

**NUMBER:** WCC-92

**TITLE:** Beef Cattle Energetics

**DURATION:** October 1, 1999 to September 30, 2002

**DESCRIPTION AND JUSTIFICATION:**

The beef industry in the United States continues to have an uphill struggle to be economically viable. Pressure from competing protein sources for domestic consumers' dollars and from beef producers in other countries, both in entering the U.S. market as well as in foreign markets, continues to be very strong. Because price is a dominant factor in the competitive position of U.S.-produced beef, efforts to improve production efficiency continue to be of high importance.

Improvement in production efficiency can be achieved by a reduction in input for a given amount of output, an increase in output for a given level of input, or a combination of these. Methods to further optimize the ratio of output to input are sought. Feed represents the largest economic input in life-cycle beef production. A large proportion (greater than two-thirds) of feed cost is in meeting energy requirements. Energy requirements to meet daily maintenance of all ages of animals plus productive functions such as growth, gestation, and lactation are therefore large. Thus, improvement in efficiency of energy utilization by genetic changes, diet changes or manipulation of feeding systems, or changes in management systems are highly desired and will be economically desirable.

Descriptive models that attempt to incorporate the complex variables of genetics, present nutrition, previous nutrition, climate--both short-term and long-term, and management are continually being updated and improved. Although the National Research Council has recently (1997) published new nutritional requirements of beef cattle, scientists plus astute producers realize that the NRC guidelines need further refinement and definition. The interaction of researchers from ruminant nutrition, genetics, and production systems, plus needed inputs from other specialized disciplines, is required to make better, more robust models on energy requirements for the various stages of production/life cycle for beef cattle.

No single institution has the research capital to independently study and solve the wide array of energy requirements and efficiencies for different production settings and genetic types of cattle. This committee has brought together, for the last six years, scientists from multiple disciplines; and effective, stimulating discussions plus cooperative working relationships have resulted. It is expected that at least someone from this committee will be a member of a future NRC committee, writing updated nutritional guidelines for beef cattle. Many committee members serve in extension and in consultant roles, aiding dissemination of information to the beef cattle industry. Application of the most efficient energy utilization in beef cattle not only enhances economic efficiency of beef production but also minimizes overfeeding of other nutrients, thus minimizing the effect of waste nutrients from cattle production on the air, the water, and the soil.

## **OBJECTIVES:**

1. To facilitate a timely exchange of research data, information and ideas among scientists drawn from multiple disciplines, extension personnel, industry representatives, and other parties interested in the measurement and interpretation of energy metabolism in beef cattle and the development of this knowledge for improved production programs.
2. To foster cooperative research relationships within the group and add interested new members with diverse backgrounds to enhance the group's discussions.
3. To plan and hold a symposium in conjunction with a major scientific meeting (either the Western Section of the American Society of Animal Science or the national American Society of Animal Science) reviewing the state of knowledge for energy metabolism in beef cattle and identifying hypotheses for consideration and new areas of research.

## **EXPECTED OUTCOMES:**

1. Identification, through discussion and consensus, of the most limiting information in beef cattle utilization of energy intake and develop appropriate hypotheses to test.
2. Interpretation of energy utilization data for development of effective, efficient production systems that minimize wastage of nutrients.
3. Development of cooperative working relationships that combine expertise across institutions and disciplines that will enhance the usefulness and scale of hypotheses tested.
4. A symposium where the latest knowledge in energy metabolism in beef cattle is critically reviewed, and new hypotheses are formulated.

## **EDUCATIONAL PLAN:**

The committee will continue to meet annually for exchange of current research, discussion of limiting areas of knowledge, presentation of new ideas for further research, and discussion of new applications in production settings. New cooperative arrangements for research are expected to arise from discussion at the annual meetings and through discussions that committee members have using our e-mail listing and our webpage. Following approval of the renewal of the project, the committee will devote a significant portion of its next annual meeting to planning the program and appropriate meeting choice for the symposium described under Objective 3. The committee would also solicit ideas on the program content from key interested scientists who are not members of the committee. Given the need for a lengthy lead time for a symposium, the committee would plan for the symposium being held during

2001.

## **PARTICIPANTS:**

The committee has representatives and cooperators that are involved in beef cattle energetics from academic institutions and government agencies in the western region and from other regions of the U.S. The committee wishes to keep its multi-disciplinary approach that includes members whose training and interests range from cellular energetics to whole-animal systems. The committee includes research scientists, state extension specialists, and members with mixed appointments.

<u>Member</u>	<u>Institution/Agency</u>	<u>Expertise</u>	<u>Res</u>	<u>CE</u>	<u>Tchg</u>	<u>Other</u>
Ransom Baldwin	USDA, ARS, Beltsville	Nutrition/Growth	100%			
Gordon Carstens	Texas A & M University	Nutrition/Energetics	25%		75%	
Calvin Ferrell	USDA, ARS, Clay Center	Nutrition/Energetics	100%			
Harvey Freetly	USDA, ARS, Clay Center	Nutrition/Energetics	100%			
Gary Hill	GA Coastal Plain Expt Sta	Stocker/cow-calf supplementation Feedlot Finishing	90%			10%
Donald Johnson	Colorado State University	Nutrition/Energetics	60%		30%	10%
Kristen Johnson	Washington State University	Nutrition/Energetics	58%		42%	
Clint Krehbiel	New Mexico State University	Nutrition/Growth	58%		42%	
William Kunkle	University of Florida	Nutrition	50%	50%		
Ronald Lemenager	Purdue University	Nutrition/Management	60%		40%	
Kyle McLeod	USDA, ARS, Beltsville	Nutrition	100%			
Merlyn Nielsen	University of Nebraska	Genetics	60%		40%	
James Oltjen	University of California	Nutrition/Systems		100%		
Mark Petersen	New Mexico State University	Nutrition/Range	50%		50%	
Roberto Sainz	University of California	Nutrition/Energetics	60%		40%	
Mike Tess	Montana State University	Genetics/Systems	70%		30%	
Charles Williams	USMARC	Systems Modeling				100%

## **OPERATIONAL STRUCTURE:**

The committee has two elected officers: Chair and the Secretary/Chair Elect. The two officers perform the administrative duties of the committee. Standing sub-committees are created and eliminated by the committee, and sub-committee chairs are appointed by the committee at the annual meeting.

## **SIGNATURES:**

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Administrative Advisor

Date

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Chair, Western Director's Association

Date

## **ATTACHMENTS:**

### **Accomplishments**

The objectives of WRCC-92 during its initial 3 years (1992-95) were met. In addition, the objectives for the first renewal period (1996-99) are on track for accomplishment. Our objectives for the combined 6-year period have been to: (1) facilitate exchange of data, information, and ideas among scientists of differing disciplines; (2) provide a forum for discussion of the current state of understanding of energy utilization; and (3) foster cooperative working relationships for scientists addressing issues in energetics.

At each annual meeting, committee members have presented research proposals and reports of their work which stimulate discussion and encourage subsequent studies for the coming year. The mix of nutritionists, geneticists, and production systems specialists has brought interesting perspectives and interpretation of several biological phenomena. At our most recent meeting in February 1998, we had guest speakers (Dr. Charles Williams from U.S. Meat Animal Research Center, and Dr. Hutton Oddy from University of New England, Armidale, Australia) who presented results from their studies involving models of energy utilization in beef cattle.

At our 1995 meeting, the committee held a 2-day workshop that summarized the current state of knowledge about energetics of beef cattle. Eight of our committee members prepared and presented position papers for the workshop. Specialists who were not on the committee were invited to be respondents (one for each position paper) at the workshop. These guests were brought in to broaden the discussion base plus to invite them to become members of the committee. The papers from the workshop have been made available by Texas A & M University; and one was published in Feedstuffs, a weekly industry news-magazine.

Cooperative efforts bringing together research programs from different locations across the country have resulted from the interaction of scientists in WCC-092. Examples of collaborative efforts are those between G. Carstens of Texas A & M and M. Nielsen of the University of Nebraska and between K. Johnson of Washington State University and R. Baldwin of USDA Beltsville. In addition, we have a website (<http://ggpl.ars.usda.gov/beef/>, maintained by R. Baldwin at Beltsville) plus an organized e-mail system (wrcc92@ucdavis.edu, organized by J. Oltjen) that facilitates interaction among committee members.