

Effects of a high lactose milk replacer on glucose metabolism in neonatal calves

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Most milk replacers (MR) contain more lactose than whole milk, which could potentially reduce insulin sensitivity and thus energy utilization in calves. This study evaluated the effects of replacing lactose with fat in MR on glucose and insulin kinetics in neonatal dairy calves fed high quantities of MR. Abomasal emptying, the outflow of milk from the abomasum into the small intestine, mediates glucose homeostasis and was therefore evaluated as well. Thirty-four Holstein-Friesian bull calves (mean \pm SE; 43.2 \pm 0.81 kg) were blocked by BW and dam parity, and randomly assigned (n = 17) to a high-lactose (17.3% crude fat, 44.3% lactose and 23.2% CP) or high-fat (23.3% crude fat, 37.3% lactose and 23.5% CP) MR. Calves were individually housed and fed pooled colostrum within 2 h and at 12 h after birth at 18 and 9% of metabolic body weight (MBW), respectively. From 24 h after birth, calves were transitioned to be fed MR at 18% of MBW (150 g/L) twice daily at 0700 and 1900 h. A glucose tolerance test was conducted on d 4 after an 8 h fast by an intravenous infusion of glucose (0.54 g/kg MBW), followed by an intravenous infusion of insulin (3.9 μ g/kg MBW) after 20 min. Postprandial sampling took place on d 6, whereby a marker to determine abomasal emptying (acetaminophen, 13 mg/kg MBW) was added to the morning meal. During both tests, sequential blood samples were collected from a catheter and analyzed for plasma glucose and insulin and acetaminophen concentrations. Data were statistically analyzed using the MIXED and NLIN procedures in SAS. Calves receiving the high-lactose treatment had difficulties maintaining glucose homeostasis in blood during both tests, as indicated by a greater ($P < 0.01$) area under the curve for plasma glucose compared with high-fat calves. Insulin concentrations were unaffected ($P > 0.05$) by treatment. Furthermore, abomasal emptying tended ($P = 0.06$) to be faster for calves fed the high-lactose treatment. Shifting the lactose to fat ratio of MR toward that of whole milk may improve the calf's ability to maintain glucose homeostasis. Understanding how commercial MR influences nutrient absorption in dairy calves may increase performance and help reduce the high morbidity and mortality rates on farm.