The Effect of Late Gestation Supplementation Strategy on Cow-Calf Performance in March-Calving Mature Cows

Jacki A. Musgrave
Kacie L. McCarthy
J. Travis Mulliniks

Summary with Implications

Implementation of supplemental protein strategies during late gestation has been shown to positively affect postweaning progeny performance. A 2-yr study was conducted to evaluate the effects of late gestation supplementation strategies on reproduction, cow body weight, and calf performance in March-calving mature range cows grazing dormant upland range. Supplementation was individually fed and provided daily with treatments being: 1) no supplementation, 2) 2 lb per day of a 30% CP distillers-based supplement, 3) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 160 mg/cow daily of monensin, 4) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 40 g/cow daily of propionate salt. Cows that received any of the 3 supplemental protein treatments gained similar BW; whereas cows that received no supplement gained the least BW during late gestation. Supplementation strategy did influence subsequent reproductive performance with CaProp and Supp cows having the greater pregnancy rates. Late gestation supplementation did not influence subsequent calf BW at birth, weaning, and entry into the feedlot. However, late gestation strategy tended to influence steer BW at finishing with offspring from NoSupp dams had the lightest finishing BW. Average daily gain, DMI, and F:G were not influenced by dam's late gestation supplementation strategy. Overall, protein supplementation in general had a positive impact on overall cow-calf performance compared to no protein supplementation. However, cows that were fed protein supplement or protein supplement with the inclusion of propionate salts had increased subsequent pregnancy rates.

Introduction

Implementation of supplemental protein strategies during late gestation may have the potential to affect cow-calf and postweaning progeny performance. Previous research has suggested evidence for prenatal influences on steer progeny from cows grazing dormant winter range with and without protein supplementation. However, protein may not be the only nutrient limiting performance of late gestating cows grazing low-quality native range. Available evidence indicates that postruminal supply of glucogenic precursors may increase nutrient utilization of forages, especially when cattle are grazing low-quality forages. Therefore, the objective of this study was to determine the impact of late gestation supplementation strategies on reproduction, cow body weight, and pre-weaning calf performance and subsequent steer feedlot performance in March-calving mature range cows.

Procedure

This study was conducted over a two-year period (2021 to 2023) utilizing mature range beef cows from the March-calving herd at the University of Nebraska Gudmundsen Sandhills Laboratory (GSL) located near Whitman, NE. Cows (n = 236) were Husker Reds (5/8 Red Angus, 3/8 Simmental) and were stratified by cow body weight and BCS and assigned randomly to a late gestation supplementation treatment. Supplementation was initiated in December each year and terminated approximately 30-d prior to the start of the calving season in February. During the supplemental period, all cows grazed dormant upland native range in one group. Cows were individually supplemented daily by Super SmartFeed (C-Lock Inc., Rapid City, SD) electronic pasture feeding system. Supplementation treatments were: 1) no supplementation as the negative control (**NoSupp**), 2) 2 lb per day of a 30% CP distillers-based supplement (**Supp**), 3) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 160 mg/cow daily of monensin (**RUM**), 4) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 40 g/cow daily of propionate salt (**CaProp**). Supplemental treatments of RUM and CaProp were designed to provide additional glucogenic precursors that may increase nutrient utilization and efficiency impacting both the performance of the cows and developing fetus.

Cow body weight (BW) and body condition score (BCS; 1 = emaciated, 9 = obese) by palpation were measured and recorded at weaning (November), pre-calving (February), and pre-breeding (May). Fertile bulls were introduced for natural service and removed on d 45 of the breeding season. Cow pregnancy diagnosis was detected via transrectal ultrasonography and rectal palpation at weaning each year.

Calves were weighed at birth and at weaning. At weaning, steers (n = 118) were held in a drylot on ad libitum hay for 2 weeks postweaning and then shipped to West Central Research and Extension Center (WCREC; North Platte, NE) and entered the feedlot. Steers were placed in a GrowSafe feeding system approximately 2 weeks after arrival at WCREC. Following a 10-d acclimation period in the GrowSafe, steers were weighed 2 consecutive d and the average was the initial feedlot entry BW used in calculating feedlot performance. All steers experienced a 21 d transition period to a common finishing diet of 48% dry rolled corn, 40% corn gluten feed, 7% prairie hay, and 5% supplement. All steers were implanted with 14 mg estradiol benzonate and 100 mg trenbolone acetate (Synovex Choice, Zoetis) at feedlot entry. Approximately 100 d before slaughter, calves were implanted with 28 mg estradiol benzoate and 200 mg trenbolone acetate (Synovex Plus, Zoetis). Each year, steers were slaughtered at a commercial facility (Tyson Fresh Meats, Lexington, NE) when estimated visually to have 0.5 inch fat thickness as a entire group over the 12th rib. Carcass data were collected 24 h post slaughter and final BW was calculated from hot carcass weight

Table 1. Effect of late gestation supplementation on cow performance

	Treatment[1]					
Measurement	NoSupp	Supp	CaProp	RUM	SEM	*P*-value
Cow body weight, lb						
Nov	1063	1059	1064	1060	5	0.89
Feb	1086[a]	1153[b]	1146[b]	1142[b]	7	0.04
May	1063	1057	1060	1052	10	0.73
Body weight change, lb						
Nov to Feb	23[a]	94[b]	82[b]	82[b]	3	0.01
Feb to May	-23[a]	-96[b]	-86[b]	-90[b]	4	0.01
Cow BCS						
Nov	5.3	5.4	5.4	5.4	0.3	0.91
Feb	4.9	5.2	5.4	5.3	0.2	0.45
May	5.2	5.3	5.5	5.4	0.2	0.78
Pregnancy rate, %	89[a]	95[b]	94[b]	90[a]	2	0.05

[1] Supplementation were: 1) no supplementation as the negative control (NoSupp), 2) 2 lb per day of a 30% CP distillers-based supplement (Supp), 3) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 160 mg/cow daily of monensin (RUM), 4) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 40 g/cow daily of propionate salt (CaProp).

Table 2. Effect of late gestation supplementation on subsequent offspring performance

	Treatment[1]					
Measurement	NoSupp	Supp	CaProp	RUM	SEM	P-value
Calf body weight, lb						
Birth	73	75	76	76	3	0.68
Weaning	577	587	585	582	5	0.49
Feedlot Performance, lb						
Entry	805	821	823	819	12	0.69
Finishing	1325	1368	1363	1363	20	0.18
ADG, lb/d	2.97	3.13	3.09	3.11	0.26	0.56
DMI, lb/d	21.46	22.56	20.71	20.74	0.75	0.45
F:G	7.22	7.21	6.71	6.67	0.31	0.11
Carcass Characteristics						
Hot carcass weight, lb	835[a]	862[b]	859[b]	859[b]	11	0.02
Choice or greater, %	89	77	100	77	8	0.08
Yield Grade	2.74	2.63	2.85	2.54	0.35	0.52
LM area, in^2	14.54[a]	15.36[b]	15.45[b]	15.65[b]	0.44	0.03
Marbling score[2]	508	514	510	465	25	0.22
Backfat, in	0.53	0.57	0.59	0.57	0.43	0.88

[1] Supplementation were: 1) no supplementation as the negative control (NoSupp), 2) 2 lb per day of a 30% CP distillers-based supplement (Supp), 3) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 160 mg/cow daily of monensin (RUM), 4) 2 lb per day of a 30% CP distillers-based supplement with the inclusion of 40 g/cow daily of propionate salt (CaProp).

[2] Marbling score: 400 = Small[00], 450 = Small[50], 500 = Modest[00]

(HCW) based on an average dressing percentage of 63%. Carcass data included HCW, marbling, yield grade, backfat, and longissimus muscle (LM) area.

Data were analyzed as a randomized block design using the MIXED procedure (SAS Inst. Inc., Cary, NC, USA) with cow as the experimental unit using the Kenward-Roger degrees of freedom method. The model included fixed effects of year, age, treatment, calf sex, and their interactions. Separation of least squares was performed by the PDIFF option in SAS when a significant ($P \leq 0.05$) effect was detected. Significance level was set at $P \leq 0.05$.

Results

Initial cow BW at the beginning of the experiment in November at weaning was not different ($P = 0.89$; Table 1) among late gestation supplementation strategies. However, pre-calving BW in February was influenced ($P = 0.04$) by treatments. Cows that received any of the 3 supplemental protein treatments gained similar BW; whereas cows that received no supplement gained the least BW during late gestation. By the start of the breeding season in May, cow BW was not different ($P = 0.73$) among late gestation strategies, which was driven by NoSupp cows losing the least amount of BW from calving to breeding. Cow BCS was not different ($P \geq 0.45$) at weaning, calving, and pre-breeding among the late gestation strategies. Subsequent pregnancy rates were influenced ($P = 0.05$) by late gestation supplementation strategy. Cows that received CaProp or Supp had similar pregnancy rates, which were greater than cows receiving RUM or NoSupp that did not differ from each other.

Late gestation supplementation did not influence ($P > 0.49$; Table 2) subsequent calf BW at birth, weaning, and entry into the feedlot. However, late gestation strategy tended to influence ($P = 0.06$) steer BW at finishing with offspring from NoSupp dams having the lightest finishing BW. Average daily gain, DMI, and F:G were not influenced ($P > 0.11$) by dam's late gestation supplementation strategy.

Steer HCW was influenced ($P = 0.02$; Table 2) by late gestation supplementation strategy with offspring from NoSupp cows having the lightest HCW and no difference among the offspring of dams that received a protein supplement. Yield grade, marbling score, and backfat thickness were not influenced ($P > 0.22$) by late gestation supplementation strategy. However, there was a tendency ($P = 0.08$) for offspring from cows receiving CaProp to have a greater percentage of Choice or greater than other offspring. Lastly, LM area was increased ($P = 0.03$) in offspring from dams that received a protein supplement compared to offspring from cows that received no supplement.

Conclusion

Supplementation strategy did influence cow BW change during late gestation; however, this response was driven by protein supplementation (i.e., cows receiving supplementation or no supplementation) rather than the addition of feed additives to the protein supplementation. However, pregnancy rates were increased in cows receiving protein supplementation with or without the additional propionate salt compared to no supplementation or protein supplementation with the addition of rumensin. In post-weaning steer performance, protein supplementation (Supp, CaProp, or RUM) during late gestation did increase overall subsequent finishing steer BW and carcass weight over steers from non-supplemented cows with same days on feed.

Jackie A. Musgrave, research technician.

Kacie L. McCarthy, cow-calf extension specialist, Lincoln.

J. Travis Mulliniks, range nutritionist, West Central Research and Extension Center, North Platte.