Starting Rations and Procedures for Stressed Calves

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Introduction

Many interstate and intrastate shipments of yearlings and calves occur each year throughout the United States. Because they have been exposed to a wide range of conditions, it is difficult to decide on which rations and management techniques should be used to obtain efficient, economical gains.

Bovine respiratory disease continues to be one of the major diseases associated with cattle production in this country even though there has been a tremendous research effort to determine ways of reducing its occurrence. Prevention of the disease, through proper management practices, appears to be the best way to eliminate or reduce its detrimental effects.

Major management decisions should be made before the cattle are purchased. The decisions should determine: (1) the location of purchase; (2) type (grade), breed, and condition of cattle purchased; (3) whether cattle are purchased in large groups, small groups or individually, on farms, ranches or in sale arenas; (4) whether the cattle are shipped direct or sorted at a central location before shipping; and (5) whether bulls and/or horned cattle will be accepted. Most of these decisions will greatly influence the amount of morbidity and mortality that will be experienced as the cattle are adapted to feedlot or pasture conditions.

After the cattle are obtained, decisions need to be made concerning: (1) castration and dehorning (where applicable); (2) vaccines, anthelmintics, vitamins, etc., to be used during processing; and (3) feed additives and composition of starting rations.

These studies were designed to help develop procedures and starting rations for stressed calves so that some of the above management decisions could be made with a higher degree of confidence.

Experimental Procedures

Cattle used in these studies were primarily choice-type Hereford, Angus and Hereford x Angus calves that weighed 400-500 lbs. at purchase. They were purchased through sale arenas in Oklahoma City, Okla.; Ft. Worth, Texas; and Memphis, Tenn., areas. Calves were dehorned and castrated at origin or during processing here.

On arrival at the Garden City Experiment Station, calves were weighed, tattooed, and vaccinated for infectious bovine rhinotracheitis, bovine virus diarrhea, leptospirosis, blackleg and malignant edema. Other treatments (such as vitamins and anthelmintics) varied among trials.

Water was withheld for four hours after arrival. Loose grass hay was provided free-choice initially, but sparingly as calves adapted to rations. In most studies a mixed ration (Table 13) was fed.

At the time of processing (Expt. Stn.) all cattle were temperatured and those with over 103°F were given an antibiotic and sulfa drug. Calves with over 105°F were treated for at least three days in a row or as long as necessary for their temperature to go below 103°F. Calves were checked twice daily and those with signs of sickness were taken from their pen, temperatured and treated. Various combinations of antibiotics and sulfa drugs were used to obtain the most effective combination.

Results and Discussion

Study 1. Effects of Castration and/or Dehorning on Performance of Stressed Calves.

In a trial (Table 1) involving 199 head of 440-lb. calves, animals purchased as hornless steers (control) gained faster ($P<0.05$) and had less sickness and medicinal cost than those dehorned (Expt. Stn.), or castrated (origin, Ft. Worth, Texas), or castrated (origin) and dehorned (Expt. Stn.). Dehorning (only) calves on arrival at the Expt. Stn. seemed to cause more stress (more sickness, higher medicinal costs) than castrating (only) at origin. Castrating (origin) and dehorning (Expt. Stn.) did not appear to cause more stress on the calves than dehorning (only) at the Expt. Stn.

Data obtained during a second trial (Table 2) further emphasize the effect of castration on weight gain, sickness and death loss. The high death loss observed in this study was due to blizzard conditions that prevailed for the first three weeks of the trial. Feedlots in the area experienced similar losses in calves that had recently been transported long distances.

In trial three (Table 3), bull calves were left intact or castrated by the "Burdizzo" or surgical method. Castrated calves gained slower ($P<0.05$), had a higher incidence of sickness, required more treatments for sickness and had higher medicinal costs than either bulls or steers. Death loss was higher when the "Burdizzo" method was used.

Table 1. Effects of Indicated Treatments on Performance of Stressed Calves

Indicated data	Control (hornless steers)	Dehorned (Expt. Stn.)	Castrated (origin)	Castrated (origin) and dehorned (Expt. Stn.)
	October 16 to November 14, 1975, 28 days			
No. of calves	63	52	40	44
Avg. initial wt., lb.[1]	440.6	438.8	440.9	440.0
Avg. daily gn., lb.	1.42[2]	.86[3]	1.08[3]	.89[3]
Sick calves, %	46.0	67.3	52.5	68.2
No. times sick treated, avg.	3.9	4.8	4.4	3.9
Deaths, no. (%)	2 (3.2)	4 (7.7)	2 (5.0)	2 (4.5)
Avg. medicinal cost/hd., $[4]	2.59	4.83	3.41	3.59

[1]Initial weights were taken during processing only; after castrating (origin), before dehorning.
[2] and [3]Values in a row not followed by a common reference differ ($P<0.05$).
[4]Includes all calves in each treatment group.

Table 2
Effect of Castration (Before vs. After Purchase) on Performance of Stressed Calves

Summary of 2 trials (Nov. 17 to Dec. 15, 1975, 28 days and March 29, to April 29, 1976, 30 days)

Indicated data	Castrated	
	Before purchase	After purchase
No. of calves	191	102
Avg. initial wt., lb.	443.5	437.0
Avg. daily gain, lb.	1.44	1.25
Sick calves, %	54.4	72.0
Times sick treated, avg.	3.7	4.7
Deaths, no. (%)	23 (12.0)	18 (17.6)

In this trial, bull calves gained faster than steer calves, but the use of bulls as finishing animals has not been a practical alternative to steers. Therefore, bulls must be castrated in order to be considered acceptable feedlot animals.

These data on castration show the importance of purchasing steer calves. In general, steers can be expected to produce gain at a lower cost than castrated animals, especially the first 28 days after purchase. Dehorning calves also causes stress, which leads to poor performance. The data show, however, that if both castration and dehorning are needed, both should be performed near the same time rather than subjecting calves to stress twice.

Study 2. Effects of Transporting Calves on Top vs. Bottom Decks of Semi-Trailer Trucks.

Some studies have indicated a high incidence of sickness in calves transported on top decks of semi-trailer trucks, particularly when the trucks had short exhaust pipes.

Two trials (Table 4) involving 484 calves showed no difference in performance due to transporting on the top or bottom decks of semi-trailer trucks. Exhaust pipes on the trucks were high enough for the exhaust to clear the top of the trailers. Therefore, exhaust fumes caused no problems for calves transported on the top deck.

Study 3. Effects of Vitamins on Performance of Stressed Calves.

The use of vitamins to improve performance of stressed cattle has increased in recent years. Several vitamins and vitamin mixtures are available. However, data relating to their efficacy are limited.

Four trials (Tables 5, 6, 7 and 8) with stressed calves show that the use of vitamins improved rate of gain (Table 9) from 1.6 to 4% during the first 28 days, compared to untreated calves. However, more sickness and death losses occurred when vitamins were used. More studies are needed to better evaluate these responses.

Study 4. Effects of Probiotics on Performance of Stressed Calves.

Live cultures of simplified intestional microflora, dominated by *Lactobacillus acidophilus*, are marketed as boluses and feed supplements for improving health and performance of cattle by producing a more favorable balance of beneficial microorganisms in their intestines. *Lactobacillus* organisms have been recommended primarily for animals undergoing stress. They are recommended for use during the time of weaning, shipping and environmental changes.

Table 3. Effect of Castration Method on Performance of Stressed Calves

Indicated data	Control (Steer)	Control (Bull)	Castrated (Surgical)	Castrated ("Burdizzo")
	March 26 to April 24, 1974, 29 days			
No. of calves	33	26	30	24
Avg. daily gain, lb.	1.48[1]	1.69[1]	.87[2]	.79[2]
Sick calves, %	36.4	50.0	80.0	83.3
Times sick treated, avg.	2.4	2.2	3.7	4.5
Avg. medicinal cost/hd., $[3]	1.32	1.52	5.19	6.26
Deaths, no. (%)	1 (3.0)	1 (3.8)	1 (3.3)	3 (12.5)

[1] and [2]Values in a row not followed by a common reference differ significantly at $P<0.05$.
[3]Includes all calves in each treatment group.

Table 4
Effects of Transporting Calves on Top vs. Bottom Decks of Semi-Trailer Trucks

Indicated data	Deck	
	Top	Bottom
No. of calves	235	249
Avg. initial wt., lb.	428.3	421.0
Avg. daily gain, lb.	1.07	1.14
Sick calves, %	44.6	41.6
No. times sick treated, avg.	4.0	3.6
Deaths, no. (%)	8 (3.4)	8 (3.2)

Table 5
Effects of Vitamins on Performance of Stressed Calves

March 12 to May 3, 1973, 51 days		
Indicated data	Control	Vits. A,D,E
No. of calves	42	42
Avg. initial wt., lb.	450	467
Avg. daily gain, lb.	1.12	1.24
Sick calves, %	35.7	21.4
Times sick treated, avg.	2.4	3.1
Deaths, no. (%)	1 (2.4)	3 (7.1)

Table 6
Effect of Vitamins on Performance of Stressed Calves

March 26 to April 24, 1974, 29 days		
Indicated data	Control	Vits. A,D
No. of calves	62	72
Avg. daily gain, lb.	1.72	1.80
Sick calves, %	30.6	33.3
Times sick treated, avg.	2.9	2.1
Deaths, no. (%)	1 (1.6)	0 (0)

Table 7
Effect of Vitamins on Performance of Stressed Calves

March 29 to April 29, 1976, 30 days			
Indicated data	Control	Vits. A,D	Vits. A,B_{12}
No. of calves	33	70	69
Avg. initial wt., lb.	437.9	435.7	431.1
Avg. daily gain, lb.	1.43	1.28	1.38
Sick calves, %	31.3	35.6	39.1
Times sick treated, avg.	3.7	3.0	2.4
Deaths, no. (%)	1 (3.0)	1 (1.4)	4 (5.8)

Table 8. Effect of Vitamins on Performance of Stressed Calves

September 12 or 19 to October 13, 1977, 31 and 24 days, respectively				
	Vitamins			
Indicated data	None (control)	A,D	A,B_{12}	A,D,B_{12}
No. of calves	61	59	61	59
Avg. daily gain, lb.	2.08	2.31	2.22	2.02
Sick calves, %	16.6	20.0	18.1	25.4
Times sick treated, avg.	7.3	3.6	4.7	4.5
Deaths, no. (%)	2 (3.3)	3 (5.1)	3 (4.9)	2 (3.4)

Table 9
Summary of Effects of Vitamins on Performance of Stressed Calves

Indicated data	A,D (4 Trials)	A,B_{12} (2 Trials)
No. of calves	243	130
	% Improvement (compared to controls)	
Daily gain	+ 4.0	+ 1.6
Sick calves	- 0.7	-17.0
Times sick treated	- 8.4	+35.4
Deaths	-13.8[1]	-68.7[2]

[1]Death loss: control, 5 head (2.53%); vitamins A, D, 7 head (2.88%).
[2]Death loss: control, 3 head (3.19%); vitamins A, D, B_{12}, 7 head (5.38%).

Table 10
Effects of Probiotics on Performance of Stressed Calves

Summary of 3 (28-day) trials: Nov. 17 to Dec. 15, 1975; March 29 to April 26, 1976; and Oct. 25 to Nov. 22, 1976		
Indicated data	Control	Probiotics
No. of calves	298	300
Avg. daily gain, lb.	1.56	1.49
Avg. feed consumption, lb.	9.07	9.01
Lb. feed/lb. gain	6.28	6.27
Sick calves, %	49.0	49.0
Times sick treated, avg.	4.1	4.7
Deaths, no. (%)	32 (10.7)	19 (6.3)*

*$P<0.07$.

In three trials (Table 10), involving 598 stressed calves, probiotics were given to calves as a bolus during processing and also included as a feed supplement in the ration at .25 lb./hd./day for 14 days, except that those in the October 1976 trial got only the bolus. Probiotics did not improve rate of gain, feed consumption or efficiency or incidence of sickness of calves but they apparently reduced death loss ($P< 0.07$).

A 276-day growing and finishing trial (Table 11) was conducted with 42 cross-bred steers to determine the effects of probiotic cultures on health and performance of feedlot cattle. During the first 54 days, calves fed probiotic cultures of viable *Lactobacillus* organisms gained 7% more efficiently than control animals. From 55 to 118 days of the trial, no difference in performance was observed between cattle fed probiotics and those fed a control ration. During the finishing period, steers fed probiotic cultures consumed 11.2% more feed and gained 10.4% faster than controls. However, feed efficiency was not influenced by feeding probiotic cultures during this period.

For the entire trial (276 days), cattle fed probiotics consumed 6.7% more feed and gained 7.4% faster than controls, but feed efficiency was not significantly improved. No deaths were observed in this trial (probably because the calves were hauled directly

Table 11
Effects of Probiotics on the Performance of Growing and Finishing Steers

Oct. 28, 1977 thru July 30, 1978, 276 days		
Indicated data	Controls (No probiotics)	Probiotics
No. of steers	21	21
Avg. weight, lb.		
Initial	521.7	521.0
Final	1250.3	1305.8
Avg. daily gain, lb.		
0-54 days	2.30	2.31
55-118 days	2.48	2.53
119-276 days	2.82	3.15*
0-276 days	2.64	2.85
Feed Consumption, lb. (dry-matter basis)		
0-54 days	13.41	12.57
55-118 days	16.89	17.46
119-276 days	15.98	18.00
0-276 days	15.69	16.82
Feed per lb. gain (dry-matter basis)		
0-54 days	5.86	5.45
55-118 days	6.85	6.92
119-276 days	5.67	5.71
0-276 days	5.95	5.90
Carcass data		
Dressing percentage	64.85	64.82
Yield grade	2.25	2.52
Quality grade (% choice)	38.1	33.4

*P<0.05

Table 12
Influence of Sodium Bicarbonate on the Performance of Stressed Calves Fed Growing Rations Containing Wheat

Oct. 28, 1977, to Jan. 26, 1978, 89 days		
Indicated factor	No Sodium bicarbonate	Sodium bicarbonate
No. of steers	62	62
Avg. weight, lbs.		
Initial	432.1	412.3
Final	610.8	589.0
Gain	178.7	176.7
Daily gain		
0-41 days	2.24	2.14
42-89 days	1.81	1.86
0-89 days	2.01	1.98
Avg. feed consumed, lb. DM		
Daily		
0-41 days	10.67	10.21
42-89 days	16.00	16.27
0-89 days	13.55	13.47
Per lb. gain		
0-41 days	4.79	4.80
42-89 days	8.99	8.84
0-89 days	6.75	6.81

Table 13. Composition of Rations Used to Compare Corn Silage, Ground Alfalfa, Mixed and Pelleted Rations

	Ration			
Indicated data	Corn silage	Ground alfalfa	Mixed	Pelleted
Feed Ingredient				
Corn silage	89.9	–	48.0	–
Ground alfalfa	–	38.5	19.4	15.0
Steam-flaked grain sorghum	–	52.3	24.0	–
Rice bran	–	–	–	50.4
Wheat Millrun	–	–	–	32.8
Supplement[1]	10.1	9.2	8.6	1.8
Ration Composition				
Dry matter content, %	41.3	85.7	62.0	91.4
Crude protein, %[2]	14.0	14.0	14.0	15.3
Digestible protein, %[2 3]	10.2	9.8	10.0	10.9
NEm, Mcal/lb.[2 3]	.70	.74	.73	.74
NEg, Mcal/lb.[2 3]	.45	.45	.45	.46
Calcium, %[2 3]	.61	.81	.67	.55
Phosphorus, %	.45	.44	.48	.98

[1]Various supplements were used to make all rations (except the pelleted ration) isonitrogenous and isocaloric.
[2]Dry-matter basis.
[3]Calculated values.

from a ranch) and only one steer was treated for sickness. Therefore, we could not determine the effects of probiotics on morbidity or mortality in this trial.

Study 5. Effects of Sodium Bicarbonate on the Performance of Stressed Calves.

Buffers, like sodium bicarbonate, have commonly been used to alleviate acidosis in feedlot cattle. Sometimes proper ration formulations and feeding management eliminate the need for buffers. Some research trials have shown positive responses to sodium bicarbonate in rations containing large quantities of fermented or "high-energy" feeds.

The ration fed during this trial consisted (dry-matter basis) of 63% corn silage, 10% ground alfalfa hay, 20% dry-rolled wheat, and 7% supplement. Sodium bicarbonate was added to the mixed rations twice/day at 4/10 of 1% of the rations' dry-matter content.

In an 89-day trial (Table 12) sodium bicarbonate did not improve rate of gain, feed consumption, or feed efficiency. No difference was observed in performances during the first 41 days of the trial compared with the final 48 days.

Table 14
Effects of Ration Composition on
Performance of Stressed Yearlings

May 5 to June 9, 1975, 35 days			
	Ration		
Indicated data	Corn silage	Hay	Mixed ration
No. of calves	30	30	30
Avg. initial wt., lb.	457	476	473
Avg. daily gain, lb.	1.53	1.20	.67
Daily feed intake, lb.*	12.7	12.6	11.4
Feed/lb. gain, lb.*	8.33	10.4	17.2
Sick animals, %	76.7	76.7	93.4
Times sick treated, avg.	1.3	1.5	1.5
Deaths, no. (%)	3 (10.0)	1 (3.3)	1 (3.3)
Cost/cwt. gain, $	39.93	51.75	85.82

*Dry-matter basis.

Table 15
Effects of Ration Composition on
Performance of Stressed Calves

Oct. 16 to Nov. 14, 1975, 28 days			
	Ration		
Indicated data	Corn silage	Ground alfalfa	Mixed
No. of calves	66	66	67
Avg. initial wt., lb.	443.8	439.8	437.1
Avg. daily gain, lb.			
0-14 days	.06	.09	.19
15-28 days	2.19	2.19	1.79
0-28 days	1.13	1.14	.99
Daily feed intake, lb.*			
0-14 days	5.93	5.35	5.63
15-28 days	10.72	10.21	10.39
0-28 days	8.29	7.74	7.96
Lb. feed/lb. gain, lb.*	7.34	6.79	8.04
Sick calves, %	66.7	54.6	52.2
Times sick treated, avg.	4.0	4.3	4.8
Deaths, no. (%)	3 (4.5)	3 (4.5)	3 (4.5)

*Dry-matter basis.

Study 6. Effects of Ration Composition on Performance of Stressed Cattle.

Several trials were conducted to evaluate the performance of stressed cattle fed corn silage, ground alfalfa, mixed or pelleted rations (Table 13).

The first trial (Table 14) involved 90 head of stressed yearling steers. Daily gain and feed efficiency were best when corn silage was fed. Cattle performed poorly when fed a mixed ration.

In the second trial (Table 15), all calves were switched to the corn silage ration on the 14th day of the trial. Crude protein content of the ration was reduced to 12.5% (dry-matter basis). Calves fed the hay ration for 14 days and then changed to a corn silage ration for 14 days gained more efficiently than those fed a corn silage ration for the entire trial (28 days) or those fed a mixed ration (14 days), then changed to a corn silage ration (14 days).

In a third trial (Table 16), calves fed a pelleted ration gained less ($P<0.05$) and were less efficient than those fed either a corn silage or ground alfalfa hay ration. Death losses were extremely high due to blizzard conditions during the trial.

In summary, calves performed better when fed a ground alfalfa hay ration. Yearlings performed best on the corn silage ration. Therefore, results from these trials substantiate results from other studies that suggest that prior nutrition (feeding regime) of cattle greatly influence their adaptability to various rations. These results indicate that stressed calves undergoing weaning stress seem to adapt and perform better on ground hay rations while cattle past the stresses of weaning appear to perform well on either corn silage or ground hay rations.

Table 16
Effects of Ration Composition on
Performance of Stressed Calves

Nov. 17 to Dec. 15, 1975, 28 days			
	Ration		
Indicated data	Corn silage	Ground alfalfa	Pelleted
No. of calves	63	63	63
Avg. initial wt., lb.	446.1	438.6	439.5
Avg. daily gain, lb.	1.53[1]	1.63[1]	.81[2]
Daily feed intake, lb.[3]	7.63	6.79	7.59
Lb. feed/lb. gain[3]	5.04	4.25	9.41
Sick calves, %	77.8	69.9	82.6
Times sick treated, avg.	4.8	4.4	4.7
Deaths, no. (%)	11 (17.5)	12 (19.0)	15 (23.8)

[1] and [2]Means in a row not followed by a common reference differ significantly at $P<0.05$.
[3]Dry-matter basis.