Abstract: The objective was to determine if lactate adaptation in cannulated steers affected fermentation characteristics in an ex vivo model of ruminal acidosis. Eighteen cannulated steers (790 ± 68 kg) were assigned to one of two treatments: 500 mL of H2O (CON) or 1 mM DL-Lactic acid solution per kg steer BW (LAC). After treatments were dosed prior to feeding for 6 d, rumen fluid was collected for an ex vivo study. Three flasks for each steer contained 7.5 g DM of substrate (70% corn, 15% DDG, and 15% silage) and 160 mL of inoculum with rumen fluid and McDougall's buffer (4:1 ratio). Sample aliquots (1.7 mL) were collected every 4 h from the flask for 36 h fermentation for later analysis. At 12 h, 90 mM of neutralized DL-Lactic acid was added to each flask to further evaluate lactate utilization over time. Data were analyzed using the MIXED procedure of SAS 9.4 with a repeated measures analysis. A treatment by hour interaction was not detected (P = 0.19) for pH. However, steers on LAC tended (P = 0.06) to have a greater pH than CON. No treatment by hour interaction or treatment effect was observed (P ≥ 0.44) for molar proportion of acetate, propionate, butyrate, and ammonia. A treatment by hour interaction tended (P = 0.07) to be observed for total VFA; CON was greater than LAC at hour 8, 13, 16, and 20. Control steers had a greater (P = 0.03) in vitro dry matter disappearance compared with LAC (63.6 vs. 54.0%, respectively). Although results indicated that rumen fluid from lactate-adapted steers had a greater pH in an acidosis model, rumen fluid from CON steers had improved IVDMD and total VFA concentrations.

Keywords: acidosis, ex vivo model, lactate

Authors:

239 Relationship Between Body Temperature and Behavior-Activities of Non-Pregnant Early Lactation Dairy Cows. Mercedes E. Brunton1, Maria Elisa Montes1, Adrianna Mann3, Kelsey Teeple1, Uduak George3, Jaquelyn P. Boerman1, Theresa Casey1, 1Purdue University, 2San Diego State University

Abstract: Animal behavior is a component of animal welfare and known to affect physiology as a primary input to the circadian system. Our objectives were to determine if non-pregnant, early lactation dairy cows in a free-stall exhibited circadian rhythms of behavior and core body temperature, and if oscillations in daily behaviors and activities of a cow relate to daily oscillations in body temperature or estrus, parity, and days in milk (DIM). Thirty Holstein cows (21-80 DIM) were observed for a 48-h period. The activities of standing, eating, ruminating, lying, and estrus behavior were recorded every 10 min. Data loggers (buttons) secured to blank (progesterone removed) controlled internal drug release (CIDR) devices were placed intravaginally in a subset of cows (n = 11) to record body temperature every 10 min over the same 48 h period. Cows were milked twice each day starting approximately 05:00 and 17:00, and the 70 min period encompassed moving cows to and from the milking parlor. The entire period cows were away from the free-stall was marked as milking. An ethogram was created using a binary system (0, 1), with 1 for each behavior. Behavior and temperature data were graphed for visualization, and cosine fit analysis found lack of evidence for circadian rhythms. Programs in R were used to plot behavior to overlay temperature recordings over the 48 h period to determine if temperature varied with behavior-activity. Temperature increased during milking periods in 8 of 11 cows (statistical method in development), but no other relationships were found. To study patterns of behavior, an adjacency matrix was utilized to create a directed graph for each cow. Analysis of the effect of estrus, parity and DIM on behavior patterns is ongoing. Computational approaches are currently being developed that may serve as tools to analyze the effect of production management systems on cow behavior.

Keywords: circadian rhythm, computational analysis, cow behavior, early lactation