Effects of Calf Age at Weaning on Cow and Calf Performance and Efficiency in a Drylot/Confinement Production System

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Summary

An ongoing study evaluated the effects of calf age at weaning on cow and calf performance and reproduction in a confinement production system. Early-weaning improved cow BW at normal weaning. Pregnancy rates were not impacted by calf age at weaning. Dry matter intake was not different between early-weaned cows and calves compared with normal-weaned pairs. Feed requirements and energy utilization were equal between early- and normal-weaned pairs when fed a distillers grains and crop residue based diet.

Introduction

Increases in grain prices and the subsequent impact on land values and lease rates have challenged the long-term availability of forage for summer grazing. Recent drought conditions have decreased forage production and diminished rangeland carrying capacity in certain areas. Maintaining cow-calf pairs in total or semi-confinement may be a viable alternative for producers when grass is limited or unavailable due to drought and other factors. Limit-feeding high energy diets to cows in confinement can be utilized to reduce feed costs without negatively impacting performance as compared to feeding forage *ad libitum* (*2009 Nebraska Beef Cattle Report*, pp. 11-12). Early-weaning of calves reduces cow maintenance requirements and may have beneficial effects on reproduction (*Journal of Animal Science*, 68:1438-1446). Additionally, early-weaned calves are very efficient at converting feed to gain (*Journal of Animal Science*, 78:1403-1413). Thus, early weaning may be logical when cow-calf pairs are maintained in confinement. Therefore, our objectives were to: 1) evaluate the impact of calf age at weaning on cow BW, BCS, reproduction, and calf performance when cow-calf pairs are limit-fed high energy diets in a drylot/confinement production system; and 2) compare the energy efficiency of producing a weaned calf to 205 days of age between early and normal weaning.

Procedure

Multiparous, crossbred (Red Angus x Red Poll x Tarentaise x South Devon x Devon), lactating beef cows (n = 84) with summer-born calves at side were utilized in a continual study (2012 - present) conducted at both the University of Nebraska–Lincoln Agricultural Research and Development Center (ARDC) feedlot located near Mead, Neb. and the Panhandle Research and Extension Center (PHREC) feedlot at Scottsbluff, Neb. The trial was a randomized complete block design with a 2 x 2 factorial arrangement of treatments. Cows were blocked by pre-breeding BW (heavy, medium, and light), stratified by calf age, and assigned randomly within strata to one of four treatments with three replications (pens) per treatment. Treatment factors included: 1) calf age at weaning; early weaned (EW) at 90 days of age or normal weaned (NW) at 205 days of age and 2) research location: eastern (ARDC) or western (PHREC) Nebraska. Data reported are for year 1 only.

Prior to the beginning of the experiment, cows at both locations were managed as a common group and calved in June and July in earthen feedlot pens without access to shade. Post-calving, cows were limit-fed approximately 19.0 lb DM/cow/day a diet of 50% wet or modified distillers grains plus solubles (WDGS; MDGS) and 50% ground cornstalks (ARDC) or wheat straw (PHREC), on a DM basis. Upon trial initiation (late-September), EW calves were weaned at 90 days of age, and fed separately from their dams within each location. Normal-weaned calves remained with their dams and were weaned in late January at 205 days of age. Two-day consecutive cow BW measurements were recorded to determine weight change from pre-breeding to normal-weaning. Body condition score was assessed visually at pre-breeding and normal weaning by the same experienced technician. Two-day consecutive calf BW measurements were collected to evaluate gain from early to normal weaning. Prior to collecting weights, all cattle were limit-fed (1.3% of BW for cows, 2.0% of BW for calves; DM basis) for 5 days prior to initiation and upon completion of the trial to minimize variation in gastrointestinal tract fill.

Table 1. **Ingredient and nutrient composition of diets fed to all cows and calves from early to normal weaning by location[1].**

	Location	
Ingredient, %	ARDC	PHREC
MDGS	56.5	
WDGS	—	58.0
Cornstalks	40.0	—
Wheat straw	—	40.0
Supplement[2]	3.5	2.0
Calculated Composition		
CP, %	19.0	18.8
TDN, %	80.0	80.0
Ca, %	0.75	0.77
P, %	0.50	0.49

[1]All values presented on a DM basis.
[2]Supplements contained limestone, trace minerals, vitamins and formulated to provide 200 mg/cow daily monensin sodium.

From early to normal weaning, EW cows within each location were limit-fed 15.0 lb DM/cow daily a diet consisting of either WDGS or MDGS and cornstalks or wheat straw (Table 1). Concurrently, EW calves within each location were offered *ad libitum* access to the same diet as the cows. Normal-weaned cow-calf pairs were limit-fed the equivalent amount of DM by adding the DMI of the EW cows and calves. Intake was not partitioned between the NW cow and calf. Consequently, the total DMI between either the EW cows and calves or the NW pairs was intended to be equal and increased due to growth of the calf. All cattle were pen-fed once daily in concrete fence line feed bunks with the following bunk space allotments: 2 feet per EW cow, 1 foot per EW calf,

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Table 2. Daily DMI by weaning treatment.

Item	Weaning Treatment EW[1]	NW[2]
Cow	15.0	—
Calf	8.5	—
Cow-calf pair	—	22.8
Total	23.5	22.8

[1]EW = early-weaned at 90 days of age.
[2]NW = normal weaned at 205 days of age.

Table 3. Performance of cows by location and weaning treatment.

Item	ARDC EW[4]	ARDC NW[5]	PHREC EW[4]	PHREC NW[5]	SEM	P-value Weaning[1]	P-value Location[2]	P-value W x L[3]
Cow BW, lb								
Pre-breeding	1115	1101	1150	1134	90	0.56	0.21	0.95
Normal-weaning	1129[b]	1109[b]	1266[a]	1165[b]	89	0.05	0.01	0.16
Cow BW change, lb	15[b]	7[b]	115[a]	32[b]	12	0.01	<0.01	0.02
Cow BCS[6]								
Pre-breeding	5.4	5.3	5.0	5.0	0.3	0.56	0.06	0.91
Normal-weaning	5.1	5.1	5.4	5.1	0.3	0.23	0.23	0.34
Cow BCS change[6]	-0.3[c]	-0.2[c]	0.3[a]	0.1[b]	0.1	0.23	<0.01	0.03

[1]Fixed effect of calf age at weaning.
[2]Fixed effect of location.
[3]Calf age at weaning x location interaction.
[4]EW = early weaned at 90 days of age.
[5]NW = normal weaned at 205 days of age.
[6]BCS on a 1 (emaciated) to 9 (obese) scale.
[a-c]Within a row, least squares means without common superscripts differ at $P \leq 0.05$.

Table 4. Performance of calves by location and weaning treatment.

Item	ARDC EW[4]	ARDC NW[5]	PHREC EW[4]	PHREC NW[5]	SEM	P-value Weaning[1]	P-value Location[2]	P-value W x L[3]
Calf BW[6], lb								
Early-weaning	274	276	295	288	14	0.85	0.23	0.76
Normal-weaning	447[b]	501[a]	494[a]	479[a,b]	13	0.17	0.36	0.03
Calf ADG, lb	1.48[b]	1.93[a]	1.65[b]	1.58[b]	0.05	0.01	0.12	<0.01

[1]Fixed effect of calf age at weaning.
[2]Fixed effect of location.
[3]Calf age at weaning x location interaction.
[4]EW = early weaned at 90 days of age.
[5]NW = normal weaned at 205 days of age.
[6]Actual weights.
[a-b]Within a row, least squares means without common superscripts differ at $P \leq 0.05$.

and 3 feet per NW cow-calf pair.

Cows were exposed to fertile Simmental x Angus bulls at a bull:cow ratio of 1:10 for 60 days beginning September 26 (concurrent with early-weaning), and breeding occurred in the feedlot pens. Pregnancy was diagnosed via ultrasound 60 days after bull removal.

Data were analyzed as a randomized complete block design with pen as the experimental unit. Model fixed effects included calf age at weaning, location, and the weaning x location interaction. Block was included in the analysis as a random effect, and significance was declared at $P \leq 0.05$.

Results

Across locations, EW calves had a daily DMI of 8.5 lb from early to normal weaning (Table 2). This amount was adjusted weekly and added to the 15.0 lb DM fed to the EW cows to derive the total amount fed to the NW pairs. Therefore, the EW cows and calves consumed 23.5 lb total DM/day while the NW pairs consumed 22.8 lb DM/day, supplying 18.8 and 18.2 lb of TDN to EW and NW treatments, respectively.

The weaning age by location interaction was not significant for cow BW at normal weaning (Table 3). Cows at PHREC had greater BW than ARDC cows, and EW cows had greater BW than NW cows at normal weaning. Although there was a significant weaning age by location interaction for BW change, EW cows gained more BW than NW cows regardless of location. Body condition score was not different among treatments at either pre-breeding or normal weaning. However, regardless of weaning regimen, PHREC cows gained 0.2 BCS units while ARDC cows lost 0.2 BCS units between early and normal weaning. Pregnancy rates (88.2-90.5%) were not impacted by calf age at weaning, but additional years are needed to gain statistical power.

Calf BW and gain data are presented in Table 4. Weight was similar among treatments at early-weaning. There was a significant weaning age by location interaction for ADG. Early weaned and NW calves at PHREC were not statistically different, while NW calves gained significantly more than EW calves at ARDC. As a result, EW and NW calves at PHREC had similar BW at normal weaning while NW calves were heavier than EW at ARDC.

Reasons for the weaning age by location interactions among cow and calf performance variables are unclear but may be related to lack of statistical power in one year of data. However, when evaluating only the main effect of weaning age for cow BCS change, both EW and NW cows on average maintained body condition (Table 3). Furthermore, such changes in BCS are small and likely have little biological relevance. Cow BW change from early to normal weaning was 45 lb greater on average for EW than NW cows. Likewise, EW calves gained 19 lb less than NW calves from early to normal weaning, indicating that the sum weight of the EW pair was similar to that of the NW pairs. Dry matter intake was also similar between EW and NW pairs implying energy utilization is comparable when pairs are fed distillers grains and crop residue based diets. Our preliminary data suggest early weaning has minimal impact on cow or calf performance or cow reproduction when pairs are limit-fed high energy diets in confinement. Furthermore, early-weaned cows and calves require the same amount of feed as normal weaned pairs together. Limit-feeding distillers grains and crop residue based diets to cow-calf pairs in confinement may be a viable alternative for producers when grass is limited or unavailable.

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