Fenceline Weaning on Pasture and Forage Barley to Extend the Grazing Season for Replacement Heifers – a Three-year Summary[1]

Dick Pruitt[2]*, William Epperson[2†], Vance Owens[3‡] and Alexander Smart[4]*
Departments of Animal and Range Sciences*, Veterinary Science[†], and Plant Science[‡]

BEEF 2005 – 02

Summary

In a three-year study at the SDSU Cow/Calf Teaching and Research Unit, Brookings, SD, heifer calves were allotted to two weaning management treatments in early October. The pasture-weaned group was separated from their dams and grazed a grass pasture across the fence from their dams for two weeks. Then, until early December, they grazed "Robust" barley (forage type) that had been no-till planted into oat stubble in early August. The drylot-weaned group was fed a traditional weaning diet of grass hay, corn and protein supplement from weaning until early December. Heifers received the same diet and were managed as one group from December until April. The effect of management on heifer weight gain depended on year**.** In the first two years gains for two and four weeks after weaning were affected by weaning treatment, but gains from weaning to December and April were similar. In the third year gains of heifers while grazing forage barley were less from weaning to December and April than those in dry lot. Pasture weaning appeared to cause less stress for both cows and calves, but no differences in incidence of disease were observed. Antibody titers for IBR, BVD type 1 and BVD type 2 were determined at weaning and two and four weeks after weaning to measure the development of immunity from vaccinations administered about two months prior to and at weaning. There was no overall effect of treatment on antibody titers, but there was an interaction of treatment and year for BVD type 1 at 2 weeks after weaning but not by 4 weeks. The percentage of heifers with positive titers was similar at all three sampling times. Heifers fed in drylot had more backfat, larger rib eye area, and % intramuscular fat in April. The results of this study indicate fenceline weaning on pasture combined with small grain pasture to extend the grazing system is a feasible alternative for managing replacement heifers compared to a traditional drylot weaning system. As would be expected, forage conditions as affected by year can influence performance. Weight of calves at weaning and forage conditions influence the need for supplementation.

Introduction

Some cowherd owners report that weaning calves on pasture greatly reduces the stress on the cow and the calf. The reduction in stress has potential to improve the health of weaned calves and possibly the acquisition of immunity from vaccination. It is common in southern areas of the US to graze calves on small grain pasture in the fall and winter. In South Dakota, combining pasture weaning and an extended grazing season has potential to reduce cost and labor associated with feeding, maintaining drylot facilities, and manure management. Small grains such as wheat, oats, rye, barley, and triticale are potential sources of high quality forage for calves. The objectives of this study were: 1) Evaluate fenceline weaning on pasture compared to traditional drylot weaning for calves and 2) Evaluate forage barley for pasture to extend the grazing season of weaned calves.

Materials and Methods

In each of three years, heifer calves averaging 198 days of age were allotted by breed and weight to two weaning treatments in early October. On weaning day the heifers in the pasture-weaned group were separated from their dams and allowed to graze grass pasture across the fence from their dams for two weeks. Two weeks after weaning they grazed 30 acres of forage barley until early December. The pasture consisted of "Robust" barley (forage type) that had been no-till planted into oat stubble in early August. They had access to a free choice mixture of salt, phosphorous, and

[1] This project was made possible by funds from USDA Multi-State Feed Barley Grant; Bill & Rita Larson, Fowler, CO; and the SD Ag. Exp. Station.
[2] Professor
[3] Associate Professor
[4] Assistant Professor

trace minerals. The heifers in the drylot-weaned group were transported to pens two miles from their dams and bunk fed a diet of corn, protein supplement, and grass hay (Table 1). Beginning in early December, all heifers were fed and managed as one group until yearling weights were recorded in April.

Prior to weaning (64 days the first year, 58 days the second year, and 43 days the third year) all heifers were administered a modified live virus vaccine containing IBR, BVD type 1, BVD type 2, PI_3, BRSV, as well as a Haemophilus somnus bactrin (Resvac 4/Somubac from Pfizer Animal Health). On the day of weaning, heifers were weighed and re-vaccinated with the same vaccine. At weaning and two and four weeks after weaning, a blood sample was collected from each heifer by jugular venipuncture. Using standard procedures, IBR, BVD type 1, and BVD type 2 titers were determined by the South Dakota Animal Disease Research and Diagnostic Laboratory, Brookings, SD. At two and four weeks after weaning and again in early December, all heifers were weighed following removal from feed and water overnight. For 28 days following weaning, heifer health was determined by observing for signs of depression, gauntness, eye or nose discharge, increased respiratory rate, coughing, diarrhea, or lameness.

In April, heifers were weighed after receiving the same diet and being managed as one group since December. Ultrasound images were recorded by a Centralized Ultrasound Processing Lab (CUP) certified technician. Images were interpreted by the CUP Lab, Ames, Iowa, for rib fat, intramuscular fat and rib eye area.

Data were analyzed using the general linear model (GLM) procedure of SAS and means were separated using the predicted difference (PDIFF) option. For average daily gain and weight the statistical model included weaning treatment, year, and weaning treatment x year. For ultrasound measurements the statistical model included weaning treatment, year, weaning treatment x year, percentage Angus, and age in days. A second analysis was conducted with rib fat as a covariate to determine the effect of treatment on rib eye area and % intramuscular fat. The logarithm base 2 of blood titers for IBR, BVD type 1, and BVD type 2 were analyzed with weaning treatment, year, and weaning treatment x year in the statistical model. The logarithm base 2 of blood titers at weaning was included as a covariate to analyze titers at two and four weeks after weaning. The least square means were transformed back to titers for Table 4. The percentage of calves with positive titers by treatment was analyzed by the frequency procedure (FREQ) of SAS with chi-square to determine significant differences.

Results & Discussion

The impact of weaning management on weight gain for the 4 weeks after weaning was dependent on year ($P < 0.05$ for the treatment x year interaction; Table 2). In the first year, pasture-weaned heifers gained more than the drylot group during the first two weeks after weaning ($P < 0.10$). Gains during other periods were similar, resulting in similar weights in April. Due to less favorable pasture conditions in the second year, the drylot group outgained the pasture-weaned group for two and four weeks after weaning ($P < 0.05$). Gains from weaning to December and April were not affected by management in either of the first two years. During the third year, quality and quantity of barley pasture limited gains from weaning to early December ($P < 0.05$). Heifers did not compensate from December to April, resulting in 51 lb lower weight in April ($P = 0.05$) for heifers that grazed forage barley.

It is not surprising that year affects weight gains of grazing cattle more than cattle fed grain and hay in drylot. Similar gains from weaning to December and to April during the first two years indicate that weaning on pasture followed by grazing small grains is a feasible alternative for developing replacement heifers. Research at other locations indicates that as long as heifers reach an appropriate target weight by the beginning of the breeding season, lower weight gain during early periods will not reduce reproductive performance.

Based on their performance, it would have been advisable to provide supplemental feed to heifers grazing barley during the third year to achieve weight gain similar to the drylot group. An important difference in year three was that heifers were slightly younger and almost 60 lb lighter at weaning. The pasture group was not able to make up for lower gains early after weaning. Supplementation early after weaning is likely more important for lighter calves, particularly when forage quality and quantity limits performance. This could be important when calves are weaned earlier than 7 months of age.

The drylot-weaned group exhibited typical weaning behavior by walking the fence and bawling for about a week following weaning. The pasture-weaned group appeared to be less stressed. No bawling or walking the fence was observed. Weather conditions were near ideal to minimize stress each year, and no disease symptoms were observed for either group.

Management treatment did not affect IBR or BVD type 2 titer at any of the three sampling times (Table 3). There was a year x weaning treatment interaction (P = 0.06) for BVD type 1 titer at 2 weeks after weaning. During the second year the drylot group had a higher mean BVD type 1 titer than the pasture group (136.9 versus 73.1; P = 0.06). By four weeks, titer values were similar. It is possible that weaning management affected acquisition of immunity following vaccination. But after analyzing three years of data, the effect was not consistent. Table 4 shows the same information expressed as the percentage of heifers with positive titers. There was no effect of treatment when analyzed in this manner.

Body composition measured by ultrasonography in April is presented in Table 5. Heifers weaned on pasture had less rib fat (*P* < 0.001), smaller rib eye area (*P* < 0.001), and lower %IMF (*P* = 0.02). In a second analysis when rib fat was included in the statistical model as a covariate, the differences for rib eye area and % IMF were still important. Although it was not expected that the small difference in diets for less than three months would affect body composition as yearlings, this difference was consistent across years. Other research indicates that nutrition at a young age can affect body composition of yearlings. This may not be important for developing replacement females but could be a factor to consider when backgrounding calves intended for harvest.

Implications

Fenceline weaning on pasture followed by grazing small grain pasture is an alternative to drylot weaning for developing replacement heifers. It appears to be less stressful without detrimental affects on immunity following vaccination. Yearly differences that affect forage quality and quantity will influence gain. Calf weight at weaning and forage conditions may be important when determining the need for supplementation.

Tables

Table 1. Average daily intake of drylot heifers from weaning to early December

Grass hay, lb DM	7.3
Cracked corn, lb DM	4.1
Protein supplement, lb DM[a]	1.2
Rumensin supplement, lb DM[b]	0.9
Crude protein, lb	1.6
ME, Mcal	14.5

[a]Provided 27.4% CP and Ca, P, and trace minerals to exceed NRC (1996) requirements.
[b]To provide 100 mg monensin per head daily.

Table 2. Weaning management and heifer performance

Year	2002		2003		2004	
Weaning treatment	Drylot	Barley Pasture	Drylot	Barley Pasture	Drylot	Barley Pasture
No. heifers	23	23	21	21	26	26
Age, days	200	203	201	201	193	193
Weaning weight, lb	584	577	576	572	521	520
Average daily gain after weaning, lb[a]						
First 2 weeks	-0.52[b]	0.11[c]	0.40[d]	-0.82[e]	0.21	0.62
First 4 weeks	0.59	0.70	1.26[d]	-0.09[e]	1.07	0.70
To December	1.42	1.49	1.48	1.43	1.60[d]	0.99[e]
To April	1.96	1.96	1.87	1.78	1.98[d]	1.75[e]
April weight, lb	929	922	951	930	959[d]	908[e]

[a] There was a year x treatment interaction for ADG during all periods ($P < 0.05$).
[b,c] Within year, means with uncommon superscripts differ ($P < 0.10$).
[d,e] Within year, means with uncommon superscripts differ ($P < 0.05$).

Table 3. Effect of weaning management on IBR and BVD titers

Management treatment	Drylot	Pasture	Treatment P =	Treatment x year P =
No. heifers	70	70		
Age at weaning, days	198	197		
IBR titer				
Weaning	8.8	8.1	0.60	0.74
2 weeks after weaning[a]	106.4	111.6	0.78	0.85
4 weeks after weaning[a]	85.1	86.4	0.94	0.29
BVD type 1 titer				
Weaning	46.9	44.3	0.81	0.68
2 weeks after weaning[a, b]	77.8	80.3	0.87	0.06
4 weeks after weaning[a]	83.8	84.4	0.98	0.28
BVD type 2 titer				
Weaning	5.6	6.0	0.55	0.85
2 weeks after weaning[a]	7.2	6.9	0.69	0.54
4 weeks after weaning[a]	7.0	7.4	0.64	0.55

[a] The statistical model for titers at two and four weeks after weaning included the titer at weaning as a covariate.
[b] In the second year BVD type 1 titer at 2 weeks was greater for the drylot group than the pasture group (136.9 vs 73.1; $P = 0.08$).

Table 4. Weaning treatment and percentage of positive titers for IBR and BVD

	Drylot	Pasture	P =
IBR titer, % positive (> 4)			
weaning	62.9	57.1	0.49
2 weeks after weaning	98.6	95.7	0.31
4 weeks after weaning	94.3	92.9	0.73
BVD type 1 titer, % positive (> 8)			
weanng	84.3	81.4	0.65
2 weeks after weaning	90.0	87.1	0.60
4 weeks after weaning	90.0	85.7	0.44
BVD type 2 titer, % positive (> 8)			
weaning	12.9	15.7	0.63
2 weeks after weaning	28.6	28.6	1.00
4 weeks after weaning	15.7	25.7	0.14

Table 5. Weaning treatment and yearling ultrasound measurements

Weaning Treatment	Drylot	Pasture	Treatment P =	Treatment x Year P =
No. heifers	70	68		
Avg. age, days	408	408		
Rump fat, in.	0.29	0.29	0.61	0.64
Rib fat, in.	0.24	0.22	0.02	0.78
Ribeye area, sq. in.[a]	11.4	10.8	0.00	0.84
% Intramuscular fat[a]	4.27	3.98	0.00	0.96

[a] When rib fat was included in the model, treatment effect was still important (P < 0.06).