

Prerequisites:

Graduate student status or consent of instructor. Successful completion of a Junior or Senior level Animal or Human Nutrition Course.

Objectives:

The overall objective for the course is for students to learn the classical concepts of nutritional energetics. The course will be a study of the whole animal and not focused on cellular respiration. Multiple species (including humans) will be examined and the course should be of interest to students from many departments across campus.

Topics:

1. The contributions of Archimedes, Newton, Lavoisier, Priestly, Rubner, Armsby, Atwater, Brody, Kleiber, Blaxter, Lofgreen, Garrett, and others to the science of energetics.
2. Direct and indirect techniques for determining basal metabolic rate.
3. Measurement of body composition and energy retention or loss.
4. Whole animal energy flux and how energy is partitioned for maintenance, tissue growth, lactation, pregnancy, wool and mohair production, and exercise.
5. Energy sparing effects of weight loss.
6. Factors influencing maintenance requirements including: metabolic body size, species, genotype, breed, age, sex, physiological state, prior alimentation, climate, photoperiod, and body composition.
7. Factors influencing dietary energy digestibility and metabolism including normal fecal, urinary, and gaseous energy losses, level of intake, rate of passage, feed additive effects, and associative effects among feed ingredients.
8. Using energetics to help interpret results from a wide variety of biological studies.
9. Use of the Net Energy requirement systems, as outlined by the NRC Nutrient Requirements of Beef and Dairy Cattle publications, to predict body weight gain and milk production.

Instructor: John J. Wagner, Ph.D.
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Office Hours: M/W/F 9 to 11 AM

Location: 135 Animal Sciences

Days and Time: M, W, F from 8:00 – 8:50 AM

Grading:

1. Assigned reading summaries (200 points in total).
2. Traditional 50 minute mid-term exam (100 points).
3. Semester paper
 - a. First draft (100 points).
 - b. Paper reviews and group discussion (50 points).
 - c. Final revisions (50 points).
4. Take-home final exam (200 points).

Guaranteed Grade:

Percentage	Points	Grade
≥ 90	≥ 630	A
87 – 89.9	609 – 629	B+
80 – 86.9	560 – 608	B
77 – 79.9	539 – 559	C+
70 – 76.9	490 – 538	C
60 – 69.9	420 – 489	D
< 60	< 420	F

Learning Management System:

I will be using “Canvas” to provide slides and to record grades. Students are responsible for learning Canvas.

Literature of Historical Interest:

Blaxter, K. L. 1967. *The Energy Metabolism of Ruminants* (2nd ed.). Hutchinson & Co., London.

Blaxter, K. L. 1989. *Energy Metabolism in Animals and Man*. University Press, Cambridge.

Brody, S. 1945. *Bioenergetics and Growth*. Hafner Publishing Co., New York.

Kleiber, M. 1961. *The Fire of Life*. John Wiley & Sons, New York.

Mitchell, H. H. 1962. *Comparative Nutrition of Man and Domestic Animals*, Vols. 1 & 2. Academic Press, New York.

Recommended Texts:

Purchase of the following texts is not required. However, students are encouraged to obtain copies of the “NRC” for their primary species of interest.

1. NRC Nutrient Requirements
 - a. Beef Cattle
 - b. Dairy
 - c. Horse
 - d. Small Ruminant
 - e. Swine
 - f. Others

2. Nutritional Energetics of Domestic Animals and Glossary of Energy Terms.
 Subcommittee on Biological Energy, Committee on Animal Nutrition. Free pdf available at: http://www.nap.edu/download.php?record_id=1670

Required Readings:

There will be required readings assigned periodically from the literature. For most of the readings only a citation will be provided and the student will be required to find the paper. Students will be required to provide a written summary for these readings. Suggested format for these summaries is listed below:

1. Title
2. Authors and Institutions
3. Paper objectives
4. Key methodologies used
5. Key findings
6. Conclusions
7. Contributions of the paper to the study of bioenergetics

Semester Schedule:

Date	Day	Topic
18 Jan	W	Syllabus and course introduction
20 Jan	F	Early Theories of Heat
23 Jan	M	Modern Theory of Heat
25 Jan	W	Temperature and Heat
27 Jan	F	Introduction to Calorimetry
30 Jan	M	Coffee Cup Calorimetry Experiment

01 Feb	W	
03 Feb	F	
06 Feb	M	
08 Feb	W	
10 Feb	F	
13 Feb	M	
15 Feb	W	
17 Feb	F	
20 Feb	M	
22 Feb	W	
24 Feb	F	
27 Feb	M	
01 Mar	W	
03 Mar	F	
06 Mar	M	
08 Mar	W	
10 Mar	F	Midterm Exam
11 – 19 Mar	Sa – Su	Spring Break
20 Mar	M	
22 Mar	W	
24 Mar	F	
27 Mar	M	
29 Mar	W	
31 Mar	F	Manuscript Draft 1 Due. Manuscripts sent out for review.
03 Apr	M	
05 Apr	W	
07 Apr	F	
10 Apr	M	
12 Apr	W	Manuscript reviews due.
14 Apr	F	No class, Plains Nutrition Council
17 Apr	M	
19 Apr	W	Reviews returned to authors.
21 Apr	F	
24 Apr	M	Take-home final exam distributed. Colorado state university
26 Apr	W	Presentation 1
28 Apr	F	Presentation 2
01 May	M	Presentation 3
03 May	W	Presentation 4
05 May	F	Manuscript final draft due. Course evaluation.
10 May	W	Take-home Final Exam due. 1:50 PM.