Effects of Glutamate Supplementation During the Periparturient Period on the Performance of Dairy Cows

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Dairy cows often experience negative energy balance, fat mobilization, and inflammation after calving, which increase the risk of metabolic disorders. Supplementation of glutamate (Glu), a primary energy source for the small intestine, may spare its glucose consumption and allow for greater energy supply for milk production, but effects of supplementing Glu have not been evaluated in dairy cows. To evaluate the effects of supplementing Glu, fifty-two multiparous Holstein cows were fed diets with or without rumen protected monosodium Glu (MSG) at 4% of dietary dry matter for 3 weeks before calving and at 3% of dietary dry matter for 3 weeks after calving. Contrary to our pretrial hypothesis, the MSG treatment did not decrease serum concentrations of inflammation markers and β-hydroxybutyrate, and did not increase milk yield. However, dry matter intake of cows fed MSG tended to be higher on d -1 (13.9 vs 12.7 kg/d; $P = 0.10$) and was higher on d 1 (15.7 vs 13.7 kg/d; $P = 0.03$) relative to calving. In addition, cows fed MSG had lower serum concentrations of free fatty acids (670 vs 981 μEq/L; $P < 0.01$) and total bilirubin (0.22 vs 0.34 mg/dL; $P < 0.01$), and lower plasma 3-methylhistidine concentration (1.28 vs 1.50 μmol/dL; $P = 0.03$) on d 4 after calving, which suggested less body fat mobilization, less liver damage, and less body protein mobilization, respectively. Furthermore, cows fed MSG had higher total-tract digestibility of dry matter (70.6 vs 69.1%; $P = 0.05$), crude protein (75.1 vs 72.6%; $P = 0.03$) and fat (66.0 vs 61.2%; $P = 0.05$) in the first week after calving. These results suggest that Glu supplementation may not decrease ketosis and inflammation or increase milk production, but it may increase feed intake and nutrient digestibility, and decrease mobilization of body fat and protein immediately after calving.

Effect of Selective Removal of High Proviral Load Cattle on the Herd Prevalence of Bovine Leukosis

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Bovine leukosis, caused by bovine leukemia virus (BLV), is a common viral disease of cows. Time between infection and disease is long, and leukosis cases are uncommon, but BLV infected animals have reduced immunity, milk production and longevity. It is difficult to detect infected cows without laboratory methods. Controlling BLV from dairy herds has been challenging as the high within-herd prevalence makes a test and cull strategy impractical. BLV produces a copy of itself and build that in the genome of the cow, this is a provirus. The number of proviruses vary between cows and this has clinical consequences. The proviral load (PVL), measured as the amount of proviruses in the host's white blood cells, is associated with BLV transmission. The objective of this study therefore is evaluating the impact of removing just the high proviral load (HPL) cows from the herd on the BLV herd prevalence. Milk or blood samples were collected from the milking cows in ten dairy herds across Alberta. The samples were tested for antibodies against BLV and the proviral load was determined in the BLV-positive cows. Of 2,023 dairy cows sampled, 682 tested positive for BLV antibodies, the within-herd prevalence ranged from 9.22% to 52.24% (median=35%). The proviral load distribution in the positive cows is reported in table 1. Culling recommendations were provided for the HPL cows to reduce within-herd transmission. We will follow up with these farmers annually to evaluate the impact of this strategy for two more years.

Table 1: Proviral load distribution

	High proviral load	Moderate proviral load	Low proviral load	Proviruses not detected*
Number of cows n (%)	77 (11.29)	192 (28.16)	287 (42.08)	118 (17.30)

* these animals are antibody positive (are infected) but provirus could not be detected using our laboratory tests.

Take Home Messages: We study the impact of removing HPL cows, on BLV transmission within the herd, which could be an economical and practical way of BLV control.

The Effect of Gradual Weaning Method and Forage Type on Feeding Behaviour and Growth of Dairy Calves

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The aim of this study was to compare feeding behaviour and performance of dairy calves (n=108) offered grass hay or silage based TMR and weaned using three gradual weaning methods based on age (WA), DMI (WI), or a combination of DMI and age (WIA). All calves were offered 12 L/d of milk until d 30, milk was then gradually reduced by 25% of calf's average milk intake over 3 d. For WA calves, milk remained stable until d 62, remaining milk was reduced linearly until weaning at d 70. For WI calves, milk was reduced by 25% over 3 d once calves consumed an average of 200g/d, 600g/d, and 1150g/d of DM (DMI based on forage and starter). For WIA calves, milk remained stable until calves consumed an average of 200g/d DM, remaining milk was reduced linearly until weaning at d 70. Milk, starter, forage, and unrewarded visits at milk feeder were calculated over weaning (31d-69d) and postweaning (70d-84d). WI and WIA calves had greater final BW compared to WA calves (123±1.9 vs 121±1.8 vs 117±1.9 kg). WI calves ate more starter and forage and consumed less milk than WIA and WA calves (starter: 1.2±0.08 vs 0.8±0.06 vs 0.5±0.05 kg DM/d; forage: 0.1±0.01 vs 0.09±0.008 vs 0.08±0.006 kg DM/d; milk: 3±0.2 vs 4± 0.1 vs 6±0.2 L/d). Postweaning, WI and WIA calves ate more starter than WA calves (2.9±0.1 vs 2.8±0.1 vs 2.5±0.09 kg DM/d). Unrewarded visits were greater during weaning for WI and WIA calves compared to WA calves (10±0.6 vs 11±0.8 vs 7±0.4 visits/d). Hay calves had greater final BW (118±1.8 vs 113±1.7 kg) and ate more starter during weaning (0.8±0.09 vs 0.6±0.04 kg DM/d) and postweaning (2.8±0.1 vs 2.4±0.1 kg DM/d) compared to TMR calves. These results suggest that including a DMI target within a weaning method can improve starter intake and BW. However, the high number of unrewarded visits in WI and WIA suggests that these milk reduction methods may result in increased hunger during weaning. Feeding grass hay over a silage based TMR can result in greater starter intake and BW.

Anogenital Distance is Consistent Throughout Adult Life in Holstein Cows and Associated with Embryo Quality

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Good fertility is important for the financial sustainability of dairy farms. Anogenital distance (AGD; the distance between the anus and clitoris in cattle) is a novel reproductive phenotype with high genetic variation and moderate heritability (0.37). In recent reports, short-AGD dairy cows (≤127 mm) and heifers (≤110 mm) had greater pregnancy/AI and shorter calving-to-conception interval than long-AGD cattle, making AGD a promising phenotype to be considered in future genetic selection programs to improve fertility. A phenotype suitable for genetic selection should be consistent (repeatable) and measurable early in life. Therefore, the 1st study was to determine the repeatability of AGD at different ages in heifers and through various physiological states in cows. In the 2nd study, we hypothesized that the higher fertility in short-AGD cattle is because of high embryo quality. In the 1st study, AGD was measured in calves (n=48) from birth to breeding age, and in cows, through phases of a complete estrous cycle (n=20), different stages of pregnancy (30, 90, 180 & 270 d; n=78) and lactation (monthly, from 30 to 300 DIM; n=30). AGD measured at 6-mo was correlated with adult AGD. The AGD measurements at different phases of the estrous cycle, pregnancy (except at 270 d), and lactation did not differ within the same animal and were highly correlated (r>0.95). In the 2nd study, data on embryo yield and quality were obtained from superovulated cows and heifers of two commercial dairy herds. Although embryo yield and quality did not differ in heifers, short-AGD cows had proportionately more (*P*=0.01) fertilized eggs and transferable quality embryos out of total structures (embryos + ova) recovered than in long-AGD cows.

Take home messages: 1) AGD measured at 6 mo of age is reflective of AGD at breeding age; 2) AGD was consistent throughout adult life; 3) Embryo quality was higher in short-AGD cows than in long-AGD cows; 4) Results strengthen AGD as a potential fertility trait.