

Course Title:

Energy Utilization in Domestic Livestock. (2) I, in odd years.

Course Description:

Comprehensive discussion of the development and application of energy systems used to guide livestock feeding, procedures used in energy experimentation, dietary/digestive/environmental factors that influence efficiency of energy utilization, and the efficiencies with which different energy substrates are used to support various maintenance and production functions. Emphasis will be placed upon ruminants. Two hours lec. a week. Pr.: BIOCH 521.

Student Performance Objectives:

Students completing the course will be able to:

Describe the techniques required for the measurement of energy flux in domestic livestock and critique experiments with regard to the appropriateness of procedures used and the conclusions drawn from such experiments.

Explain the impact of various dietary (e.g., chemical composition, etc.), animal (e.g., level of intake, animal specie, etc.), management (e.g., feed processing, etc.) and/or environmental factors (e.g., ambient temperature, etc.) on the energy losses experienced following consumption of a given diet.

Describe the efficiency with which different energy substrates are used to support maintenance, growth, lactation, and other physiological functions and explain the factors that influence the efficiency with which energy is used for these different functions.

Outline key components of the major energy systems used as the foundation upon which various applied feeding systems have been developed to guide the feeding of domestic livestock around the world.

Summarize and explain key concepts in the field of domestic animal energy utilization drawn from select articles published in the scientific literature.

Instructor:

Robert C. Cochran

Course Outline:

- I. Introduction -- the study of livestock energy utilization in relation to classical bioenergetics
- II. Techniques for measuring energy flux in domestic livestock
 - A. Bomb calorimetry
 - B. Direct animal calorimetry
 - C. Indirect respiration calorimetry
 - D. Other indirect techniques for measuring energy flux
- III. Energy balance and factors affecting energy loss
 - A. Overview of energy balance
 - B. Factors that influence fecal energy loss
 - C. Factors that influence gaseous energy loss
 - D. Factors that influence urinary energy loss
 - E. Factors that influence heat production (i.e., efficiency of metabolizable energy use)
 - F. Efficiency of metabolizable energy utilization for different physiological functions
- IV. Development and application of energy systems
 - A. Early developments in energy systems (Hay equivalent, starch equivalent, TDN, early NE systems)
 - B. Foundational energy systems (California NE, Beltsville NE₁, Blaxter/ARC; Noblet NE; Cornell CNCPS)

Evaluation Procedures:

Three essay examinations constructed to evaluate students with regard to their mastery of student performance objectives.

One written and/or oral summary of published literature in an area clearly relevant to the study of energy utilization in domestic livestock.

Text and Reference Material:

- 1) Information will be primarily derived from articles published in the scientific literature.
- 2) Excerpts from classical texts in the field of energy utilization will be used in a support function: Kleiber, M. 1975. *The Fire of Life* (2nd Ed.). Robert E. Krieger Publishing Co., Malabar, Florida; Blaxter, K. L. 1962. *The Energy Metabolism of Ruminants* (1st Ed.). Hutchison and Col., Ltd., London; Blaxter, K. L., 1989. *Energy Metabolism in Animals and Man*. Cambridge University Press, Cambridge, UK.

Sequencing:

Offered fall semester in odd numbered years.

Supplemental Information:

This course is designed for doctoral students and advanced master's students in Animal Science, or associated fields, who have an interest in studying the utilization of energy by domestic livestock at an organismic level.