Targeting the North Dakota natural beef market: impacts on early calf growth and performance

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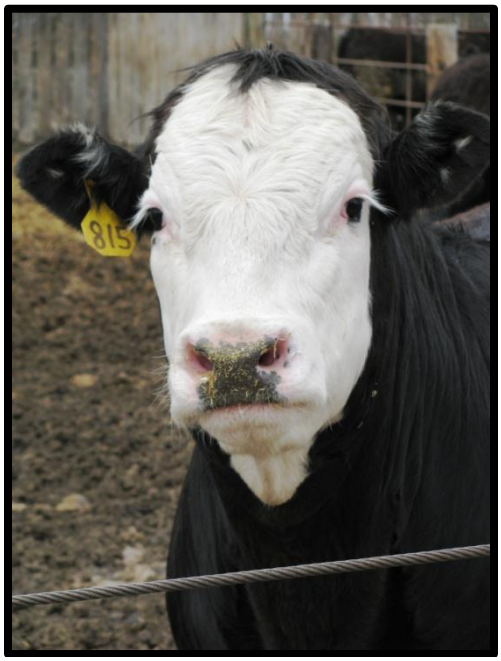
Introduction

Beef producers are always looking for opportunities to increase profits from their calf crops. One possible method of increasing calf profits is to produce calves "naturally," supporting a niche market for beef producers who have raised cattle without any antibiotics, implants, or ionophores.

Reports of large premiums have been reported for calves marketed as natural in the market place. One marketing cooperative announced that it would pay a $100 per head premium for natural cattle (AgricultureOnline, 2007), and Springer and co-workers (2009) discovered premiums averaging $4.76 and $5.79/cwt live weight for natural cattle paid by feed yards and marketing companies in their survey.

Little research has directly assessed the production costs and best management practices involved in natural beef production beginning with the receiving and backgrounding phases of feedlot finishing. Most research has evaluated natural feeding practices during only the last 120 to 200 days of feeding for calf-feds and yearling cattle. Furthermore, cattle producers considering this specialty market have questions regarding the methods and economics of producing calves in a natural production system. This study investigated the impacts of natural production in the backgrounding phase of calf growth.



Natural steer fed in drylot pens.

Materials and Methods

The NDSU Institutional Animal Care and Use Committee approved all protocols used in this study. The experiment was conducted at the NDSU Hettinger Research Extension Center's feedlot in Hettinger, ND, and the NDSU Carrington Research Extension Center's feedlot in Carrington, ND. Seventy-six

Angus-cross steer calves (average 546 lbs, birth date Mar. 28 ± 20 days) were purchased from a local sale barn ($108/cwt; Stockmen's Livestock Exchange, Dickinson, ND) and transported by commercial truck to the Hettinger feedlot. Calves were age- and source-verified through the CalfAID USDA Process Verified Program. Calves originated from a single ranch and were confirmed as raised under natural production practices through producer documentation. After arrival, calves were acclimated for a period of seven days. Calves were fed a natural diet (totally-mixed ration; Step 1; Table 1) from day -7 through -1 of the adaptation period.

Table 1. Dietary ingredient and nutrient concentration on calf growing diets.

	Diets			
	Natural		Conventional	
Item	Step 1	Final	Step 1	Final
Ingredient, % DM basis				
Cracked corn	32.0	32.0	31.8	31.7
Deccox crumbles	1.5	1.5	1.5	1.5
Dried distillers grains w/solubles	12.4	12.4	12.6	12.6
Growing supplement[a,b]	3.9	4.2	3.9	4.2
Limestone	0.5	0.5	0.5	0.5
Mixed hay[c]	39.8	39.5	39.8	39.6
Oat silage	9.1	9.1	9.3	9.3
ProTernative yeast[d,e]	0.3	0.3	--	--
Sodium bicarbonate	0.5	0.5	0.6	0.6
Nutrient Concentration[f]				
DM, %	77.4	75.8	77.1	74.9
CP, % DM basis	14.8	13.0	14.8	13.0
NEg, Mcal/lb	0.53	0.56	0.52	0.56
Ca: P	1.56	2.1	2.0	2.1

[a]Natural calf growing supplement contained a minimum of 7.2% CP, 3.375% Ca, 0.27% P, 1.0% K, no animal byproducts, and no medications (as fed).
[b]Conventional calf growing supplement contained a minimum of 7.2% CP, 3.375% Ca, 0.27% P, 1.0% K, no animal byproducts and 350 mg/lb Rumensin (as fed).
[c]Mixed hay composed of equal parts of ground barley and alfalfa grass hays.
[d]ProTernative Stress Formula yeast product used in the Step 1 diet (day 0-21).
[e]ProTernative Continuous Fed yeast product used in the final diet (day 22-85).
[f]Analytical results for growing diets are from composited samples.

Two-day unshrunk weights were recorded prior to morning feeding on day -1 and day 0. Seventy-two calves were selected for study use, stratified by body weight, allotted randomly to one of 12 pens (six steers/pen; six pens/treatment) and pens were assigned randomly to one of two treatments: (1) natural diets and production management (NAT) and (2) conventional diets and management (CONV). Calves receiving the NAT treatments did not receive any animal byproducts derived from mammalian, avian and/or aquatic sources, growth-promoting implants or ionophores (USDA, AMS, 2009). At the time of weighing, calves were dewormed and vaccinated for respiratory, clostridial, *Hemophilus somnus*, and Mannheimia diseases.

For the first 21 days of the study, calves were fed a 49:51 forage:concentrate step-up ration containing 14.8 percent crude protein and 0.52 Mcal/lb of NEg (dry matter [DM] basis; Step1 NAT and CONV diets; Table 1). The NAT rations contained cracked corn, ground mixed hay, oat silage, dried distillers grains with solubles (POET Nutrition, Sioux Falls, SD), a growing supplement that contained no

medications, an active (live) yeast concentrate (ProTernative Ivy Natural Solutions, Inc., Overland Park, KS), limestone, deccox crumbles and sodium bicarbonate. The CONV rations were composed of similar ingredients, with the exceptions of no active (live) yeast concentrate and the growing supplement contained 350 mg/lb Rumensin (Elanco Animal Health, Indianapolis, IN).

On day 21, calves were revaccinated for respiratory, clostridial, Hemophilus somnus, and Mannheimia diseases and CONV calves were implanted with a Ralgro implant (36 mg zeranol; Schering-Plough Animal Health Corp., Kenilworth, NJ). From day 21 to the end of backgrounding, calves were fed a 49:51 forage:concentrate growing diet (13% crude protein; 0.56 Mcal/lb NEg NAT and CONV final diets; DM basis; Table 1). All diets fed were formulated to provide 2.20 pounds of daily gain. Calf diets were fed once daily (9 a.m.) and slick bunk management was used to determine individual pen daily feed allotments. Calves had free access to water in ice-free automatic fenceline water fountains.

Calves were checked daily and data recorded for bloat scores (Paisley and Horn, 1998) and respiratory illness. Calf weights were measured on day -1, 0, 21, 22, 48, 83 and 84. Initial and final weights were determined by averaging two consecutive weigh days (unshrunk weights), while interim body weights were measured as unshrunk weights recorded prior to feeding. Diet samples were collected (day 2, 7, 15, 43, 49, 62, 74 and 82), composited by treatment and analyzed by a commercial laboratory (Midwest Laboratories, Omaha, NE) for nutritional components.

At the conclusion of the 85-day growing period at Hettinger, calves were shipped to the NDSU Carrington Research Extension Center for finishing. Calf growth and performance from the background phase was analyzed as a completely randomized design with the pen serving as the experimental unit. Treatment means were compared ($P < 0.05$) using least squares means according to SAS MIXED procedures.

Results and Discussion

One CONV calf was treated for respiratory illness in the first two weeks of the study. No NAT calves were treated for respiratory illnesses. Regardless of treatment (NAT or CONV), none of the calves involved in this trial had any cases of rumen bloat (possibly due to the supplemental sodium bicarbonate). Deccox (decoquinate) crumbles were included in both treatments to prevent coccidiosis. North Dakota Natural Beef LLC (Fargo, ND) was consulted prior to coccidiostat usage to verify that its use was permitted under their natural program specifications. Veterinary costs were similar across treatments and averaged $7.32/hd ($P = 0.42$; Table 2) during the study.

At the conclusion of the 85-day growing period at Hettinger, calves were shipped to the NDSU Carrington Research Extension Center for finishing.

Table 2. Effect of diet and management strategies on calf backgrounding performance.

Item	Treatments		SEM[c]	P value[d]
	NAT[a]	CONV[b]		
No. head	36.00	36.00	-	-
Age at weaning, days	207.00	211.00	3.23	0.40
Initial weight, lb	549.00	544.00	3.30	0.31
Final weight, lb	765.00[f]	787.00[g]	6.30	0.03
DMI, lb/d	21.90[g]	20.40[f]	0.37	0.02
Weight gain, lb	216.00[f]	242.00[g]	6.80	0.02
ADG, lb/d	2.54[f]	2.85[g]	0.08	0.02
Gain:feed	0.12[f]	0.14[g]	0.003	0.001
Feed cost, $/lb of body weight gain[e]	0.81[g]	0.59[f]	0.02	< 0.001
Veterinary costs, $/hd	7.01	7.63	0.74	0.42

[a]NAT: Naturally-produced calves.
[b]CONV: Conventionally-produced calves.
[c]Standard error of mean; n = 6 observations per treatment.
[d]P value for F-test of treatment.
[e]Cracked corn = $0.09/lb; deccox crumbles = $0.36/lb; natural growing supplement = $0.16/lb; medicated growing supplement = $0.23/lb; limestone = $0.11/lb; ground mixed hay = $0.05/lb; oat silage = $0.01/lb; salt block =$0.10/lb; sodium bicarbonate = $0.28/lb; dried distillers grains w/solubles = $0.09/lb; ProTernative Stress Formula Yeast = $ 1.21/lb and ProTernative. Continuous Fed Yeast = $ 1.09/lb.
[f, g]Means with different subscripts differ (P < 0.05).

The effect of diet and management strategies on calf backgrounding performance is presented in Table 2. Calves averaged 209 days of age at weaning (P = 0.40). Natural calves weighed 549 pounds, while the CONV calves averaged 544 pounds at the study start (*P* = 0.31). Conventional calves were significantly heavier and had greater daily gain (ADG) compared to NAT calves at the end of the growing period (787 lbs and 2.85 lbs vs. 765 lbs and 2.54 lbs for CONV and NAT calves, respectively; P ≤ 0.03).

Feed intake (DMI) was 6.8 percent higher for NAT calves (21.9 lbs) as compared to CONV calves (20.4 lbs; P = 0.02). These observed DMI differ from those reported by Sawyer et al. (2003) in their study comparing natural and conventional finishing programs. Feed intakes by CONV calves may have been influenced by the Rumensin levels fed (325 mg monensin) during the 85-day growing period.

Although diet costs for CONV calves were $5.68/ton more than NAT calves ($152.56/ton and $158.24/ton for NAT and CONV diets, respectively), conventionally-managed calves had $0.22 lower feed costs/pound of body weight gained and 0.02 greater feed efficiency (gain:feed) as compared to NAT calves (P ≤ 0.001). Similar gain:feed results were reported by Wileman et al. (2009) in their analysis of modern technologies used in beef production.

Implications

In the present study, calves that were managed as “natural,” with no growth-promoting implants, ionophores or antibiotics, gained approximately 0.30 pounds/day less during backgrounding as compared to those that were managed conventionally (implanted with a growth-promoting implant, fed an ionophore, and treated with antibiotics during morbidity). Additionally, conventional calves had lower feed costs and greater feed efficiencies than natural calves after the 85-day background period. Continued evaluation of breakeven costs and pen closeouts for naturally-raised versus conventionally-raised calves is necessary, especially in times of high feed costs.

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