Milk Production Impacts on Cow Reproductive and Calf Growth Performance

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Summary with Implications

Cattle records were collected and analyzed over an 18-year period to evaluate the impact of milk production on reproductive performance and pre- and post-weaning calf performance of a March-calving herd in the Nebraska Sandhills. Milk production positively increased with increasing cow body weight and age. Pregnancy rates and subsequent calving date were not impacted by milk production. Calf pre-weaning average daily gain and adjusted 205-d weaning weight were increased by 0.7 lb/d and 13.4 lb for every 1 lb increase in milk production. These increases in pre-weaning performance followed calves through the feedlot resulting in a tendency for heavier final live calf body weight and hot carcass weight. However, carcass quality characteristics were not influenced by dam milk production. This study implies that increasing milk production resulted in greater pre-weaning performance to produce calves with heavier weaning weights. Calves from increased milking dams maintained their greater weaning body weight throughout the finishing period to produce heavier carcasses.

Table 1. Demographics of cows utilized for data collection from 2000–2018 for average lactation period and pre-breeding season (June)

	Lactation Period Average[1]			Pre-breeding Average[2]		
Measurement	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Cow Age, yr	2	11	3.56	--	--	--
Cow BW, lb	623	1885	1002	579	1804	936
Cow BCS	4.00	7.00	5.29	4.00	7.00	5.20
Milk Yield, lb/d	3.20	27.34	12.78	0.79	31.6	15.0
Julian Calving Date, d	53	123	79.5	--	--	--
Calf Birth BW, lb	50.4	116	77.5	--	--	--

[1]Lactation period average accounts for June–November.

[2]Pre-breeding average is based on data collected in June.

Introduction

As cow-calf producers focus on greater weaning weights, selection for increased production parameters including milk production and weaning weight have become prevalent. Historically, milk production has been positively associated with calf body weight with an increase in calf weaning weight with increasing dam milk production. However, increased cow-calf production may not be captured due to environmental conditions and resource availability. This can be observed in a spring calving Sandhills herd due to the lower forage quality during peak lactation, a time of increasing nutrient requirements. Modeling the nutrient requirements for 2- and 4-year old cows with varying levels of milk production resulted in an energy deficiency in both age groups at peak lactation for March-calving cows (*2020 Nebraska Beef Cattle Report*, pp. 5–7). If nutrients are not met at this time of high demand, reproductive performance can be negatively impacted by delaying return to estrus. The objective of this study was to determine the impact milk production has on subsequent cow reproductive performance and calf performance throughout the pre- and post-weaning phases.

Procedure

Data was collected between the years 2000–2018 from the March calving herd at the University of Nebraska Gudmundsen Sandhills Laboratory (Whitman, NE). Cows (n = 348; n = ~ 20/yr) utilized were Husker Reds (5/8 Red Angus and 3/8 Simmental) and were 2 to 11 years of age (Table 1). In year 2000 and 2015 to 2018, cows were assigned to one of two grazing treatments: meadow or range. From years 2001 to 2014, all cows were grazed on upland range.

Cow body weight (BW) and body condition score (BCS) were taken in June, July, September, November, and January. Weigh-suckle-weigh was used to estimate milk production in June, July, September, and November by separating calves from cows by 1000 h and allowed to suckle at 1700 h before being separated again. Calf BW were taken at 0700 h the following morning at which time cows and calves were paired up, allowing calves to suckle. Upon completion of suckling period (not exceeding 30 minutes), calves were weighed again. Difference in calf BW was calculated and used to extrapolate for milk production over 24 hr based on hourly production. Detection of pregnancy was determined via ultrasound each September. Calf BW was recorded at birth (March/April), June, July, September, and November. Weaning weights were adjusted to a 205-d age constant BW. A subset of steers (total n = 87; Table 2) were held in a drylot on ad libitum hay for 2 weeks postweaning and then shipped to West Central Research and Extension Center (North Platte, NE) and entered into the feedlot. Calves were stepped up over a 21-d period to a diet containing 48% dry rolled corn, 40% wet corn gluten feed, 7% ground grass hay, and 5% supplement on a dry matter basis. Steers were implanted with Synovex Choice upon entry to the feedlot and reimplanted with Synovex Plus 105 d later. Calves were

Table 2. Number of steers entering the feedlot at West Central Research and Extension Center (North Platte, NE)

Year	Number of Calves
2009	9
2011	10
2012	10
2015	21
2016	21
2017	16

Table 3. Regression coefficient estimates used to determine the increase of cow demographics on milk yield (lb)

Measurement	Estimate[1]	SEM	*P*-value
Average Milk Yield			
Cow Age, yr	0.02	0.07	< 0.001
Average Cow BW, 100 lb	2.00	0.37	< 0.001
Pre-breeding Milk Yield			
Julian Date of Birth, d	0.02	0.01	0.018
Cow Age, yr	0.29	0.10	0.003
Average Cow BW, 100 lb	2.33	0.51	< 0.001

[1]Estimates provide the increase or decrease response in the measured variable for every additional increase in fixed effect.

Table 4. Impact of milk production on cow reproductive performance

	Estimate	SEM	*P*-value
Pregnancy Rate, %	0.003	0.35	0.99
Subsequent calving date, d	0.38	0.48	0.43

[1]Estimates provide the increase or decrease response in the measured variable for every additional 1 lb increase in milk production.

Table 5. Regression coefficients used to estimate the increase on pre-weaning calf performance per lb increase of milk production

Measurement	Estimate[1]	SEM	*P*-value
Pre-breeding calf BW, lb	3.50	0.75	< 0.001
Pre-weaning ADG, lb/d	0.07	0.009	< 0.001
Adj. 205-d calf BW, lb	13.4	1.48	< 0.001

[1]Estimates provide the increase or decrease response in the measured variable for every additional 1 lb increase in milk production.

Table 6. Regression coefficients used to estimate the increase on post-weaning calf performance and carcass characteristics per lb increase of milk production

Measurement	Estimate[1]	SEM	*P*-value
Feedlot Live Performance			
Feedlot ADG, lb/d	0.04	0.04	0.96
Final Live Calf BW, lb	23.3	7.73	< 0.01
Carcass Characteristics			
Hot Carcass Weight, lb	14.6	4.88	< 0.01
Quality Grade[2]	-0.017	0.025	0.49
Yield Grade	0.105	0.055	0.06
Ribeye Area, in	0.011	0.010	0.91
Marbling Score	2.37	5.98	0.69
Backfat, in	0.016	0.012	0.18

[1]Estimates provide the increase or decrease response in the measured variable for every additional 1 lb increase in milk production.

[2]Quality grade was assigned numerical values with 1 = Prime, 2 = Choice, etc.

slaughtered upon visual estimation of ½-inch backfat (BF) and carcass quality data was collected.

Data were averaged throughout the lactation period and used as variables in production models. Cow age and cow BW were included in the model as covariates due to their significant impact on milk production. Year and cow served as random effects in all models. Significance level was set at $\alpha \leq 0.05$.

Results

Average milk production throughout the lactation period was positively influenced by cow BW and cow age ($P < 0.001$; Table 3). Every additional 100 lb of cow BW resulted in a 2.0 lb increase in daily milk production. Cow age also positively impacted milk production with an increase of 0.20 lbs per year of age. These increases from cow BW and cow age could be due to the overall average of the herd being young, suggesting that many cows had yet to reach maturity when data was collected. Studies have shown increasing milk production up to 8 years of age in cows, which would agree with the average increase in age observed in these cows averaging 3.5 yrs of age. However, milk production did not impact cow pregnancy rate nor subsequent calving date ($P \geq 0.43$; Table 4).

Increases in adjusted 205-d calf weaning BW and pre-weaning ADG were observed due to milk production. Pre-weaning ADG increased ($P < 0.01$; Table 5) by 0.07 lb/d for every pound increase of milk production. This increase in pre-weaning ADG resulted in greater adjusted 205-d calf weaning BW ($P < 0.01$) by 13.4 lb of calf BW for every pound increase in milk production.

Dam milk production had no impact ($P \geq 0.18$; Table 6) on backfat thickness or marbling score in progeny. Additionally, quality grade and ribeye area were not influenced ($P \geq 0.49$) by increasing dam milk production. However, yield grade tended ($P = 0.06$) to increase with increasing dam milk production. Final live calf BW after the finishing phase increased ($P < 0.01$; Table 6) by 18.9 lb for every pound increase of milk production. In addition, HCW was increased ($P < 0.01$) by an additional 14.6 lb for every pound increase in average milk production. These increases could be due to the impact of milk production on calf weaning weight resulting in heavier calves entering the feedlot. Feedlot ADG was not impacted (P = 0.96) by dam milk production.

Conclusions

Within the herd evaluated, dam milk production increased with cow BW and cow age. However, the reproductive performance in the study was not impacted by level of milk production, suggesting that dam milk production in the current study was not great enough to limit reproduction. Dam milk production had a positive influence on calf pre-weaning growth and BW with additional gains of 0.07 lb/d and overall 13.4 lb additional weaning weight with every pound increase in average milk production. Therefore, it is important to consider the role milk production has on calf pre-weaning performance when striving to produce calves that achieve greater weaning weights. The greater BW at weaning in the offspring of dams with greater milk production, produced an advantage that was maintained throughout the feeding period to produce greater final live BW and HCW.

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