

Animal Metabolism
ANEQ 522
Course Syllabus, Fall 2017

Instructor: Terry E. Engle
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004 Animal Sciences
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Office Hours: By appointment

Teaching Assistant:

Text and Reading Assignments:

Harper's Illustrated Biochemistry (30th Ed.). 2015. V. W. Rodwell, D. A. Bender, K. M. Botham, P. J. Kennelly, and P. A. Weil. The McGraw-Hill Companies, Inc.

Students will also be required to read certain assigned journal articles and write a term paper reviewing a specific metabolic disease (Term paper topic must be approved by the instructor).

Course Requirements:

Prerequisites: CHEM 245 and CHEM 246 or CHEM 346

Class Periods:

9:00 a.m. – 9:50 a.m. MWF Room: C248 Clark Building

Course Concept and Objectives:

The overall intent of this course is to discuss the intricate and dynamic regulatory mechanisms that modulate intermediary metabolism in eukaryotes. It is designed to serve as a bridge between the “basic biochemical science” (metabolic pathways, etc.) and “applied sciences” relevant to production agriculture, human nutritional sciences, and medicine.

Objectives:

A successful student in this course will be able to:

- Compare and contrast how dietary feed is converted to body structures, energy, and energy stores within ruminants and non-ruminants.
- Describe how energy stores are used when needed under various physiological conditions (exercise, fasting, starvation, pregnancy, and lactation).
- Discuss how metabolic processes are regulated to meet the body's need under maintenance, growth, and productive metabolic conditions.

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Tentative quiz and exam schedule:

Quiz I – September 27th (50 points)
Exam I - October 4th (100 points) **and term paper topic due**
Quiz II - November 10th (50 points)
Exam II - November 17th (100 points)
Quiz III – December 15th (50 points)
Term Paper – December 2nd (100 points)
Final Exam (Comprehensive) – Monday, December 11th 7:30 a.m. – 9:30 a.m. (150 points)

Grading:

Guaranteed grade

90+	A
80+	B
70+	C
60+	D
59 or below	F

Plus/minus grading will not be used in this course.

Academic Integrity:

You should be familiar with the University’s policy on academic integrity found under the Students Rights and Responsibilities section in the University’s General Catalog. The Colorado State University General Catalog can be purchased from the Colorado State University Bookstore located in the Lory Student Center. The content included in the Students Rights and Responsibilities section applies to this course. Your signature on a test or assignment means that you have neither given nor received unauthorized aid and represents your commitment to honorable and trustworthy behavior that is in the spirit of the Honor Pledge. It is permissible for you to share class notes, study in groups, and review tests from previous years.

Colorado State University’s Sexual Harassment and Violence policy:

Following national guidance from the Office of Civil Rights, professors must follow CSU’s policy as a “mandatory reporter” of any personal disclosure of sexual harassment, abuse, and/or violence related experiences or incidents shared with the professor in person, via email, and/or in classroom papers or homework exercises. These disclosures include but are not limited to reports of personal relational abuse, relational/domestic violence, and stalking. While professors are often able to help students locate appropriate channels of assistance on campus (e.g., see the CSU Health Network link below), disclosure by the student to the professor requires that the professor inform appropriate CSU channels to help ensure that the student’s safety and welfare is being addressed, even if the student requests that the disclosure not be shared.

For counseling support and assistance, please see The CSU HEALTH NETWORK, which includes a variety of counseling services that can be accessed at: <http://www.health.colostate.edu/>. and, The Sexual Assault Victim Assistance Team is a confidential resource for students that does not have a reporting requirement and that can be of great help to students who have experienced sexual assault. The web address is <http://www.wgac.colostate.edu/need-help-support>.

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Principles of Community:

The Principles of Community support the Colorado State University mission and vision of access, research, teaching, service and engagement. A collaborative, and vibrant community is a foundation for learning, critical inquiry, and discovery. Therefore, each member of the CSU community has a responsibility to uphold these principles when engaging with one another and acting on behalf of the University

Inclusion: We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents, and contributions.

Integrity: We are accountable for our actions and will act ethically and honestly in all our interactions.

Respect: We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

Service: We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

Social Justice: We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.

Term Paper – Review of a Specific Metabolic Disease:

Your term paper needs to be approved by the instructor no later than the date scheduled for the first exam.

The term paper needs to be a review of a specific carbohydrate, lipid, or protein related metabolic disease. At least 10 citations of peer reviewed journal articles need to be included in your review write-up. Your review paper should include: 1) an introduction describing the problem, 2) a review of the literature describing the specifics of the metabolic disease that you are reviewing, 3) research that has been conducted to define, alleviate, and treat the metabolic disorder, and 4) a concluding section describing your ideas for future research that should be conducted (based on your review of the literature pertaining to the metabolic disease that you have chosen to write about).

Your paper should not exceed 10 pages (single spaced with 1 inch margins using a 12 point font size). All citations cited within your term paper need to be listed in a separate section at the end of your paper using the Journal of Animal Science citation format. The citations do not count towards the 10 page length maximum.

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Topics to be covered and associated chapters:

1. Read chapter 1 for general background information.
2. Water, pH, and buffers - Chapter 2
3. Amino acids, peptides, and proteins - Chapters 3, 4, 5, 6
4. Enzymes - kinetics, mechanisms, and regulation - Chapters 7, 8, 9
5. Bioenergetics, electron transport, and oxidative phosphorylation - Chapters 11, 12, 13,
6. Carbohydrates - structures, functions, digestion, absorption, and transport - Chapters 14, 16, 17, 18, 19, 20, 21, 43, ruminant
 - Glycolysis/GNG pathway overview and tissue regulation
 - Endocrine regulation: insulin, glucagon, and epinephrine
 - Hexose phosphorylation and Glucose-6-phosphatase
 - Phosphofructokinase and Fructose bisphosphate
 - Regulation of Pyruvate kinase, Pyruvate Carboxylase and PEPCK
 - Regulation of glycogen metabolism
 - Mitochondria: fine structure and genomic organization
 - Mitochondria: transporters and redox shuttles
 - Mitochondria: regulation of pyruvate dehydrogenase
 - Mitochondria: regulation of TCA cycle and ETC
 - Mitochondria: anaplerosis and ketogenesis
7. Lipids - structures, functions, digestion, absorption, transport, and metabolism - Chapters 15, 16, 22, 23, 24, 25, 26, 43, ruminant
 - Tissue variations: regulation of hormone sensitive lipase
 - Pathways and regulation of oxidative lipid metabolism (CPTI)
 - Pathways and regulation of oxidative lipid metabolism (HMG-CoA synthase)
 - Pathways and regulation of fatty acid synthase (Acetyl-CoA carboxylase)
 - Pathways and regulation of triglyceride and PL biosynthesis
 - Pathways and regulation of cholesterol metabolism structure, digestion,
8. Proteins - digestion, absorption, and metabolism - Chapters 27, 28, 29, 30, 43, ruminant
9. Nucleic acids - structure, digestion, metabolism - Chapters 32, 33, 34, 35, 36, 37, 38, 39
10. Integration of metabolism - Chapter 16, also to include fasting/starvation state, fed state, exercise and changes at birth
11. Regulation via external stimuli (G-proteins, cAMP, cAMP RE, inositol phosphate, Ca and DAG), Chapter 42
12. Vitamins and minerals - not already discussed as part of metabolism - Chapters 44

The chapters in the textbook are listed where applicable. Also, become familiar with chapters dealing with specific hormones when they are discussed in class. The textbook is a human text with a medical slant but most of the medical aspects are at the end of the chapter thus, you should find the first part of each chapter very helpful in understand the material and lectures. Keep in mind that most of the metabolic processes are the same or similar in most animal species. The biggest exception is with ruminant animals (mentioned in the text) and these differences will be discussed in class.