BLOOD KETONE LEVELS OF YOUNG POSTPARTUM RANGE COWS INCREASED AFTER SUPPLEMENTATION CEASED

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Young beef cows grazing dormant native range experience weight loss and nutrient imbalances postpartum. Due to high acetate production from ruminal fermentation and low metabolic glucose supply, ruminal acetate is cleared slowly and may be converted to β-hydroxybutyrate (βHB). As a chute-side measure of nutrient status, whole-blood βHB levels of two- and three-year-old postpartum range cows (n = 45) were measured with a handheld ketone sensor (MediSense/Abbott Laboratories, Abingdon, UK). Measurements were taken in May and July when cows were grazing dormant range. In May, cows were also receiving one of three 30% CP supplements containing increasing quantities of glucogenic precursors (57, 124, or 192 g/d glucogenic potential). For each ketone reading, βHB in the blood is oxidized to acetoacetate in the presence of hydroxybutyrate dehydrogenase with the concomitant reduction of NAD^+ to NADH. The NADH is reoxidized to NAD^+ by a redox mediator. The current generated is directly proportional to the βHB concentration. After 30 s, the βHB concentration (mmol/L) is displayed on the meter. Data were analyzed using physiological state, time of measurement and their interaction in the model. Cows had higher ($P < 0.01$) βHB in July than they did in May (0.34 vs 0.16 ± 0.02 mmol/L, respectively). Levels of βHB did not approach subclinical ketosis. However, the differences between the two measurements may suggest that the glucogenic precursors in the supplements may have improved utilization of acetate arising from ruminal fermentation. Cows were at an earlier stage of lactation (avg 53 d postpartum), presumably producing more milk, but gaining weight (0.11 ± 0.10 kg/d) in May, while in July were further along the lactation curve (avg 124 d postpartum) and producing less milk, but losing weight (-0.22 ± 0.10 kg/d). Protein supplementation may have decreased βHB produced by improving acetate clearance due to a greater supply of glucogenic precursors.
Key Words: β-hydroxybutyrate, Acetate, Glucose, Lactation

GLUCOSE HALF-LIFE OF YOUNG POSTPARTUM LACTATING COWS WAS HALF THAT OF NON-LACTATING HERDMATES

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Lactation and recently diet quality have been implicated as regulators of nutrient partitioning by decreasing tissue sensitivity to insulin. Treatments were arranged as a 2 x 2 factorial to investigate the influence of lactation and season on serum glucose clearance. Glucose tolerance tests (GTT) were conducted on lactating (LACT, n = 4) and non-lactating (NLACT, n = 4) three-year-old cows grazing dormant native range in May (57 d postpartum) and July (135 d postpartum). In January, before calving, NLACT cows were heavier than LACT cows (468 ± 18 vs 414 ± 9 kg); all cows were body condition score (BCS) 4.6 ± 0.24. Calves from NLACT cows did not survive. NLACT cows gained condition after calving (May BCS 5.9 ± 0.12; July BCS 6.5 ± 0.26) while LACT cows maintained condition (May BCS 3.9 ± 0.24; July BCS 4.4 ± 0.13). For each GTT, 50% dextrose solution was infused at 0.5 mL/kg BW via jugular catheter and serum was collected at 11 time intervals for 120 min. Serum glucose and insulin areas-under-the-curve (AUC) and glucose half-lives were calculated. Glucose AUC (7299 vs 10599 ± 1173 units) tended ($P = 0.08$) to be smaller, and insulin AUC (185 vs 361 ± 17 units) was smaller ($P < 0.01$) for LACT cows than for NLACT cows. Glucose half-life was nearly 50% less ($P = 0.03$) for LACT compared to NLACT cows (53 vs 100 ± 12 min) and tended ($P = 0.08$) to be longer in July compared to May (94 vs 58 ± 12 min). Diet quality as affected by season did influence glucose half-life. LACT cows were more responsive to insulin than NLACT cows since they cleared glucose in less time with less insulin, although it would be expected that NLACT cows would clear glucose in less time than LACT cows. Body condition may be as important as lactation in the regulation of glucose clearance.

Key Words: Glucose, Insulin, Lactation, Physiological state

INCREASING GLUCOSE PRECURSORS IN RANGE SUPPLEMENTS FED TO YOUNG POSTPARTUM RANGE COWS

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Increased nutrient demands during late gestation and lactation may amplify the need for supplementation of cows grazing dormant New Mexico range. Even with a supplementation regimen, young beef cows experience a period of weight loss after calving and during lactation. In order for a cow to gain weight and thus start cycling, an adequate supply of blood glucose must be available to the animal, and she must be able to absorb that glucose into her tissues. The hormone responsible for glucose uptake is insulin, and in periods of weight loss and nutrient stress the cow is less responsive to its effects. Ruminants synthesize nearly all of their glucose from products of digestion, which include propionate (a product of ruminal carbohydrate fermentation) and amino acids (from protein degradation). However, fermentation of dormant forage yields small amounts of these glucose precursors (propionate). During lactation, the increased demand for glucose for milk production adds to the deficit of glucose available to the cow. Her problem is 3-fold: first, she has an inadequate supply of blood glucose, second, the need for glucose has dramatically increased for milk production, and third, blood glucose is inhibited from entering tissues, thus restricting her ability to gain body weight. Previous research at NMSU showed improved cow reproductive performance (earlier return to estrus) when supplements containing increased glucose precursors were fed. However, an optimum level of supplemental glucose precursors has yet to be defined. Therefore, a study was conducted at the Corona Range and Livestock Research Center to evaluate reproduction, milk production, weight change, and tissue insulin sensitivity responses of 2- and 3-yr-old postpartum beef cows (n = 51) to supplements differing in glucose precursors. Supplements were individually fed after the morning grazing period twice weekly at 2.5 lb per head per day for 78 d postpartum. The three supplements each provided 0.75 lb **CP** with increasing amounts of potential glucose precursors (GP): 0.13 lb GP (**LOGP**), 0.27 lb GP (**MIDGP**), or 0.42 lb GP (**HIGP**). Glucose precursors were supplied by bypass protein (blood and feather meal) in the