological chemistry and intermediary metabolism of livestock species; unique aspects of absorption and cellular metabolism of carbohydrates, lipids and proteins in livestock species; regulation of cellular nutrient metabolism in livestock species

PREREQUISITES: BICH 410 or equivalent or permission of the instructor.

OBJECTIVES:

Upon completion of this course, the student should be able to:

1. Integrate biochemical concepts with the unique metabolism of ruminant and monogastric livestock species.
2. Integrate the cellular and physiological metabolism of the major nutrients.
3. Contrast species differences in the assimilation and metabolism of nutrients.

READING MATERIAL:

TEXT. No text is required. Handouts will be provided for every topic, as will background material from:

A Biochemical Approach to Nutrition. 1977. Freedland, R.A., and Briggs, S. Chapman and Hall Ltd. Chapters from this small textbook will be provided.

A more comprehensive text is:

Biochemistry: A Short Course. 1997. Matthews, H.R., Freedland, R., and Miesfeld, R.L. Wiley-Liss, Inc.

For those who would like more species-specific information, the following texts are suggested:

Swine Nutrition, 2nd ed. 2001. Lewis, A.J. and Southern, L.L. (Ed.). CRC Press.

Poultry Science, 3rd ed. 1992. Ensminger, M.E. Interstate Publishers.

Equine Clinical Nutrition: Feeding and Care. 1995. Lewis, L.D. Williams & Wilkins.

The Ruminant Animal: Digestive Physiology and Nutrition. 1998. Church, D.C. (Ed.). Prentice Hall.

Livestock Feeds & Feeding, 5th ed. 2002. Kellems, R.O. and Church, D.C. (Ed.). Prentice Hall.

Nutritional Ecology of the Ruminant, 2nd ed. Van Soest, P.J. Cornell University Press.

OFFICE HOURS: I will always be available immediately after class. Other appointments can be made by contacting me at my e-mail address.

GRADING:

| | |
|------------------|----------------|
| A = 90-100% | 290-261 points |
| B = 80-89% | 260-232 points |
| C = 70-79% | 231-203 points |
| D = 60-69% | 202-174 points |
| F = 59% or lower | 173≤ points |

EXAMS:

| | |
|---------------------------------|-------------------|
| Midterm I* | 50 points |
| Midterm II | 50 points |
| Midterm III | 50 points |
| Midterm IV | 50 points |
| Quizzes** | 40 points |
| Final (25% new, 75% review) | <u>100 points</u> |
| TOTAL | 340 points |
| TOTAL FOR GRADE BASIS*** | 290 points |

*There will be four midterms, each covering the material from five lectures. The final exam will cover lecture material from three classes plus material from the previous midterms.

Twenty, two-point quizzes will be given throughout the semester. The quizzes are designed to encourage students to study ahead for class and reinforce exam material. **There are no make-up quizzes, but students will not be penalized for missing quizzes due to excused absences (total quiz score will be adjusted accordingly). Excused absences include illnesses, scientific meetings in which the student is required to attend, and unavoidable laboratory research. Arriving late for class is not considered an excused absence.

***Students are allowed to drop one midterm (Midterms I – IV). **Students are required to take all midterms and the final, but students are allowed to miss one midterm for excused absences.** Students who do not miss any midterms may drop the midterm with the lowest score. **Students who miss two midterms (excused or otherwise) are required to take a midterm that includes information from both missed midterms.**

AGGIE CODE OF HONOR: “An Aggie does not lie, cheat or steal, or tolerate those who do.”

AMERICANS with DISABILITIES ACT (ADA) POLICY STATEMENT:

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit <http://disability.tamu.edu>.

LECTURE OUTLINE

SECTION I. CHEMISTRY AND DIGESTION OF CARBOHYDRATES, LIPIDS, AND PROTEINS

January

- 20 Introduction to the class; animal products as food
- 25 Chemistry of carbohydrates
- 27 Chemistry of lipids; essential and nonessential fatty acids

February

- 1 Chemistry of amino acids and proteins
- 3 Digestion of carbohydrates and lipids in monogastrics and ruminants
- 8 Digestion of protein in monogastrics and ruminants
- 10 **Midterm I – Chemistry and digestion of carbohydrates, lipids, and proteins**

SECTION II. CARBOHYDRATE METABOLISM

- 15 Glycolysis
- 17 The tricarboxylic acid cycle
- 22 Gluconeogenesis; ruminants vs monogastrics
- 24 Glycogen synthesis
- 29 Glycogen degradation

March

- 2 **Midterm II – Carbohydrate metabolism**

SECTION III. LIPID METABOLISM

- 7 Fatty acid synthesis; ruminants vs monogastrics
- 9 Fatty acid elongation and desaturation in animals
- 14 & 16 **Spring Break**
- 21 Triacylglycerol and phospholipid synthesis and turnover
- 23 Fatty acid oxidation and peroxidation
- 28 Cholesterol metabolism in monogastrics and ruminants
- 30 **Midterm III – Lipid metabolism**

SECTION IV. AMINO ACIDS, PROTEIN, AND ENERGY METABOLISM

April

- 4 Amino acid metabolism
- 6 Interorgan amino acid metabolism
- 11 Protein synthesis
- 13 The respiratory quotient; basal metabolic rate
- 18 Gross energy, digestible energy, metabolizable energy, net energy, and heat increment
- 20 **Midterm IV – Amino acids, protein, and energy metabolism**

SECTION VI. INTERMEDIARY METABOLISM AND HORMONAL REGULATION OF METABOLISM

- 25 Intermediary metabolism: integration of carbohydrate, lipid, and protein metabolism
- 27 Regulation of growth and metabolism by insulin and β -adrenergic agonists in livestock species

May

- 2 Regulation of metabolism by somatotropin in livestock species
- 4 Reading day; no class
- 9 **Final Exam, 10:30 – 12:30 (25 points new material; 75 points comprehensive)**