Impact of managing cow-calf pairs on pasture or in a dry lot during a 10-day synchronization period on reproductive performance and weight change in cows and their calves

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The objective of this study was to evaluate the impacts of managing cow-calf pairs in a dry lot for a 10-day estrous synchronization to alleviate time and labor that are associated with synchronization protocols. Dry-lot management did not affect reproductive performance of cows; however, the weaning weights of the suckling calves were impacted negatively.

Summary

Angus-based cow-calf pairs (n = 422) were assigned to one of two treatments: 1) dry lot (DL), pairs were managed in dry lots during a 10-day estrous synchronization period or 2) control (CON), pairs remained on summer pasture for the synchronization. The DL group was provided ad libitum grass hay, and both treatments had equal access to a vitamin/mineral supplement. All cows were exposed to seven-day CO-Synch + CIDR protocol for synchronization of ovulation. Body weight (BW) of cows were recorded on days minus 10, 0 and 95, and calves were recorded on minus10, 0, 35 and 88 relative to breeding. Whole blood was collected on a subset of cow-calf pairs (n = 72) on days minus10 and 0 for serum nonesterified fatty acid (NEFA) concentration. Pregnancy status was determined in cows on days 35 and 95 with ultrasound. Cows and calves in the DL group had reduced ($P \leq 0.04$) weight gain during the 10-day synchronization period, compared with cows and calves in the CON group. Calf concentrations of NEFA on day 0 were impacted by a treatment by group interaction. Concentrations of NEFA in DL cows were greater ($P = 0.001$) than CON cows on day 0. No differences ($P \geq 0.36$) were observed between treatments for pregnancy rate at days 35 or 95 or cow BW on day 95. However, calves in the DL treatments were lighter ($P \leq 0.003$) on days 35 and 88 (weaning), compared with calves in the CON group. Managing cow-calf pairs in the dry lot for a 10-day estrus synchronization and AI period did not affect reproductive performance of cows, but it did have a negative impact on calf weaning weights.

Introduction

Artificial insemination (AI) offers many benefits. However, only 8 percent of producers in a 2007 survey indicated that they utilize AI (NAHMS, 2009). Variation occurs in cattle management across herds as producers attempt to reduce the amount of time and labor required of an AI protocol, which is the No. 1 concern of producers (NAHMS, 2009).

Differences in herd management may be causing differences in pregnancy rates with AI across locations, despite the use of similar protocols (Larson et al., 2006). An example of a management strategy is to confine cattle to dry lots close to working facilities during the synchronization period to lessen the burden of gathering cattle multiple times.

Abrupt diet changes have been reported to have negative impacts on reproductive performance (Perry et al., 2009; Bridges et al., 2012), energy balance (Zhang et al., 2013), milk production and calf performance (Chelikani et al., 2004).

The consequences of moving cow-calf pairs from grazing pastures to dry-lot feeding for a short period on cow reproductive performance and calf growth are unknown. Therefore, the objectives of this study were to evaluate the effects of moving cow-calf pairs from summer grazing to dry-lot feeding for a 10-day period of estrous synchronization on cow reproductive performance, BW and concentration of NEFA, and calf BW and concentrations of NEFA.

Experimental Procedures

Angus crossbred cow-calf pairs (n = 422) at the Central Grasslands Research Extension Center near Streeter, N.D., were used in this study. Cow-calf pairs were managed in two groups based on cow age: young (2 to 4 years old; n = 209) and old (5 years and old; n = 213).

Within management groups, cows were designated to one of two treatments (Figure 1): 1) control (CON), pairs remained on summer pasture for the 10-day synchronization and breeding period, and were gathered each of the three times re-

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quired to facilitate estrous synchronization and AI (n = 212), or 2) dry lot (DL), pairs were removed from summer pastures and managed in drylots during the 10-day synchronization period (n = 210).

The DL treatment group received ad libitum grass hay for the 10-day period, and both groups had equal access to mineral supplement. The crude protein content of the hay fed to the DL pairs was 10.7 percent, and the pasture available to CON cows was 10.5 percent.

Ovulation was synchronized in all cows by exposure to the seven-day CO-Synch + CIDR protocol (Larson et al., 2006). Body weights of cows were recorded on days minus 10, 0 and 95, whereas the BW of calves was recorded on days minus10, 0, 35 and 88 (weaning). Immediately following timed artificial insemination (TAI), all pairs were returned to summer pastures and cleanup bulls were placed in pastures from days 10 to 49 after AI.

A subset of cow-calf pairs (n = 72 pairs, 36 from each treatment, and 36 from each age group) were selected for blood collection. Whole blood samples were collected from cows and calves on days minus 10 and 0 into 10-milliliter Vacutainer tubes (BD Worldwide, Franklin Lakes, N.J.) without additives. Serum was harvested and concentrations of NEFA were analyzed (NEFA-C Wako Chemicals USA, Richmond, Va.).

Cows were ultrasounded on days 35 and 95 to determine pregnancy status. Examination on day 35 revealed the proportion of cows pregnant with AI, whereas examination on day 95 revealed the proportion of cows pregnant at the end of the breeding season.

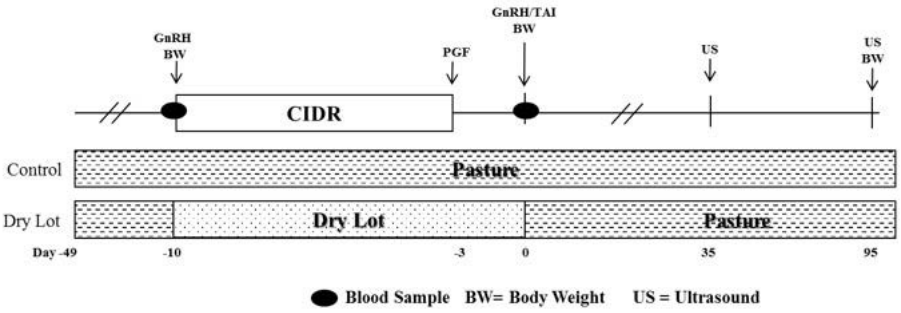

Figure 1. Schematic of experimental treatments.

Table 1. Impact of moving cow-calf pairs into a dry lot for a 10-day estrus synchronization protocol on body weight of cows and calves.

	Treatment		
Item	Pasture	Drylot	SEM
Cow Body Weight, lb.			
day -10	1,302	1,299	12.8
day 0	1,302^{x}	1,264^{y}	11.9
day 95	1,353	1,337	12.5
Calf Body Weight, lb.			
day -10	210.0	209.7	2.9
day 0	229.5^{x}	220.4^{y}	3.1
day 35	313.9^{x}	300.7^{y}	3.5
day 88	459.8^{x}	440.0^{y}	4.4

^{xy}Means within row differ ($P \leq 0.04$)

Results and Discussion

Pregnancy rates with AI and season-ending rates were similar ($P \geq 0.50$) between the two treatments (49 versus 52.5 percent and 91 versus 89.6 percent for CON and DL on days 35 and 95, respectively), and no differences ($P = 0.16$) in pregnancy loss were observed (data not shown).

During the 10-day synchronization period, cows in the DL had reduced ($P = 0.02$) weight gain compared with CON, but similar ($P = 0.35$) BW at day 95 (Table 1). Concentrations of NEFA on day 0 tended to be impacted by a treatment × management group interaction ($P = 0.06$; Table 2). Old cows in the DL treatment had greater ($P < 0.001$) concentrations of NEFA than old CON cows, and both treatments in the young cows were intermediate.

The greater concentrations of NEFA on day 0 in DL cows indicates they were in a greater negative energy balance than the CON pairs (Radostits et al., 2007). In the young cow group, we founds no effect ($P = 0.3$) of treatment on day 0 concentrations of NEFA.

Perhaps the lack of difference observed in young cows was due, in part, to 2-year-old cows having an elevated concentration of NEFA at the onset of treatments (day minus 10), compared with the 3- and 4-year-olds that made up the young group (data not shown).

Calves in DL had reduced ($P \leq 0.04$) weight gain on days 0 and 35, and remained lighter ($P = 0.002$) at weaning, compared with CON calves (Table 1). Calf concentration of NEFAs on day 0 were impacted by a management group × treatment interaction ($P = 0.002$). Calves in the young group from both treatments and DL calves in the old group had greater ($P \leq 0.05$) concentrations of NEFA, compared with CON calves in the old group. Results of this study indicate that the DL treatment had more of an effect on calves in the old group than the young.

Moving cow-calf pairs from summer grazing into a dry-lot setting for the 10-day period for estrus synchronization and AI did not impact reproductive performance; however, we saw a negative impact of the dry-lot treatment on calf weights that still was present at weaning.

Producers must consider the reduction in weaning weights of calves alongside the reduced labor and time demands associated with the implementation of estrus synchronization to determine whether managing cow-calf pairs in a dry lot during the breeding period warrants consideration on their operation.

Literature Cited

Bridges, G.A., S.G. Kruse, B. Funnell, G.A. Perry, P.J. Gunn, R.P. Arias and S.L. Lake. 2012. Changes in body condition on oocyte quality and embryo survival. Proceedings, Applied Reproductive Strategies in Beef Cattle, Sioux Falls, S.D.

Chelikani, P.K., J.D. Ambrose, D.H. Keisler and J.J. Kennelly. 2004. Effect of short-term fasting on plasma concentrations of leptin and other hormones and metabolites in dairy cattle. Domest. Anim. Endocrinol. 26:33-48.

Galvao, K.N., J.E.P. Santos, S.O. Juchem, R.L.A. Cerri, A.C. Coscioni and M. Villasenor. 2004. Effect of addition of progesterone intravaginal insert to a timed insemination protocol using estradiol cypionate on ovulation rate, pregnancy rate, and late embryonic loss in lactating dairy cows. J. Anim. Sci. 82:3508-3517.

Larson, J.E., G.C. Lamb, J.S. Stevenson, S.K. Johnson, M.L. Day, T.W. Geary, D.J. Kesler, J.M. DeJarnette, F.N. Schrick, A. DiCostanzo and J.D. Arseneau. 2006. Synchronization of estrus in suckled beef cows for detected estrus and artificial insemination and timed artificial insemination using gonadotropin-releasing hormone, prostaglandin F2α, and progesterone. J. Anim. Sci. 84:332-342.

National Animal Health Monitoring Systems (NAHMS). 2009. Beef 2007-08, Part III: Changes in the U.S. beef cow-calf industry, 1993-2008. Natl. Anim. Health Monit. Serv., Fort Collins, Colo.

Perry, G.A., J. Walker, C. Wright and K. Olson. 2009. Impact of method of heifer development and post-AI management on reproductive efficiency. Range Beef Cow Symposium, Casper, Wyo. Paper 263.

Radostits, O.M., C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2007. Veterinary Medicine -A textbook of the diseases of cattle, horses, sheep, pigs, and goats. 10th ed. Saunders Elsevier, New York, N.Y.

Zhang, S., R.I. Albornoz, J.R. Aschenback, D.R. Barreda and G.B. Penner. 2013. Short-term feed restriction impairs the absorptive function of the reticulo-rumen and total tract barrier function in beef cattle. J. Anim. Sci. 91:1685-1695. doi: 10.2527/jas2012-5669.

Table 2. Impact of moving cow-calf pairs into a dry lot for a 10-day estrus synchronization protocol on serum NEFA concentrations of cows and calves.

	Treatment					*P*-value		
Item	Old DL	Old CON	Young DL	Young CON	SEM	Trt	Group	Trt × Group
Cows								
day -10	338.4^{x}	295.8^{x}	722.4^{y}	689.1^{y}	62.7	0.55	<0.001	0.9
day 0	788.3^{x}	507.9^{y}	635.2^{xy}	556^{xy}	57.5	0.002	0.44	0.07
Calves								
day -10	448.2	326.5	415.9	413.0	37.1	0.10	0.47	0.12
day 0	528.7^{x}	346.1^{y}	459.3^{x}	502.8^{x}	40.0	0.09	0.27	0.006

^{xy}Means with row differ ($P \leq 0.05$)