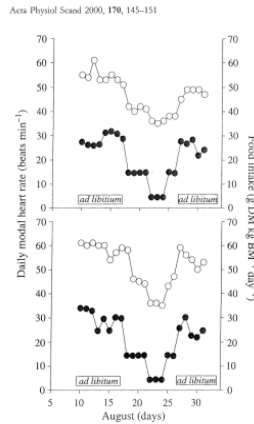


Background

Most beef cattle in Montana are fed hay for 3-5 months each winter (1). Many ranchers assume that cattle will lose excessive weight if cattle are not fed hay during winter.

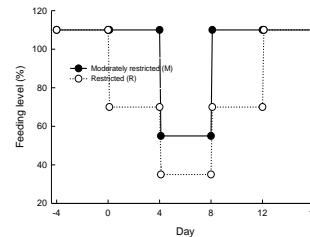
Previous research suggests that cattle grazing winter range lower their metabolic rates similar to wildlife (2), without impacting reproduction. Heart rate closely tracks step-wise decreases and increases in feeding level in reindeer and red deer (3, 4, figure).

If metabolic rates of beef cattle track feeding level, ranchers may be maintaining elevated metabolic rates at great expense during winter.



Methods

Our trial was conducted at the Bozeman Agricultural Research and Teaching (BART) Farm from late February until early April 2015. Six head of young, non-pregnant, non-lactating Black Angus cattle were placed in individual pens for 16 days to determine their desired feeding level (100%). During this initial period, they were trained to load into our portable metabolic chamber (PMC), an enclosed horse trailer. During the entire trial, they were fed chopped hay (7.5% CP). On d 0 of the trial (3/17/15), three cows were subjected to Moderately Restricted (M; 110% > 55% > 110%) and three cows were subjected to Restricted (R; 110% > 70% > 35% > 70% > 110%) feeding levels in four day increments:



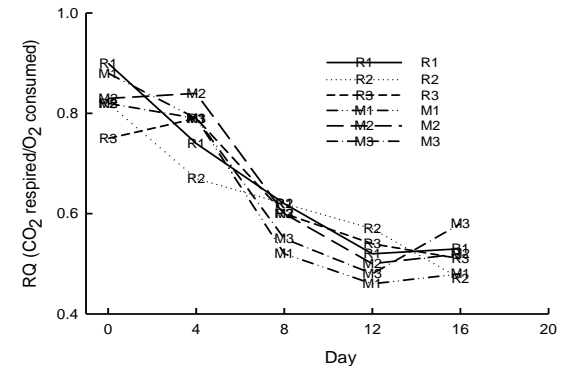
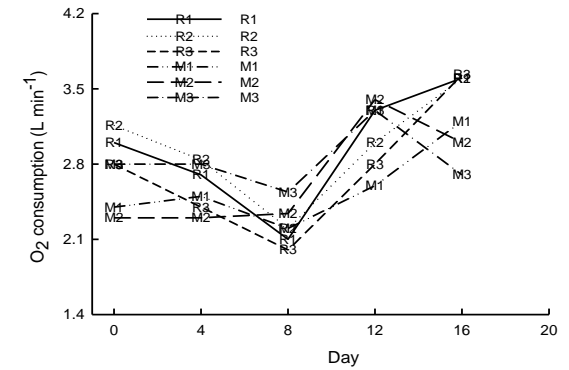
Metabolic rates (based on O₂ consumed) of all cows were measured the morning following each four day feeding increment. After placing a cow in the portable metabolic chamber, O₂ consumed and CO₂ respired were measured with a gas analyzer (Field Metabolic System, Sable Systems, Inc. Las Vegas) for 30-40 minutes.



Ambient air was pulled through the chamber at 1,000 L min⁻¹. Oxygen and CO₂ were sampled every second. Chamber measures were alternated with ambient measures every 3-4 minutes to determine O₂ consumed and CO₂ respired.



Results and Importance



For most cows, metabolic rates (based on O₂ consumed) tracked feeding levels in a step-wise manner. And as expected, RQs declined as feeding levels were restricted indicating cattle were catabolizing fat.

Overall, these results indicate that cattle entering winter in good condition that graze rangeland may conserve energy by lowering their metabolic rates, without impacting reproductive performance, e.g., at the MAES Red Bluff Research Ranch.

Objective

Our objective was to determine if metabolic rates of beef cattle track step-wise adjustments in feeding level.

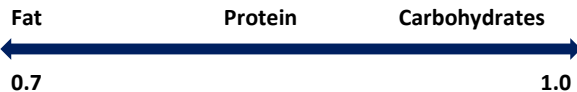
Concepts

RESPIRATION - CHOS + O₂ > CO₂ + H₂O and ENERGY!
Metabolic Rate (MR) is represented as the rate of O₂ consumed in L min⁻¹

RESPIRATORY QUOTIENT (RQ)
RQ = CO₂ respired / O₂ consumed

RQs values vary based on diet components, feeding levels and energy status of the animal.

RQ values



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* Protocol was approved by Montana State University's Institutional Animal Care and Use Committee (Protocol 2014-AA07).
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