38th
LIVESTOCK RESEARCH
ROUNDUP
OCTOBER 26, 1988

DICKINSON EXPERIMENT STATION

Dickinson, North Dakota

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LIVESTOCK RESEARCH

AT THE

DICKINSON BRANCH EXPERIMENT STATION

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BROOD COW EFFICIENCY STUDY

By

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The long term brood cow efficiency study is designed to evaluate diverse crossbred cow types under the environmental conditions of southwestern North Dakota. This investigation is designed to measure the energy necessary under winter drylot and summer grazing conditions to allow those breeds being evaluated to succeed reproductively and also to document the cost of production. There are three major interactions of importance in the investigation which include the interaction between nutrition and reproduction, the interaction between nutrition and total beef production, and the interaction between grazing intensity and plant density change.

Breed combinations selected represent a cross section of the cattle breeds found in North America, and were categorized according to their expected mature body weight and lactation potential. The Hereford breed serves as the foundation and control breed in the study. The breeding scheme and breed combinations used in this terminal crossing system are shown in the following table:

COW BREED	X	SIRE BREED	=	CALF BREED
Hereford (Control)		Hereford		Hereford
Hereford		Charolais		Charolais x Hereford
Angus x Hereford		Charolais		Charolais x Angus x Hereford
M-Shorthorn x Angus x Hereford		Charolais		Charolais x Angus x M-Shorthorn x Hereford
Simmental x Hereford		Charolais		Charolais x Simmental x Hereford

The evaluation consists of two phases, a drylot wintering phase and a summer grazing phase on native pasture. During the wintering phase each breeds gestation and lactation dry matter intake is monitored since body condition and plane of nutrition during the wintering period has a significant impact on rebreeding performance. Dry matter TDN levels that will promote optimum rebreeding efficiency are utilized.

PROCEDURE:

In 1986, the new feedlot facilities at ranch headquarters were under construction, therefore, the breed groups were housed in Dickinson and fed long crested wheatgrass hay in round bales and one pound of dry rolled barley per head daily during the gestation phase. As each cow calved she and her calf were weighed and transferred to ranch headquarters where they were allowed free choice access to the complete mixed lactation ration shown in Table 1. Measured intake of feed was discontinued on May 21st when the groups were moved to spring pasture. Breeding exposure to fertility tested Charolais bulls began on June 1st. Bulls were removed on July 31st.

In 1987, the cow groups were allowed to graze crop aftermath until December 14th when they were moved into drylot and started on the silage based gestation rations shown in Table 2. The groups were maintained on the rations for a one week adjustment period before being weighed on two consecutive days. Weights from the two consecutive weighings were averaged and the gestation phase was started on December 22nd. As each cow calved, she and her calf were weighed and transferred to a separate set of cow lots reserved for each breed after calving, and started on the complete mixed lactaion ration shown in Table 2. The groups were maintained on these rations until being turned out on spring pasture April 30th. In 1986, 30 percent of the MS x A x H cows were open at the end of the breeding season. Therefore, in 1987 feeding eight pounds of dry rolled barley per head during the first heat cycle of breeding was begun to the high lactation Milking Shorthorn and Simmental cross cow groups. Fertility tested Charolais bulls were put with the cow groups beginning on June 1st and were removed on August 1st.

In 1988, the groups were handled in much the same way as in 1987, but didn't graze crop aftermath quite as long. They were adjusted to the silage based winter gestation rations shown in Table 3, and weighed on trial December 15th. The lactation phase was longer in 1988 because of the drought. Spring pastures grew very little, and as a result the breed groups were held on feed in drylot until May 27th. Feeding of eight pounds of dry rolled barley supplement to the high lactation groups (MS x A x H and S x H) began on May 27th also. Fertility tested Charolais bulls were put with all groups on June 1st and removed August 15th. Length of the breeding season was extended two additional weeks because of the prolonged heat experienced during June and July.

Dry matter intake levels during gestation have been regulated based on body weight measurements taken weekly. The breed groups are being fed to gain approximately two pounds daily during gestation so that they will have a net gain after calving ranging between 4 and 6 tenths of a pound per day. The (H) and (A x H) groups are being fed 22 pounds of dry matter as a basal ration, and the (MS x A x H) and (S x H) groups are being fed 24 pounds of dry matter as a basal ration. Adjustments to the basal dry matter intake levels are being made upward or downward based upon body weight changes at each weekly weighing, and are further adjusted for cold weather according to the following schedule: 15° F (no adjustment), 0°F (+9.1%), -15° F (+18%), and -30° F (+27%).

The experiment began in 1986 with an unequal number of cows in each breed group that were properly bred to Charolais. In all subsequent years, the herds are being maintained at ten cows. Replacements for cows that have had to be removed from the study have been very limited. Replacements are being made at two specific times during the production year. Cows that lose calves before the start of the breeding season June 1st are replaced with a comparable pair from an established reserve gene pool. Those cows that test open at weaning are replaced with a comparable bred cow from the reserve pool.

Efficiency in beef production is measured as the feed energy input per unit of beef produced, where energy input is expressed in terms of megacalories per kilogram of liveweight. In this study, efficiency is being measured in megacalories per pound of liveweight weaned and is obtained by charting the total amount of digestible energy consumed against the pounds of calf weaned from all cows exposed. Additional measurements include: 1) pre and post calving gain, gestation and lactation dry matter feed consumption, and the economics of wintering, 2) mean milk production estimates at selected dates during the grazing season, 3) mean animal weight gains and gain per acre of pasture, and 4) mean herbage production and percent difference on sandy, shallow, and silty range sites.

During the grazing season, stocking rate, estimated milk production, pregnancy rate and pounds of beef produced per acre are recorded for each breed. Native pastures, representative of mixed grass prairie, consist of three dominant grass species, blue grama (Bouteloua gracilis), western wheatgrass (Agropyron smithii), needle and thread (Stipa comata), and threadleaf sedge (Carex filifolia). Range sites were selected for similar vegetation, soil, slope and position of slope and are representative of three major soil types: sandy, shallow, and silty. Data collected from these sites includes herbage production sampled by clipping the vegetation to ground level inside a 0.25 meter square frame both inside and outside exclosure cages. Herbage is separated into grass, forb, and shrub components and oven dried at 80° centigrade prior to weighing. Herbage production for each component and total production for each range site is then determined.

Milk production is estimated using the weigh-suckle-weigh method at selected dates during the grazing season. Dates selected for this milking ability evaluation correspond to the varying stages of pasture maturity.

Data accumulated in this study have been summarized in several tables. The ration dry matter composition and the ingredient cost per pound of dry matter for the years 1986, 1987, and 1988 have been summarized in Tables 1, 2, and 3. Tables 4, 5, and 6 depict the pre and post -calving cow gains, dry matter feed consumption and feeding economics for 1986, 1987, and 1988. A summary of efficiency among the various breeds is shown in Table 7, and the milking ability estimate summary is shown in Table 8. Grazing results are compiled in Tables 9 and 10. Table 9 presents the mean weights and gains on native pasture, and Table 10 contains a summary of the mean herbage production on each of the range sites. Table 10 further depicts the herbage percent difference, which is a measurement of the forage utilized on each of the range sites.

SUMMARY:

Three production cycles, out of seven that are planned for this long term investigation, have been completed.

Due to the complexity of a study of this type, two specific periods in the production year are being measured in detail, and include the drylot wintering period and the summer grazing period on native range. The winter drylot period begins in the fall when the cows have completed grazing crop aftermath, and is completed in the spring when the breed groups are turned out on spring pasture in May. Starting and completion dates vary spring and fall due to weather and its effect on grazable forage. The grazing phase on native range begins the third week of June each year, and is completed when the pastures are sufficiently grazed based on clipping appraisals.

It is impossible to draw any conclusions at this stage of the study. However, a trend is developing based on dry matter digestible energy intake consumed during the drylot wintering period compared to the pounds of calf weaned from exposed cows. Based on this measurement, the breeds are falling into three groupings. The Hereford control group has been the least efficient to date requiring 10.34 megacalories (Mcal.) of digestible energy per pound of calf weaned from exposed cows. The Milking Shorthorn cross (MS x A x H) and Simmental cross (S x H) cows are intermediate with respect to efficiency requiring 9.29 and 9.34 Mcal. of digestible energy per pound of calf weaned from exposed cows, respectively. The most efficient groups at this time are the Angus x Hereford (A x H) cows and the straightbred Hereford (H) cows nursing Charolais crossbred calves. The A x H cows required 8.97 Mcal. of digestible energy and the Hereford cows required 9.19 Mcal. of digestible energy per pound of calf weaned from exposed cows. The greatest influence on efficiency in this study is reproduction. Reproductive success, therefore, will have the greatest impact on which breeds are the most efficient at the conclusion of the investigation.

The grazing element of the investigation is more difficult to analyze than the drylot phase. Once soil mapping is completed and additional data are collected the range element can be incorporated with the drylot efficiency information. Calf weight gain on native pasture appears to be closely in step with the lactation estimates being measured for the various breeds. Herbage production on each of the pastures has been adequate in 1986 and 1987. Production measurements for 1988 have not been completed, but adequate forage for grazing was limited due to the drought. The pastures were grazed for 85 days as compared to 129 days in normal years.

Table 1. Ration Dry Matter Composition and Ingredient Cost per Pound of Dry Matter. 1986

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Crested wheatgrass hay	2-05-424	96.3	.025
Dry rolled barley	4-00-535	3.7	.037
Feeding charge		_____	.0025
		100.00	
Crude Protein: 9.6%			
Calcium: .38%			
Phosphorous: .27%			
*Mineral fed free choice			
Lactation:			
Alfalfa	1-00-071	19.1	.0222
Crested wheatgrass hay	2-05-424	21.4	.025
Corn silage	3-02-822	39.8	.01944
Dry rolled barley	4-00-535	13.1	. 037
Sunflower meal		5.9	.0584
Trace mineral salt	6-04-152	.35	.064
Dicalcium phosphate	6-01-080	.35	.191
Processing		_____	.0125
		100.00	
Crude Protein: 11.0%			
Calcium: .54%			
Phosphorous: .38%			

Table 2. Ration Dry Matter Composition and Ingredient Cost per Pound of Dry Matter. 1987

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Corn silage	3-02-822	59.5	.01944
Oat hay	1-03-276	39.7	.02108
Trace mineral salt	6-04-152	.51	.064
Dicalcium phosphate	6-01-080	.29	.191
Processing		______	.0125
		100.00	
Crude protein: 8.1%			
Calcium: .45%			
Phosphorous: .24% .			
Lactation:			
Alfalfa	1-00-071	25.6	.0222
Corn silage	3-02-822	46.4	.01944
Oat hay	1-03-276	20.3	.02108
Barley Dist. Dry Grain	5-02-144	2.1	.050
Soybean oilmeal	5-20-637	3.4	.1139
Trace mineral salt	6-04-152	1.1	.064
Dicalcium phosphate	6-01-080	1.1	.191
Processing		______	.0125
		100.00	
Crude Protein: 10.7%			
Calcium: .87%			
Phosphorous: .43%			

Table 3. Ration Dry Matter Composition and Ingredient Cost per Pound of Dry Matter. 1988

	Int'l. Feed Numb.	Dry Matter Ration %	Dry Matter Cost/Pound
Gestation:			
Corn silage	3-02-822	57.9	.01944
Oat hay	1-03-276	41.3	.02108
Trace mineral salt	6-04-152	.4	.064
Dicalcium phosphate	6-01-080	.4	.191
Processing		_____	.0125
		100.00	
Crude protein: 8.1%			
Calcium: .48%			
Phosphorous: .26%			
Lactation:			
Alfalfa	1-00-071	24.3	.0222
Corn silage	3-02-822	48.2	.01944
Oat hay	1-03-276	20.5	.02108
Soybean oilmeal	5-20-637	4.8	.1139
Trace mineral salt	6-04-152	1.1	.064
Dicalcium phosphate	6-01-080	1.1	.191
Processing		_____	.0125
		100.00	
Crude protein: 10.7%			
Calcium: .85%			
Phosphorous: .44%			

Table 4. Gestation and Lactation Gain, Dry Matter Feed Consumption and Partial Economics Summary per Head for 1986

Breed	Hereford	MS x Ang. x Heref.	Angus x Hereford	Simmental x Hereford
Gestation:				
No. Head	8	10	10	7
Days fed	80.0	79.9	71.0	77.4
Initial wt., lbs.	964	964	1042	1124
Calving wt., lbs.	940	926	995	1112
Gest. wt. change, lbs.	-24	-38	-47	-12
ADGain or loss, lbs.	-.30	-.48	-.66	.16
Gestation Economics:				
Feed consumed, lbs.	2107	2054	1917	2096
Feed/hd/day., lbs.	26.3	25.7	27.0	27.1
Feed cost/lb. of DM, $	.0253	.0252	.0253	.0252
Feed cost/hd., $	53.36	51.86	48.48	60.51
Feed cost/hd/day, $	.667	.649	.683	.782
Lactation:				
No. Head	7 1/	10	10	7
Days fed	49.9	52.2	61.0	54.6
Calving wt., lbs.	929	926	995	1112
Spring turnout wt., lbs.	967	943	1042	1132
Gain after calving, lbs.	38	17	47	20
ADG after calving, lbs.	.76	.33	.77	.37
Lactation Economics:				
Feed/hd., lbs.	1079	1453	1650	1648
Feed/hd/day, lbs.	21.6	27.8	27.0	30.2
Feed cost/lb. of DM, $	.0391	.0393	.0389	.0390
Feed cost/hd., $	42.17	57.14	64.15	64.23
Feed cost/hd/day, $	.845	1.09	1.05	1.18
Combined wintering costs:				
Gestation cost, $	53.36	51.86	48.48	60.51
Lactation cost, $	42.17	57.14	64.15	64.23
Total cost, $	95.53	109.00	112.63	124.74

1/ One calf died and the pair were replace at the start of the grazing season.

Table 5. Gestation and Lactation Gain, Dry Matter Feed Consumption and Partial Economics Summary per Head for 1987

Breed	Hereford	MS x Ang. x Heref.	Angus x Hereford	Simmental x Hereford
Gestation:				
No. Head	10	10	10	10 1 /
Days Fed	90	105	95.4	100.3
Initial wt., lbs.	1157	1167	1239	1245
Calving wt., lbs.	1115	1157	1187	1238
Gest. wt. change, lbs	-42	-10	-52	-7
ADGain or loss, lbs.	-.47	-.10	-.10	-.06
Gestation Economics:				
Feed consumed, lbs.	2000	2495	2112	2446
Feed/hd/day., lbs	22.2	23.8	22.1	24.4
Feed cost/lb. of DM, $	.0328	.0334	.0333	.0337
Feed cost/hd., $	65.58	83.27	70.26	82.45
Feed cost/hd/day, $	.73	.79	.74	.82
Lactation:				
No. head	10	9 2 /	10	9
Days fed	39	29	34	32
Calving wt., lbs.	1115	1157	1206	1215
Spring turnout wt., lbs.	1196	1221	1265	1276
Gain after calving, lbs.	81	64	59	61
ADG after calving, lbs.	2.08	2.21	1.75	1.91
Lactation Economics:				
Feed/hd., lbs.	1197	1092	1164	1103
Feed/hd/day, lbs.	30.7	37.9	34.5	34.5
Feed cost/lb. of DM, $	.0391	.0390	.0392	.0392
Feed cost/hd., $	46.75	42.63	45.58	43.26
Feed cost/hd/day, $	1.20	1.48	1.35	1.35
Combined wintering costs:				
Gestation cost, $	65.58	83.27	70.26	82.45
Lactation cost, $	46.75	42.63	45.58	43.26
Flushing feed, $		4.10		4.10
Total cost, $	112.32	130.00	115.84	129.81

1 / One cow calved mid summer – replaced at the start of the grazing season.

2 / One cow calved after other breed groups were put out on grass – replaced at the start of the grazing season.

Table 6. Gestation and Lactation Gain, Dry Matter Feed Consumption and Partial Economics Summary per Head for 1988

Breed	Hereford	MS x Ang. x Heref.	Angus x Hereford	Simmental x Hereford
Gestation:				
No. Head	10	10	10	10
Days fed	91.7	102.1	93.2	99.4
Initial wt., lbs.	1222	1184	1246	1286
Calving wt., lbs.	1236	1263	1298	1343
Gest. wt. change, lbs.	14	79	52	57
ADGain or loss, lbs.	.15	.77	.56	.57
Gestation Economics:				
Feed consumed, lbs.	2298	2638	2357	2588
Feed/hd/day., lbs.	25.1	25.8	25.3	26.0
Feed cost/lb. of DM, $	.0334	.0335	.0334	.0335
Feed cost/hd., $	76.86	88.33	78.84	86.61
Feed cost/hd/day, $	.84	.87	.85	.87
Lactation:				
No. head	10	10	10	10
Days fed	71.3	60.9	68.6	63.6
Calving wt., lbs.	1236	1263	1305	1343
Spring turnout wt., lbs.	1379	1396	1457	1474
Gain after calving, lbs.	143	133	152	131
ADG after calving, lbs.	2.0	2.18	2.22	2.06
Lactation Economics:				
Feed/hd., lbs.	2192	2246	2534	2389
Feed/hd/day, lbs.	30.7	36.9	36.9	37.6
Feed cost/lb. of DM, $	.0399	.0399	.0399	.0398
Feed cost/hd., $	87.38	89.54	100.99	95.21
Feed cost/hd/day, $	1.22	1.47	1.47	1.50
Combined wintering costs:				
Gestation cost, $	76.86	88.33	78.84	86.61
Lactation cost, $	87.38	89.54	100.99	95.21
Flushing feed, $		4.10		4.10
Total cost, $	164.24	181.97	179.83	185.92

Table 7. Summary of Efficiency to Date Among the Breeds being Compared. 1988

Breed	**Heref. (Cont.)**	**Here-ford**	**MS x Ang. x Heref.**	**Angus x Heref.**	**Sim x Heref.**
No. of cows exposed	28	27	28	28	27
No. of cows exposed that weaned a calf	24	25	25	26	25
% weaning calves	85.7	92.6	89.3	92.9	92.6
Tot. Mcal. of dig. energy consumed/breed	128147.5	126744.5	139732.8	137902.7	140610.1
Tot. lbs. of calf weaned from exposed cows	12391	13794	15042	15376	15053
Lbs. of calf weaned/cow exposed	442.5	510.9	537.2	549.1	557.5
Dig. energy/lb. of calf weaned from exposed cows, Mcal.	10.34	9.19	9.29	8.97	9.34

Table 8. Two Year Mean Milking Ability Estimates. 1988

	June 18	Aug. 30	Oct. 30	Season Mean
MS x A x H	18.7	16.1	11.5	15.4
A x H	14.6	15.1	6.8	12.2
H	13.2	11.1	7.3	10.5
S x H	17.0	15.3	9.9	14.1
Heref. (Control)	12.7	12.5	7.7	11.0

Table 9. Cow and Calf Average Daily Gain (ADG) and Gain per Acre (G/A), 1987

	Weight		ADG	G/A
	Start	Finish		
COW				
Hereford (control)	1336	1391	0.42	4.6
Angus X Hereford	1256	1280	0.19	2.6
Simmental X Hereford	1287	1350	0.49	7.9
Shorthorn X Angus X Hereford	1183	1196	0.10	1.6
Hereford Crosscalf	1167	1219	0.40	6.5
CALF				
Hereford (control)	259	544	2.20	23.9
Angus X Hereford	294	588	2.28	32.3
Simmental X Hereford	300	631	2.56	41.3
Shorthorn X Angus X Hereford	312	647	2.60	41.9
Hereford crosscalf	291	570	2.16	34.9

Table 10. Mean Total Herbage Production and Percent Difference for Three Range Sites, 1986-1987

	1986				1987			
	26 Jun Pregrazed	27 Oct Ungrazed	27 Oct Grazed	% Difference	15 Jun Pregrazed	15 Oct Ungrazed	15 Oct Grazed	% Difference
Pasture 1 119 acre Hereford (control)								
Sandy	1935	3079	2207	28	2182	2913	2499	14
Shallow	1229	1118	847	24	1060	872	674	23
Silty	2081	2118	1045	51	1781	1756	1082	38
Pasture 2 92 acre Angus x Hereford								
Sandy	2053	2368	1858	22	2227	2452	1488	39
Shallow	1723	1393	760	45	1280	1100	865	21
Silty	1944	2436	1186	51	1733	1731	1311	24
Pasture 3 80 acre Simmental x Hereford								
Sandy	1369	2279	1130	50	1789	1543	1509	2
Shallow	996	1403	872	38	1168	828	739	11
Silty	2299	2456	1094	56	1690	1679	1320	21
Pasture 4 80 acre Milking Shorthorn x Angus x Hereford								
Sandy	2179	2149	1246	42	2331	2281	1223	46
Shallow	1123	764	364	52	1282	730	727	1
Silty	2091	1808	1116	38	1689	1599	1074	33
Pasture 5 80 acre Hereford crosscalf								
Sandy	2315	1981	954	52	1835	1860	1176	37
Shallow	1310	685	559	18	1308	1233	999	19
Silty	1435	2351	824	65	1898	1596	1346	16

BARLEY AND SUNFLOWER RATIONS

FOR BACKGROUNDING STEERS

By

J. L. Nelson, D. G. Landblom and LaDon Johnson

North Dakota cow-calf producers have an opportunity to increase profits by retaining ownership of their calves following weaning, according to a study by Randall Little, et al (1986) of the Department of Agricultural Economics, North Dakota State University. The study, which covered the years 1958-1984, compared several programs of retained ownership, one of which, backgrounding, is commonly used in North Dakota. This is a winter feeding program which emphasizes a higher rate of gain. The calves are fed a high energy and high protein ration consisting mostly of grain and then sold as backgrounded in the spring.

As of January 1, 1986, North Dakota produced seventy percent of the nations sunflowers, thirty-one percent of the nations barley and ranked twelfth of all states in number of beef cattle on hand. Abundant sunflower production and a depressed market price could result in the use of sunflowers for cattle feed. Producers have experienced problems with ration palatability, bloat, acidosis or founder and liver abcesses when high barley rations are fed. The extra fiber, crude protein and oil in sunflower seed should compliment high concentrate barley rations, especially when fed to calves with the genetic potential for rapid gain.

Park, et al (1981) fed 10, 20 and 30 percent sunflower seeds to growing dairy heifers. There were no differences in daily gain for the treatments. However, there was a decrease in dry matter intake with each increase in seeds, with an increase in efficiency for feed conversion.

Dinusson, et al (1982) reported mixed results. In one trial, steers fed three pounds of sunflower seed (oil type) as replacement for rolled barley gained 9.4 percent faster and required 6.9 percent less feed per pound of gain for the 105 day trial. The average daily intake of sunflower seeds was 4.04 pounds. The steers fed sunflowers gained 7.8 percent less and required 5.7 percent more feed per pound of gain than did the control steers. In a second trial, after 63 days on feed, steers consuming sunflowers ate less feed than the controls.

The purpose of the present investigation is to evaluate the use of whole sunflowers as a substitute for part of the barley in high energy "back-grounding" rations for beef steers.

EXPERIMENTAL PROCEDURE:

On December 16, 1987, forty-five Charolais crossbred steers raised on the station were selected for the trials. The steers had been weaned for approximately fifty days and were consuming a fifty percent concentrate ration. The steers had been vaccinated and boostered with a seven-way colostridial vaccine and a three-way IBR, BVD and PI_3 bactrin. They had also been implanted with a long acting ear implant.

Each steer was individually identified and weighed. The steers were then stratified by weight and randomly allotted into one of nine trial pens (3 heavy, 3 medium and 3 light) with five steers per pen. Each pen of steers was housed in identical pens measuring 32' x 112'. Each pen provided a 9' high slotted board fence on the North and West for wind protection, an automatic waterer and 16' of concrete feedbunk.

The trial rations were formulated using dry rolled barley as the principle ingredient. Whole "oil type" sunflower seeds were substituted for barley on a pound per pound basis to produce 0, 5 or 10% sunflower rations. Limited amounts of chopped mixed hay, and corn silage were included in the ration mix to improve ration texture and palatability. Limestone ($CaCo_3$) and a Vitamin ADE premix were added to the ration to fortify the calcium and Vitamin A deficiencies commonly associated with feeding high barley feedlot rations. Feed grade sodium bicarbonate was fed throughout the trial in an effort to buffer the rumen contents and prevent acidosis. All rations were supplemented with sunflower meal to insure a minimum of 13% crude protein in the ration.

Rations were weighed and mixed in a portable feed mixer wagon equipped with electronic scales. The feed was fed free choice in the concrete bunks, with fresh feed added approximately twice a week. The feed bunks were cleaned periodically to remove "fines" or otherwise stale feed.

The steers were on trial for 113 days, with individual weights recorded every 28 days. Each steer's initial weight and final weight was calculated as the average of two days weights. Following the last weighing at the conclusion of the trial, the steers were trucked approximately twenty-five miles to a local auction market where they were sold.

A statistical analysis of variance was calculated on the individual weight gains. Duncan's new multiple range test was used to determine the least significant difference between treatment means.

The rations fed and results of the trial are shown in the following tables.

Table 1. Barley and Sunflower Rations (as fed/lbs.) 1987-88

Ingredient	Control	5% Sunflower	10% Sunflower
Barley, dry rolled	14.30	13.53	12.60
Sunflower, oil type	-	1.25	2.76
Hay, mixed	4.00	4.01	3.60
Corn silage	6.30	6.79	6.90
Sunflower meal	0.69	0 .61	0.43
Sodium bicarbonate	0.54	0.56	0.56
Limestone	0.32	0.33	0.33
Trace mineral salt	0.07	0.08	0.08
Vitamin ADE [1/]	0.01	0.01	0.01
Total lbs. as feed	26.35	27.18	27.21
Calculated feed values:			
Dry matter lbs./day	19.58	20.17	20.64
Metabolizable Energy Mcal/lb.	10.47	10.76	11.02
Crude protein, lbs./day	2.55	2.66	2.75
Percent crude protein	13.00	13.20	13.30

1/ Contained: Vitamin A – 5 million USP units/lb.

Vitamin D – 1 million ICU units/lb.

Vitamin E – 500 USP units/lb.

Table 2. Trial Results from Feeding Barley and Sunflowers in Backgrounding Rations – 1987-88

	Control	5% Sunflowers	10% Sunflowers
No. of steers	15	15	15
Days on trial	113	113	113
Total animal days	1695	1695	1695
Avg. wt. off trial	992.8	997.0	1,009.2
Avg. starting wt.	650.0	648.1	650.2
Avg. gain/hd., lbs.	342.8	348.9	359.0 [1/]
Avg. daily gain	3.03	3.08	3.18
Total lbs. feed/hd (as fed)	2979	3071	3076
Avg. feed/hd/day, lbs.	26.36	27.18	27.22
Feed/cwt. gain, lbs	868	880	856
Feed cost/cwt ($)	3.97	4.08	4.23 [2/]
Avg. feed cost/hd ($)	118.20	125.22	130.14
Avg. feed cost/hd/day ($)	1.05	1.11	1.14
Avg. feed cost/cwt gain ($)	34.48	35.89	36.25

1 / No significant difference (P > .05) in animal gain between treatments. Least significant difference required = 40.8 lbs.

2 / Feed prices (as fed):

Barley	$1.35/bushel
Sunflowers	$6.00/cwt
Sunflower meal	$8.70/cwt
Mixed hay	$30.00/ton
Corn silage	$15.00/ton
Sodium bicarbonate	$21.40/cwt
Limestone	$5.60/cwt
Trace mineral salt	$6.50/cwt
Vitamin ADE	$51.20/cwt
Grinding & mixing	$25.00/ton

Table 4. Trial Results from Feeding Barley and Sunflowers in Backgrounding Rations – 1987-88

	Projected Net Returns		
	0%	**5% Sunflowers**	**10% Sunflowers**
Initial value of steer @81¢/lb.	$526.50	$524.96	$526.66
Average feed cost/head	118.20	125.22	130.14
Average combined of steer & feed	644.70	650.18	656.80
April 7, 1988 steer selling price @$71.28/cwt	707.67	710.68	719.33
Added steer value or net return	62.97	60.50	62.53

RESULTS AND DISCUSSION

Steers made very satisfactory gains on all rations offered in 1987-88. Feed efficiency and cost of gain were very acceptable with all rations fed. None of the steers experienced any of the common feedlot problems such as bloat, acidosis or founder.

Daily feed intake increase from 26.4 lbs/day (control) to 27.2 lbs/day when whole sunflowers made up 10% of the rations.

Average daily gain tended to increase with the addition of 5 and 10% whole sunflowers (from 3.03 to 3.17 lbs/hd/day) although the increased gain proved to be non-significant. All treatments tended to be similar in feed efficiency, averaging 8.7 pounds of feed per pound of gain.

Even though the sunflowers entered the ration at a depressed market value of $6/cwt, their inclusion caused feed prices to increase from $39.68 for controls to $42.31/cwt for the 10% sunflower rations with barley priced at $1.35/bushel. This caused the average feed cost per steer to increase from $118.20 for the controls to $125.22 for 5% sunflowers and $130.14 for the 10% sunflower ration.

Actual market weight and selling price favored the 10% sunflower fed steers with an $11.66 greater return than the control steers ($719.33 vs. $707.67). The 5% sunflower fed steers returned $3.01 more than controls. Based on net returns, there was only a small difference (approximately $2) between treatments with all steers showing a net return of between $60 and $62/steer fed.

The feeding of sodium bicarbonate throughout the trial may be of questionable value. Although no digestive problems or rumen acidosis developed with the rations fed, the design of the trial did not allow us to evaluate the feeding of sodium bicarbonate.

SUMMARY:

The addition of up to 10% whole oil type sunflowers in high energy barley based backgrounding rations did not adversely effect feed intake, rate of gain or feed efficiency. Barley based backgrouding rations properly supplemented with Vitamin A and calcium will allow steers to make excellent gains. Sodium bicarbonate was not adequately tested in the design of this trial**.**

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IVOMEC AND A TOTALON/WARBEX COMBINATION COMPARED FOR PARASITE CONTROL IN FEEDLOT HEIFERS

By

D.G. Landblom, J. L. Nelson, and W. D. Slanger

Livestock producers are encouraged through media advertisements to include routine treatments for internal and external parasites as part of their animal health programs. These advertisements always promise a profitable return per dollar invested when used as directed, however, it is questionable whether the promoters claims hold true for all situations and locations. Ivomec, isolated from the fermentation of Streptomyces avermitilis, and Totalon, which is a systemic pour-on formulation of the compound levamisole, are two new worming products that have been highly promoted.

Ivomec, a revolutionary new compound, is a broad spectrum parasiticide that controls gastrointestinal roundworms, lungworms, grubs, lice and mange mites that cause scabies in cattle. Totalon, a new formulation of the old compound levamisole, doesn't possess the broad spectrum of Ivomec, but does control gastrointestinal roundworms and lungworms. Warbex, also a reliable systemic pour-on that has been available for many years, controls grubs and lice. When Warbex is used in combination with Totalon the spectrum of parasiticide coverage is nearly as broad as that of Ivomec with the exception of scabies mites, which are not controlled.

Several research investigations using a variety of anthelmentics have been conducted at this station and at other locations in North Dakota and have resulted in no advantage for routine worming (Anderson, 1987, Andrews et al., 1984, Landblom and Nelson, 1985, Landblom et al., 1985a, and Stromberg, 1984). Ivomec, however, has been tested in cow/calf pairs in cooperator herds and a significant advantage for worming was reported (Wohlgemuth et. al., 1987). In addition to the encouraging results reported by Wohlgemuth with Ivomec, it has been suggested by some parasitologists that Ivomec may possess some unidentified growth promoting properties as well as its ability to kill parasites. To further evaluate the potential of Ivomec in backgrounded feedlot cattle, it is being compared to a Totalon/Warbex combination which is capable of providing a nearly equal spectrum of coverage. The purpose of this investigation is to evaluate the efficacy, growth and feed efficiency, potential growth promoting effects, and to document the economics of using a single treatment of Ivomec when compared to a Totalon/Warbex combination treatment in backgrounded heifer calves.

PROCEDURE:

Crossbred Charolais x Angus x Hereford heifer calves raised at the Dickinson Experiment Station were randomly allotted in a 117 day worming investigation in a 3 x 3 factorial design. Ivomec and a Totalon/Warbex combination were compared to a control group. Within each treatment group, the heifers were blocked into light, medium and heavyweight classes. The targeted starting weights for each weight class was 560 pounds in the lightweight group, 610 pounds in the mediumweight group, and 648 pounds in the heavyweight group. Genetic variables were reduced as much as possible by balancing calf sire and breed of dam across treatments

Prior to the start of the investigation, all calves in each treatment were fecal sampled to determine the baseline level of worm egg shedding, and worm species distribution. Each treatment was further fecal sampled at each 28 day weigh period during the study.

Heifer calves treated with the Totalon/Warbex combination received 2.5 cc. of Totalon per 110 pounds of body weight, which was poured along the midline of the back according to the manufactures recommendations. The Warbex was also poured along the midline of the back but at the rate of 3 oz./head. Ivomec treated heifers were injected subcutaneously with 1 cc. for each 110 pounds of body weight. Dosage rate was calculated using the average weight of the calves in each weight class. The control calves did not receive wormer, but did receive Warbex and to remove the external parasite variable.

In addition to the worming treatments, the heifers in this study were given a 7-way Clostridium booster vaccination, and had been previously vaccinated with a killed bacterine for IBR, BVD, and PI_3.

The heifers were fed the complete mixed ration shown in Table 1. The ration batches were blended in a feedlot mixing wagon equipped with an electronic scale. When feed bunks were filled, all pens received an equally uniform portion from each batch to eliminate potential mixing variables between batches.

Pre-trial worm egg shedding, coccidia oocyst shedding, and the effects of each anthelmentic treatment has been charted in figures 1 and 2.

The ration that was fed across treatments is shown in Table 1, and the growth, feed efficiency, and economic analysis has been summarized in Table 2.

SUMMARY:

Pre-trial fecal analysis revealed a wide distribution of worm species. Egg shedding across treatments ranged from 34 epg in the control group to 15 epg in the Ivomec treated calves. An intermediary level of 24 epg was recorded in the Totalon/Warbex group. Although the worm species distribution was wide, the most prevalent species were cooperia and nematodiru. It is common to find coccidia oocysts being shed from healthy cattle and the fecal analysis in this study was no exception. Pre-trial oocyst shedding was 567, 700, and 1233 epg in the Ivomec, control, and Totalon/Warbex groups respectively. The products used were very effective in reducing the worm egg shedding to very low levels. Coccidia oocyst shedding dropped to very low levels at the first 28 day sampling period and remained low in all treatments for the remainder of the study. Therefore, the reduction in oocyst shedding was not due to a treatment effect.

Performance measurements of economic importance which include total gain, average daily gain, feed/head/day, feed/pound of gain, and feed cost/hundredweight of gain did not differ significantly between the treated groups and control heifers. Although significance was not attained, heifers treated with Ivomec were 11 pounds heavier than the controls and were 8 pounds heavier than the Totalon/Warbex treated heifers. These differences are small, therefore, the suggestion by some parasitologists that Ivomec may possess an unidentified growth promoting factor was not confirmed in this investigation.

A partial marketing analysis has been developed. Net returns from sale of these animals at $69.80/hundredweight favored those heifers that were treated with Ivomec. Net returns were $142.35 for the control group, $141.07 for the Totalon/Warbex group, and $146.13 for the group treated with Ivomec. Ivomec treated heifers returned $3.78 more per head than the control heifers, and $5.06 more than those heifers treated with the Totalon/Warbex combination.

The number of animals represented in this investigation are small, therefore, the project will be repeated a second wintering to increase confidence in the data.

Table 1. As Fed Complete Mixed Backgrounding Ration Fed Across Treatments Comparing Ivomec and a Totalon/Warbex Combination

Ingredients		Percent (As Fed)
Corn Silage		35.1
Mixed Hay		28.0
Alfalfa		9.76
Barley		26.7
Dicalcium phosphate		.17
Trace mineral salt		.17
Vitamin A D & E		.038
		100.28%
Nutrient Analysis:		
Crude Protein	7.65% As Fed	
	11.10% Dry Matter	
Calcium	0.47% As Fed	
	0.68% Dry Matter	
Phosphorous	0.28% As Fed	
	0.34% Dry Matter	

Table 2. Backgrounding Gain Performance, Feed Efficiency, Feeding Economics, and Marketing Analysis Among Heifers Treated with either Ivomec or a Total/Warbex Combination 1988

	Control	Totalon/ Warbex	Ivomec
Gain Performance:			
No. Head	15	15	15
Day Fed	117	117	117
Initial Wt., lbs.	589	609	608
Final Wt., lbs.	890	904	911
Gain lbs.	292	295	303
ADB, lbs.	2.50	2.52	2.59
Feed Efficiency:			
Feed/head, lbs.	3286	3259	2296
Feed/head/day, lbs.	28.1	27.9	29.0
Feed/lb. of gain, lbs.	11.2	11.1	11.2
Feeding Economics:			
Feed Cost/head, $	95.70	94.92	99.02
Feed Cost/day, $	.818	.811	.846
Feed Cost/lb of gain, $	.3277	3218	.3268
Feed Cost/cwt. of gain $	32.77	32.18	32.68
Marketing Analysis:			
Feeder Heifer Cost, $ at $80.00/cwt	478.40	487.20	486.40
Parasite Treatment Cost, $			
Warbex	.47	.47	
Totalon		2.27	
Ivomec			3.35
Gross Return/head at $69.80/cwt., $	621.22	630.99	635.88
Net gain or loss $	+142.35	141.07	146.13
Treatment advantage/head compared to the control, $		-1.28	+3.78
Ivomec advantage over Totalon/Warbex/head, $			+5.06

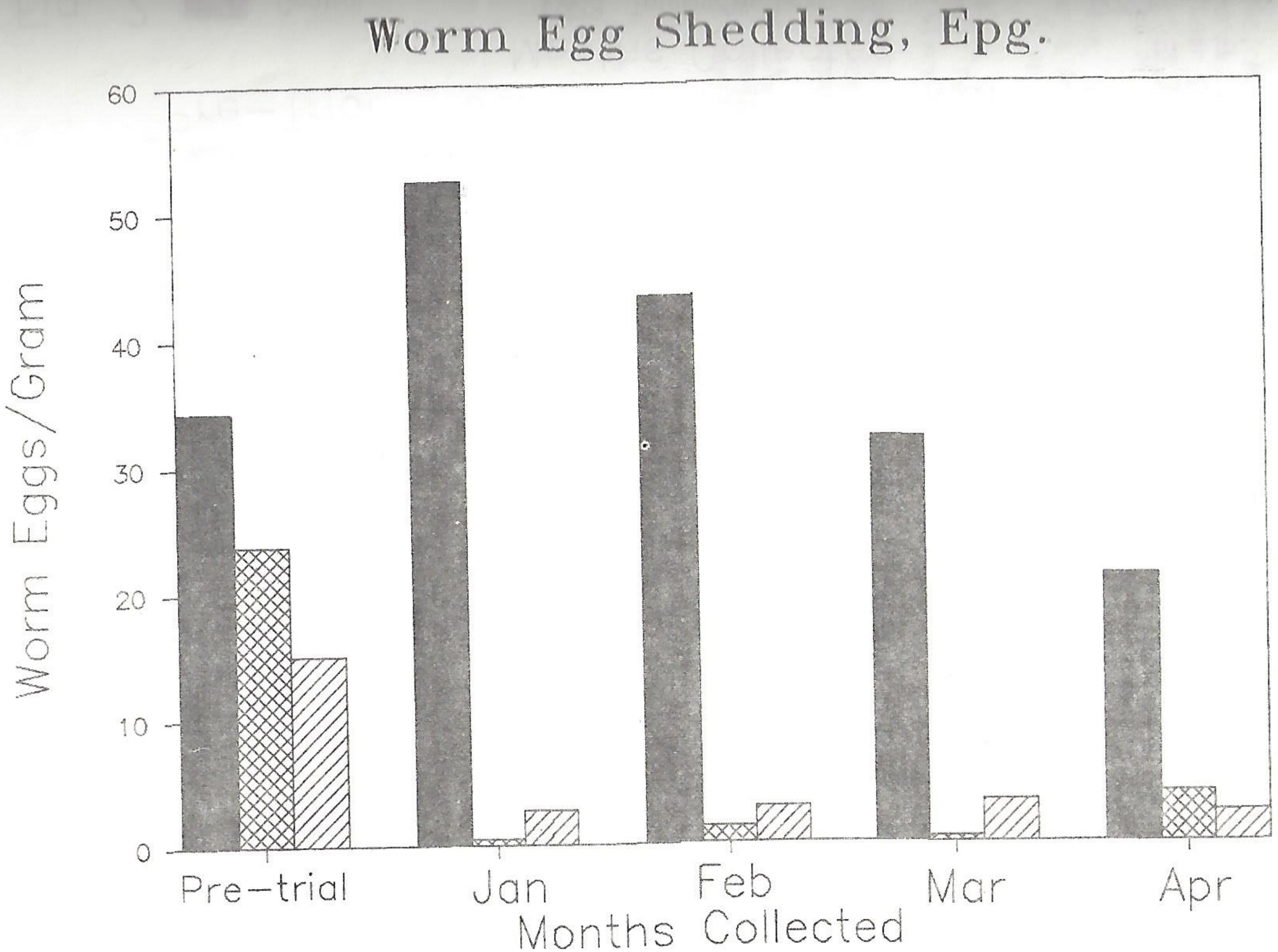
Worm Egg Shedding, Epg.
Worm Eggs/Gram
0
10
20
30
40
50
60
Pre-trial
Jan
Feb
Mar
Apr
Months Collected
Control
Totalon/Warbex
Ivomec

Fig. 1

Coccidia Oocyst Shedding, Epg

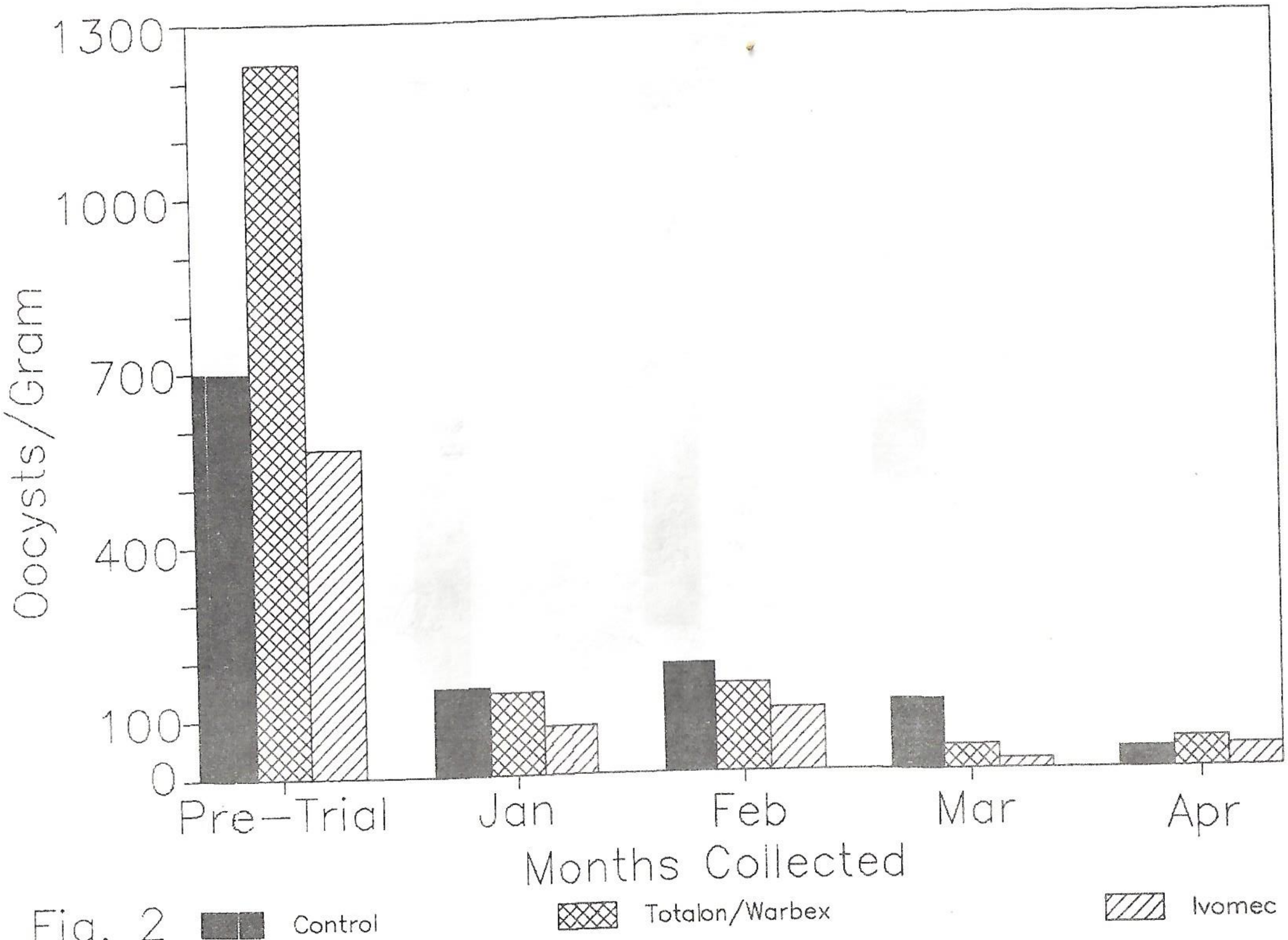

Fig. 2

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OVULATION INDUCTION METHODS COMPARED AMONG NON-CYCLING BEEF COWS

By

D. G. Landblom and J. L. Nelson

INTRODUCTION:

Normally, cows that calve during a sixty day calving period have little difficulty returning to estrus and rebreeding in order to maintain a 365 day calving interval. However, many cows calve late due to poor nutrition, disease, a difficult delivery or a retained placenta or because they were mated to subfertile bulls. The use of ovulation induction techniques developed recently may allow cattlemen to shorten the time between calving and rebreeding, and thus shift a late calving cow into the normal calving heard.

PREVIOUS WORK:

The chain of events that occur between calving and the start of regular estrus periods is not completely understood. Short and co-workers (1972) found that cows having several cycles before breeding had higher conception rates than those bred at the first estrus following calving. Cows that cycle soon after calving have a chance for several cycles and higher fertility levels at the start of the breeding season. The effects of progesterone on estrus and ovulation have been investigated intensively since its discovery in 1935. When fed in the form melengestrol acetate (MGA)[R] or implanted in the ear (Syncro-Mate B)[R] it causes a unique "priming" response in non-cycling cows which aids in the resumption of regular estrus cycles. Smith et al. (1983) and Troxel et al. (1980) found that cows "primed" with Syncro-Mate B (SMB)[R] had an increased release of lutenizing hormone (LH) when gonadotropin releasing hormone (GnRH) was given thirty hours after removal of the SMB implant. Troxel and Kessler (1983) and Smith et al. (1987) evaluated progesterone concentrations of cows given GnRH. They reported that progesterone priming produced normal corpus luteum life spans provided blood serum levels of progesterone were maintained between two-three nanagrams per milliliter of serum. Timing of GnRH administration is important if a sustainable LH release is to be obtained in the non-cycling cow. Troxel and coworkers (1980) found that interruption of nursing for a minimum of twenty-four hours was needed to obtain a satisfactory GnRH induced LH release. Smith et al. (1983) found that thirty-two hour calf removal (CR) increased pituitary responsiveness to injected GnRH provided calves were not allowed with their mothers for at least eight hours after the GnRH was given. Further review of the literature indicates that most emphasis has been placed on the use of GnRH as an ovulation induction compound when used with progesterone. Human chorionic gonadotropin (HCG), which has primarily LH activity, also produces a similiar effect in the non-cycling cow. Pratt et al. (1982) evaluated GnRH and HCG in non-cycling cows and found both compounds increased the proportion of cows with palpable corpus luteums, although the luteal phases measured were abnormally short.

Considering the findings of these researchers, a breeding management study was designed to evaluate the ovulation induction potential of progesterone priming when used with or without short-term calf removal and with either GnRH or HCG as precursor treatments to a seven day single injection Lutalyse synchronization program. The objective was to determine if ovulation induction techniques administered to cows thirty-three days after calving would induce an additional heat cycle before breeding that would result in a higher number of first service and twenty-five day pregnancies, when compared to untreated controls, in a Lutalyse synchronization breeding program. The trial was further designed to compare the first service and twenty-five day pregnancy rate responses between cows bred at the induced heat cycle with cows that were not bred until the second heat cycle following induction. The last objective was to monitor the life span of luteal tissue formation.

PROCEDURE:

The experiment contains two phases. In Phase I, cows were subjected to several ovulation induction treatments but breeding was delayed until the start of the second heat cycle at which time the cows were subjected to a seven day single injection Lutalyse synchronization program. In Phase II, a second but unrelated group of cows were subjected to one of the ovulation induction treatments without the use of Lutalyse, and were bred naturally on the induced heat. A schematic of the trial design is shown in Table 1.

PHASE I

Forty-nine third calf and older Hereford and Angus x Hereford cows and their calves were used in the investigations. After calving, but before the induction period began, the cows and calves were kept in a sheltered pasture area of approximately 20 acres. The cows were observed twice daily for standing heat and if detected in heat they were removed from the study. While the induction treatments were administered and during a thirty day progesterone monitoring period the cows were housed in drylot to simplify blood serum collections. While in drylot they were maintained on the following ration:

INGREDIENT	DRY MATTER
Alfalfa hay	7.7
Mixed Hay	6.6
Soybean meal	1.0
Corn silage	13.0
TOTAL	28.3

*Minerals were fed free choice in mineral feeders in the following ration:
One part TM salt to one part dicalcium phosphate.

The postpartum interval of cows used ranged from twenty-nine to thirty-nine days and averaged thirty-three days when the Syncro-Mate-B implants were installed.

Cows receiving Syncro-Mate-B, were implanted between 8 A.M. and 10 A.M and the implants were removed nine days later.

The calves were separated from their mothers when the implants were removed, and were returned to their mothers forty-eight hours later. While separated from their mothers, they were housed in a sheltered feedlot pen with fresh water and first cutting alfalfa hay.

Those treatments assigned to receive GnRH or HCG were injected thirty hours after implant and calf removal. Each cow, depending upon treatment, was injected with either 2000 IU of HCG or 1000 micrograms of GnRH in the rump muscle.

After the induction techniques were completed, the cows were observed for standing heat with the aid of epididectomized marker bulls equipped with chin ball marking devices. Corpus luteum development and its subsequent life span was monitored by measuring serum progesterone levels gathered during the period of ovulation indication and during the sixteen day period following gonadotropin administration. Whole blood samples were collected in heparinized tubes via jugular vein puncture. The samples were placed in an ice water bath immediately after collection. Once collection was completed, the samples were held at refrigerator temperature until the following morning when they were centrifuged and the serum collected and frozen for later analysis by radioimmunoassy. The assay was conducted by Mr. Jim Hirsh under the direction of Dr. Dale Redmer, NDSU reproductive physiologist.

Beginning on May 27, 1987, cows from all treatments were combined and subjected to a single injection Lutalyse synchronization program. During the first seven days of the breeding season the cows were detected for standing heat using sterile bulls equipped with chin ball marking harnesses, and were inseminated twelve-fourteen hours later using semen from two Charolais sires. On the morning of the seventh day (8am), all remaining cows were injected with 5 ml. (25mg) of Lutalyse^{R} deep in the rump muscle. Following the Lutalyse^{R} , the cows were detected and inseminated for an additional five days.

In September, the cows were pregnancy tested and those not determined pregnant were sold. The remaining cows calved in the spring of 1988.

PHASE II

In 1987, fifty-one cows from two to eight years old were used in Phase II and consisted of Hereford, Angus X Hereford, Milking Shorthorn X Angus X Hereford, and Simmental X Hereford breeding. The cows were grouped by calving date into three ovulation induction groups. The interval between calving and SMB implantation for the groupings was 35, 37, and 30 days for groups one, two, and three. Each of the groups was induced using the Syncro-Mate-B/HCG/48 hr. calf removal method and were bred naturally at the induced heat cycle. Lutalyse^{R} was not used in Phase II. Syncro-Mate-B implants remained in place for eleven days. The implants were removed and calves separated from their mothers at 8 A.M. on the morning of the eleventh day, and 2000 IU of HCG was injected thirty hours after implant removal. Fertile Charolais bulls were placed with groups of from five to seven cows per group following removals of the implants. Once the induced heat cycle was completed, the cows were combined with a single Charolais bull until the breeding season was completed on August 10, 1987.

In 1988, Phase II was expanded to include the following four treatments: 1) control, 2) SMG-HCG-CR, 3) SMG-HCG, and 4) SMG-HCG-CR-Lutalyse. Each of these treatments, except treatment four, was used and described in Phase I. In treatment four, Lutalyse was administered seventeen days after the SMG-HCG-CR regime was completed. Breding was done naturally using a ratio of seven cows per bull.

Data from the 1987 breeding have been summarized in Tables 1, 2 and 3. Table 1 contains a schematic of the trial design and the 1988 modifications to Phase II. Development and longevity of the corpus luteum, based on serum progesterone level is shown in Table 2 and the Phase I and II pregnancy rates for the various treatments are summarized in Table 3.

SUMMARY:

In Phase I, progesterone priming increased the number of cows identified in standing heat following implant removal, and cows in the progesterone primed treatments had a much higher incidence of normal corpus luteum development based on progesterone monitoring. While the progesterone priming appears to have been quite consistent in those treatments where priming was used, the pregnancy data is inconsistent. There appears to be a substantial set back in early pregnancy rate where short-term calf removal was used in conjunction with progesterone priming. By contrast, when either GnRH or HCG were used with progesterone priming, a marked increase was measured in the first service pregnancy rate and the number of cows pregnant in the first twenty-five days of breeding season. Compared to the control group, pre-treatment with HCG-CR one heat cycle prior to synchronization with Lutalyse was the only treatment with a higher first service conception rate. Using the HCG-CR pre-treatment resulted in a 100% first service pregnancy rate as compared to 85.7% in the control group.

In Phase II, breeding on the induced heat cycle, resulted in a 36% first service pregnancy rate and a 68.7% pregnancy rate after twenty-five days of breeding. Although this is encouraging with respect to moving late calving cows up, there was an unacceptable number of open cows at the end of the breeding season. The expansion of Phase II implemented in 1988 is aimed at evaluating methods that may increase the number of first service and twenty-five day pregnancies, and lower the number of non-breeders.

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Table 1. Schematic of Phase I and II Ovulation Induction Treatments

Calf Treatment	Steroid Treatment	Gonadotropin	Releasing Hormone	No. Head
Phase I				
1. Removed	Syncro-Mate-B	---	GnRH	7
2. Removed	Syncro-Mate-B	HCG	----	7
3. Not Removed	Syncro-Mate-B	---	GnRH	7
4. Not Removed	Syncro-Mate-B	HCG	----	7
5. Removed	---	---	GnRH	7
6. Removed	---	HCG	----	7
7. Not Removed (Control)	---	---	----	7
			Total	49
Phase II – 1987				
1. Removed	Syncro-Mate-B	HCG	Group 1 -	14
			Group 2 -	22
			Group 3 -	15
			Total	51
Phase II – 1988				
1. Control	---	---		11
2. Removed	Syncro-Mate-B	HCG		14
3. Not Removed	Syncro-Mate-B	HCG		11
4. Removed	Syncro-Mate-B	HCG	Lutalyse	12
			Total	48

Table 2. Summary of Corpus Luteum Development Based on Blood Serum Analysis. 1987

PHASE I 1 /				
Treatments	**Ovulations with Normal Corpus L. Development**	**Ovulations with Short or Altered Corpus L. Dev.**	**No. that did not ovulate**	**Days From Calving to Progesterone Priming Treatment**
SMB-GnRH-CR	5/7 – 71.4%	2/7 – 28.6%	---	34
SMB-HCG-CR	4/7 – 57.2%	1/7 – 14.3%	2/7 – 28.6%	33
SMB-GnRH-No CR	5/7 – 71.4%	1/7 – 14.3%	1/7 – 14.3%	32
SMB-HCG-No CR	5/7 – 71.4%	2/7 - 28.6%	---	34
GnRH-CR	1/7 – 14.3%	2/7 – 28.6%	4/7 – 51.7%	--
HCG-CR	2/7 – 28.3%	3/7 – 42.8%	2/7 – 28.3%	--
Control	2/7 – 28.6%	5/7 – 71.4%	---	--

1 / Phase I cows were subjected to ovulation induction treatments but were not bred artificially until the second heat cycle.

Table 3. Phase I and II Pregnancy Rates Following Ovulation Induction Treatments. 1987

Treatment	No. Head	Calving to Prog. Treat.	Calving to Prog. Treat.	1st Cycle	2nd Cycle	3rd Cycle	Open
Phase I 1 /							
SMB-GnRH-CR	7	34	44	57.1	-	28.6	14.3
SMB-HCG-CR	7	33	43	66.7	16.7	-	16.7
SMB-GnRH-NO CR	7	32	42	71.4	14.3	-	14.3
SMB-HCG-NO CR	7	34	44	85.7	14.3	-	-
GnRH-CR	7	-	43	85.7	14.3	-	-
HCG-CR	7	-	44	100.0	-	-	-
CONTROL	7	-	-	85.7	14.3	-	-
Phase II							
SMB-HCG-CR 2 /							
Group 1	14	35	47	21.4	64.3	-	14.3
Group 2	23	37	49	43.5	26.1	4.3	26.1
Group 3 3 /	14	30	42	42.9	7.4	-	50.0
Group Total	51	34	46	37.3	31.4	2.0	29.3
Combined 25 Day Pregnancy Rate					68.7		

1 / Phase I cows were not bred on the induced heat cycle. Breeding was delayed until the next heat cycle when the cows were bred artificially in a seven day single injection Lutalyse program.

2 / Phase II cows were bred naturally on the induced heat cycle.

3 / Cows in group three calved very late in the calving season and had only 25 days to become pregnant before the end of a 60 day breeding season.

CONTROL OF THE HORN FLIES IN BEEF CATTLE

By

James L. Nelson

The horn fly, Haematobia irritans (L.) is a blood sucking ectoparasite of cattle that is active from early spring until the first severe frost in the fall.

Both sexes of the adult fly remain on the cattle both day and night except for a brief time when the female leaves the host to lay eggs on freshly deposited manure pats. The eggs hatch in less than twenty-four hours and spend from three to twelve days feeding on the manure pat. Pupation (Larva to adult transition) takes place in three to fourteen days under the manure pat. After two to eight days, adult flies emerge from the puparia and begin feeding on cattle two to three hours after emergence. According to W. G. Bruce (1942), the change from egg to adult during the summer months requires only nine to twelve days, with the adult fly living about seven weeks and producing about 400 eggs. Thus, control measures can be directed at the adult flies on the cattle or the larvae stages found in manure. Cattle producers can choose from several different methods of fly control including back rubbers, sprays, dust bags, ear tags, ruminal boluses, oral larvicides and live traps. Each control method offers advantages and disadvantages in effectiveness of control, ease of administration, and cost per animal treated.

The objective of this trial was to compare the effectiveness of insecticide impregnated ear tags and the controlled-release Inhibitor bolus used to prevent horn fly larval development.

Haufe, W. O. (1982) reported that under ranch conditions in Alberta, Canada, yearling steers treated with two fenvalerate impregnated ear tags gained 17.7% more than control steers during the May 13th to September 5th grazing period. He also indicates that pest control practices must effectively eliminate an infestation without interruption during the grazing season to prevent the minimum loss of 17-20% in potential growth rate.

Quisenberry and Strohbehn, (1984), found that calves nursing on treated cows were significantly heavier at weaning than calves nursing untreated cows.

PROCEDURE:

In June, 1988, four herds of crossbred cows and calves (30-50 head per herd) were assigned to one of four fly control treatments as follows:

Herd 1 - Cows tagged with two "Max Con" insecticide ear tags per cow. "Max Con" is a trade name of the Y-Tex Corporation. Active ingredients are chlorpynifos, cypermethrin, and piperonyl butoxide.

Herd 2 - Cows tagged with two "Tomahawk" insecticide ear tags per cow. "Tomahawk" is a trade name of Coopers Animal Health, Inc. "Tomahawk" Insecticide ear tags contain pirimiphos methyl, a phosphate insecticide that has never been used on cattle in the United States.

Herd 3 - Cows given one "Inhibitor" bolus per cow. "Inhibitor" is a trademark of Sandoz, Ltd., a division of Zoecon Corporation. Active ingredient is methoprene, an insect growth regulator.

Herd 4 - Control cows not treated for flies.

Each herd grazed on similar but separate native range pastures with uniform stocking rates. Each herd was separated from one-fourth to two miles in order to maintain fly population intergrity. Actual application of the ear tags or bolus was done according to the manufactures recommendations on June 15, 16, and 20th. Due to the extreme heat and drought conditions, the trial was terminated after 67 days because Herd 1 exhausted its grass supply and required movement to new pastures. Estimates of the fly population were made early in July and again at the close of the trial. Dr. Dennis Kopp and Dr. Hendrik Meyer of the Entomology Department NDSU, helped with the first fly count and offered much valued advice and counsel.

At each fly count, approximately 15-20 cows per herd were carefully observed, using binoculars. Flies were estimated on a per side basis and converted to flies per cow figure. No attempt was made to document the number of eggs laid or hatching success of larval flies in the manure pats.

All cows and calves were individually identified and weighed on a regular basis. Although each herd had a slightly different starting date and final weigh date, all cow and calf weights were computed to a June 20th – August 26th (67) days trial period.

Results of the trial are shown in Tables 1, 2, and 3.

DISCUSSION:

Application of the ear tags or administration of the slow-release bolus required every cow to be processed through a headgate. Processing time required per cow treated was not different between the application of the ear tags or the giving of the bolus with a balling gun. Both treatments required approximately one minute per cow using a crew of three. The cost of the treatments varied from $1.79 per cow using the "Inhibitor" bolus to $2.00 per cow with either the "Max Con" or "Tomahawk" tags, exclusive of labor charges.

Fly populations were just starting to build in mid June when the three treatments were applied. By July 21, at the first fly count, both ear tag brands had reduced the number of flies per cow to less than twenty. The "Inhibitor" treated cows had counts estimated to be approximately 160 flies per cow, but the cows did not show any particular discomfort at this level. By contrast, the control cows had estimates of over 520 flies per cow and appeared to be very uncomfortable with head tossing, tail switching and bunching up.

This discomfort or “fly fighting” caused the control cows to lose weight or have minimal gains during the sixty seven day trial period. This was especially true for the Milking Shorthorn cross (MS(AxH) and Simmental (Sim X) crossbred cows.

Calf performance between herds apparently was not adversely affected since the control calves gained as much as the calves from the “Max Con” and “Inhibitor” treated herds and only slightly slower than the calves in the “Tomahawk” treated herd.

<u>SUMMARY:</u>

Cows treated with two “Max Con” or “Tomahawk” ear tags enjoyed a relatively “fly free” summer at a cost of $2.00 per cow. These cows gained from 33 to 58 pounds in body weight and also supported calf gains of from 173 to 220 pounds during the 67 day trial period. Cows treated with one “Inhibitor” bolus had fly counts of approximately 160 per cow but this level did not seem to be detrimental since the cows gained an average of 38 pounds and their calves gained between 173 and 188 pounds per head.

Control cows were heavily infested with horn flies throughout the trial period, with counts in July averaging over 520 flies per cow. Gains were minimal (12-14 pounds for Hereford and Angus X Hereford cows) to negative (-33 to -55) for the MS (AxH) and Simmental cross cows.

Calf gains were not adversely affected by a lack of fly control since they gained on par with calves from the treated herds.

Table 1. Visual Estimation of Fly Numbers Per Cow

Treatment	1st Observation July 21st	2nd Observation September 7th
Herd 1 "Max Con" tags	11	168
Herd 2 "Tomahawk" tags	19	124
Herd 3 "Inhibitor" bolus	160	180
Herd 4 Control	537	180

Table 2. Sixty-seven Day Weight Changes of Cows Treated for Fly Control

Treatment	No. Head	Gain-Loss Pound	Gain Head	ADG
"Max Con"	70	+3844	54.9	0.82
"Tomahawk"				
BWF	10	524	52.4	0.72
Hereford	10	572	57.3	0.86
MS (AxH)	10	335	33.5	0.50
Sim X	10	465	46.5	0.69
"Inhibitor"	52	1996	38.4	0.57
Control				
BWF	9	114	12.7	0.19
Hereford	9	128	14.2	0.21
MS (AxH)	7	-382	-54.6	-0.81
Sim X	9	-299	-33.2	-0.50

Table 3. Sixty-seven Day Weight Gain of Calves Nursing Cows treated for Fly Control

Treatment	No. Head	Weight Gain	Gain Head	ADG
"Max Con"				
Steers	33	5807	176.0	2.63
Heifers	37	6418	173.5	2.57
"Tomahawk"				
BWF Steers	5	1104	220.8	3.30
Heifers	5	1014	202.8	3.03
Hereford Steers	4	754	188.5	2.81
Heifers	6	1136	189.3	2.83
MS (AxH) Steers	5	925	185.0	2.76
Heifers	5	936	187.2	2.80
Sim X Steers	4	759	189.8	2.83
Heifers	6	1155	192.5	2.87
Total "Tomahawk" Steers	18	3542	196.8	2.93
Heifers	22	4241	192.8	2.87
"Inhibitor" bolus				
Steers	36	6752	187.6	2.79
Heifers	16	2770	173.1	2.58
Control				
BWF Steers	4	725	181.2	2.71
Heifers	5	846	169.2	2.52
Hereford Steers	5	889	177.8	2.65
Heifers	4	671	167.8	2.50
MS (AxH) Steers	3	574	191.3	2.86
Heifers	4	749	187.2	2.79
Sim X Steers	3	640	212.3	3.18
Heifers	6	1104	184.0	2.75
Total Control Steers	15	2828	188.5	2.81
Heifers	19	3370	177.4	2.64

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Section II

PROGRESS REPORTS

OF

RANGE AND FORAGE RESEARCH

AT THE

DICKINSON BRANCH EXPERIMENT STATION

BY

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COMPLEMENTARY ROTATION GRAZING SYSTEM IN WESTERN NORTH DAKOTA

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P. J. Sjursen, T. J. Conlon, J. L. Nelson, D. G. Landblom and D. R. Kirby

INTRODUCTION

Complementary grazing uses domesticated grass, legume, or annual crop pastures to add to or complement native range pastures. Rotation grazing moves livestock through a successive series of pastures in a preplanned sequence. Management of native range and domesticated grass pastures must be based on sound ecological principles that consider the growth and development of the dominant species and the physiological needs, weaknesses and strengths of the plants to maintain productive stands. The nutritional needs of the livestock must be included in management considerations. Sound management recommendations can only be based on reliable scientific research.

PROCEDURES

This revised project compares nongrazed, seasonlong grazing and rotation grazing on three native range sites to evaluate species composition, herbage production, and animal performance and the use of domesticated grass pastures in a complementary rotation grazing system. The present complementary rotation grazing system has been in place at the ranch headquarters of the Dickinson Experiment Station since 1983. It consists of a crested wheatgrass (Agropyron desertorum) pasture for spring grazing and an altai wildrye (Elymus angustus) pasture for fall and early winter grazing. Native range has been grazed during the summer and managed with a three pastures, twice over rotation system. The seasonlong pasture treatments were established in 1983 and grazed from mid June to late October. The deferred seasonlong system was grazed from mid July until mid November, 1983-1985. The nongrazed treatment plots were established in 1987 and have not been grazed for more than 30 years.

The intended purpose of the trial was to maximize herbage and livestock production for a cow-calf operation, lengthen the grazing season in the spring and fall, improve range condition of native range, and reduce total acreage required to carry a cow and calf. The intention was to accomplish these goals with a low number of pastures with few rotation times and be flexible enough to be adapted by a wide range of livetock operations. This type of grazing system should improve operation efficiency, reduce costs and decrease labor per unit of production, and increase saleable production per acre.

Data collected on the treatments in this study were above ground herbage production, plant species composition, leaf height measurements and phenological phases of eight major graminoid species, and animal weight performance. Commercial crossbred cattle were used in this trial.

RESULTS AND DISCUSSION

Cow and calf average daily gain and gain per acre for the complementary rotation grazing system are on table 1. Five year mean average daily gain for cows and calves were 0.51 and 2.03 pounds, respectively, for the complementary system. Mean gain per acre for the cows and calves were 7.9 and 30.6 pounds, respectively, for the system. Livestock on the complementary system grazed crested wheatgrass pastures from early May until the end of May. Native range was grazed from 1 June until mid October in a three pasture, twice over rotation system. Altai wildrye was grazed from mid October until mid or late December. The calves have usually been weaned by mid November.

Animal weight performance on crested wheatgrass (table 1) has been very good. Average cow weight gains have been 2.68 pounds per day and 98.8 pounds per acre. Average calf weight gains have been 1.99 pounds per day and 75.4 pounds per acre.

Cow and calf weight performance on native range with the twice over rotation grazing system has been good (table 1). Average cow weight gains have been 0.61 pounds per day and 8.0 pounds per acre. Calf average daily gain has been 2.18 pounds per day and 28.4 pounds per acre.

The biweekly average daily gain (table 2) for cows on the twice over rotation system have been maintained at a good level for a longer period into the grazing season than seasonlong grazing. Cows on the twice over rotation system do not lose weight until early October. Cows on the seasonlong system decreased in average daily gain to maintenance level in mid August and lost weight after mid September. Cows on the deferred seasonlong system decreased in average daily gain to maintenance level in early September and lost weight after early October. Calf average daily gains have been benefited by twice rotation grazing compared to seasonlong and deferred seasonlong grazing (table 2).

Animal performance on altai wildrye has been less than hoped for but it has extended the grazing season from mid October until mid December and reduced the length of the period in which feeding hay was required. Early gains by cows has been very good but after mid November cows have generally lost weight. Average cow weight gains have been -0.59 pounds per day and -31.9 pounds per acre (table 1). Additional research will be needed to improve animal performance after mid November. Average calf gains have been 1.37 pounds per day and 28.2 pounds per acre (table 1).

SUMMARY

The management of this complementary rotation grazing system has been based on ecological principles that consider the physiological needs, weaknesses, and strengths of the dominant plant species. Consideration of the nutritional needs of the livestock have been incorporated. Season of use of each pasture type was limited to periods of grazing when the detrimental effects of grazing were minimized and the potential for improvement in animal weight performance was maximized to near potential. Effort has been made to limit the number of pastures and rotation times to the minimum. One pasture of crested wheatgrass was used for spring grazing. A second pasture may be necessary to move the starting date earlier. The native range was managed with three pastures, each grazed two times during the grazing season. One pasture of altai wildrye was used in this system for fall and early winter grazing. The grazing season has been lengthened from the traditional 6 months to 7.1 months. This system has the potential to lengthen the grazing season to 8.0 months with additional research. The acreage required to carry a cow and calf was reduced from 24.4 acres for 6 months to 11.6 acres for 7.1 months.

By using a complementary rotation grazing system similar to the one at the Dickinson Experiment Station, livestock producers have the potential to: lengthen the grazing season, reduce the acreage required to feed a cow and calf, and increase the amount of saleable beef produced from each livestock unit.

Table 1. Average daily gain per head (ADG) and gain per acre (G/A) for cows and calves grazing the complementary rotation grazing system, Dickinson Experiment Station, 1983-1987.

	Crested Wheatgrass		Native Range		Altai Wildrye		System	
	ADG	G/A	ADG	G/A	ADG	G/A	ADG	G/A
1983								
Cow	2.65	97.9	0.82	7.4	0.51	5.7	1.10	11.4
Calf	1.76	65.0	2.21	19.9	1.52	17.0	2.06	21.7
1984								
Cow	3.11	105.3	0.25	2.8	0.02	1.0	0.46	7.4
Calf	2.14	72.4	1.96	21.7	1.16	35.3	1.81	25.5
1985								
Cow	2.20	93.4	0.50	7.3	-1.90	-68.4	0.17	3.1
Calf	1.88	79.8	1.99	28.9	2.58	51.6	2.05	33.7
1986								
Cow	4.26	144.7	0.78	12.0	-1.03	-65.2	0.46	10.0
Calf	2.34	79.5	2.30	35.2	0.49	10.1	2.06	34.9
1987								
Cow	1.20	52.7	0.71	10.5	-0.56	-32.8	0.38	7.8
Calf	1.82	80.1	2.43	36.2	1.12	27.2	2.16	37.2
Mean								
Cow	2.68	98.8	0.61	8.0	-0.59	-31.9	0.51	7.9
Calf	1.99	75.4	2.18	28.4	1.37	28.2	2.03	30.6

Table 2. Biweekly average daily gain for cows and calves on seasonlong, deferred seasonlong and twice over rotation grazing systems, Dickinson Experiment Station, 1983-1987.

	1-15 Jun	16-30 Jun	1-15 Jul	16-31 Jul	1-15 Aug	16-31 Aug	1-15 Sep	16-30 Sep	1-15 Oct	16-31 Oct	1-15 Nov	Mean
COW												
Seasonlong		1.97	1.78	1.10	0.95	0.20	0.07	-0.38	-0.81	-0.74		0.46
Deferred Seasonlong				1.52	1.49	0.71	0.15	0.15	-0.55	-0.74	-0.74	0.25
Twice Over Rotation	3.04	2.17	0.70	0.52	0.79	0.89	0.84	0.54	-1.68			0.87
CALF												
Seasonlong		2.52	2.50	2.22	2.34	2.44	2.30	1.87	1.61	1.40		2.14
Deferred Seasonlong				2.39	2.39	2.23	2.09	2.09	1.04	0.77	0.77	1.72
Twice Over Rotation	2.61	2.06	2.25	2.27	2.55	2.50	2.18	2.06	1.44			2.21

SHORT DURATION GRAZING TRIAL

D. R. Kirby and T. J. Conlon

SUMMARY

Short duration (SD) and repeated seasonlong (SL) grazing trials were initiated at the Dickinson Experiment Station Ranch Headquarters in 1981. Forage production has generally been greater on the SL treatment, yet forage disappearance has been similar despite a greater stocking rate on the SD treatment. Plant basal cover has increased between 1981 and 1987 on each range site regardless of grazing treatment. Cows have maintained approximately 15 pounds more seasonal weight gain on the SL treatment when compared to the SD treatment. Average daily gain of calves has been similar between treatments; therefore, the increased average calf gain/acre on the SD treatment is a reflection of the prior greater stocking rate on this treatment.

INTRODUCTION

The mixed grass prairie comprising approximately 30% of the land area of the state is dominated by cool and warm-season midgrasses, shortgrasses, and sedges. The principle effects of previous unrestricted, heavy grazing in the mixed grass prairie is a marked decrease of tall and midgrasses and an increased coverage of short grasses and sedges, with a subsequent decrease in total forage yield. Considered to be below their potential for forage hence livestock production, North Dakota's rangelands warrant research into more efficient management systems such as short duration grazing.

Short duration grazing is a rotation system using multiple pastures and generally one herd. Stocking rate increases appear necessary and combined with a large number of smaller sized pastures results in a high stocking density (animals/area). The grazing period of a pasture is short, usually 7 days or less, to eliminate grazing of new plant regrowth. The rest period, generally 30 to 90 days, allows plants to recover from grazing and is short enough to allow animals to graze plant regrowth before it matures. Graze and rest period lengths should vary according to the growth rate of the vegetation.

STUDY AREA AND METHODS

A trial comparing short duration (SD) to repeated seasonlong (SL) grazing was initiated June 25, 1981 on typical mixed grass prairie. Section 16 of the Ranch Headquarters was divided into one 320 acre pasture grazed seasonlong and eight 40 acre paddocks grazed rapidly in rotation. Twenty and 35 cow/calf pairs were allocated to SL and SD treatments, respectively, in June 1981, 1982 and 1983. From 1984 through 1986 an additional 5 cow/calf pairs were added to the SL treatment. In 1987 ten additional cow/calf pairs were allocated to the SL treatment for a total of 35 pairs on the SL treatment also. Cattle were rotated every 5 days on the SD trial and paddocks rested 35 days throughout the grazing season. Grazing seasons totalled 70, 112, 131, 131, 126, 140, and 140 days between 1981 and 1987. Average annual precipitation for the study area is 16 inches. Precipitation recorded for 1981 through 1987 was 8.5, 25, 15.5, 14, 24 and 14 inches, respectively. Forage production and disappearance was determined utilizing portable cages and the paired-plot technique. Fifty paired, caged and uncaged quadrats were clipped at the beginning of trials and approximately every 40 days thereafter until termination of trials. Caged plots were used to estimate growth and total annual production while comparison of paired, caged and uncaged quadrats allowed estimation of forage disappearance (use). Plant basal cover was estimated using the point contact method on permanent transects. Livestock were weighed on and off grazing trials and every 28 days throughout the trials.

RESULTS AND DISCUSSION

Annual herbaceous production on grazing treatments has ranged from 678 to 1766 lbs/ac (table 1). Although forage availability has been consistently greater on the SL treatment, year-to-year variation in forage production within treatments has been much greater, exceeding 100%. Forage disappearance estimates between treatments have been very similar each year. Disappearance differences have not exceeded 5 percentage points any year of the study.

Plant basal cover increased on all range sites across both grazing treatments between 1981 and 1987 (table 2). Basal cover was initially higher on the SD treatment but by 1987 basal cover was similar between corresponding range sites on the two grazing treatments. Increasing basal cover of plants is a reflection of improved management of the grazing resources.

Livestock performance is summarized in Table 1. In 4 out of 7 years, cows grazing the SL treatment maintained more weight than those grazing the SD treatment. However, no differences in average cow gains were found between grazing treatments in 1984, 1985 and 1987. Calf average daily gains exceeded 2 lbs/day on both treatments each year with the exception of 1984. Differences in calf daily gains between annual grazing treatments were insignificant. Calf production per acre was higher on the SD treatment between 1981 and 1986 which is a reflection of the greater stocking rate on this treatment. Calf production per acre was similar between treatments in 1987.

Table 1. Forage Production and Disappearance and Livestock Performance on Short Duration (SD) and Season-Long Grazing Treatments, Dickinson Experiment Station.

		Forage		Livestock			
				Cows		Calves	
Year	**System**	**Production (lbs/ac)**	**Disappearance %**	**ADG (lbs)**	**AG/ac (lbs)**	**ADG (lbs)**	**AG/ac (lbs)**
1981	SD	678	55	0.4	3	2.2	16
	SL	679	51	0.7	3	2.3	10
1982	SD	1645	41	0.3	4	2.1	25
	SL	1766	36	0.5	4	2.1	15
1983	SD	1057	46	0.3	5	2.1	30
	SL	1720	43	0.5	5	2.2	18
1984	SD	919	60	0.0	0	1.9	26
	SL	1371	60	0.0	0	1.9	19
1985	SD	702	61	0.1	2	2.1	28
	SL	865	61	0.1	1	2.2	21
1986	SD	1667	56	0.1	2	2.2	23
	SL	1558	60	0.2	2	2.2	24
1987	SD	1286	65	0.7	11	2.4	37
	SL	1310	63	0.7	11	2.5	38
1981-1987 Average							
Average	SD	1136	55	0.3	3.9	2.1	28
Range		678-1667	41-65	0-0.7	0-11	1.9-2.4	16-37
Average	SL	1310	53	0.4	3.7	2.2	21
Range		679-1766	36-63	0-0.7	0-11	1.9-2.5	10-38

SECTION III

LIVESTOCK RESEARCH
AT THE
CARRINGTON IRRIGATION STATION

BY

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EARLY WEANING and ALL HAY DIETS
FOR LACTATING DRYLOT BEEF COWS

V. L. Anderson

SUMMARY

Thirty eight lactating mature Hereford cows were fed alfalfa hay and straw (low input) or chopped alfalfa hay and silage (control). Half the calves in each pen were weaned on July 7 (early weaned) and half weaned on September 16 (control) Low input calves gained 2.47 lbs. per day while control calves gained 2.49 lbs per day from early May until weaning on September 16.. Early weaned calves gained 2.68 lbs vs 262 lbs per day for control from July 7 to mid September. Daily feed cost for early weaned pairs was $.78 vs $.87 for controls during the 126 day trial. Low input cow diets cost $.69 per day vs $.87 for control rations.

INTRODUCTION

Drylot lactating beef cows is a unique management system that permits increased use of residues and low quality forages. These low value feeds may not alone support lactating cows but properly supplement can be used extensively for low to moderate milking beef cows. A base ration of alfalfa-grass hay is common to many northern plains cattle operations and fed in sufficient amounts provides a base for beef cow rations. Increased residue use suggests evaluation of earlier than normal weaning in order to reduce the amount of more valuable hay in the diet. It is generally cheaper to feed a calf directly, especially after a calf has started to eat creep feed, than to feed a cow to produce milk to feed the calf. Many cattlemen do not grow or harvest corn for silage and rely on all hay and crop residues for their feed supply. All of the previous drylot cow/calf research at this station has used corn silage as one of the staple feeds. What difference in performance, if any, can be expected with all hay or hay/straw diets? A pilot study was conducted in the summer of 1987 to help identify any management problems and provide performance information on these questions.

EXPERIMENTAL PROCEDURE

After calving in the spring of 1987, 38 straightbred mature Hereford cows and their Hereford sired calves were allotted by calving date to either a low input group or control group. Low input cows were offered 20 pounds of mixed alfalfa-grass hay daily and free choice small grain straw. Straw was from barley and spring wheat fields harvested in small square bales. Control cows were fed 35 pounds of corn silage and 15 pounds of chopped alfalfa-grass hay mixed together and fed once daily in a fenceline bunk. Cow rations were based on NRC, Nutrient Requirements for Beef Cattle, (1984) for cows of average milking ability. Calves were vaccinated for IBR, PI3 and 7 way clostridia complex and implanted with Ralgro and steers had been castrated at birth. All calves were offered a creep ration of ½ chopped hay and ½ barley starting about June 1. One Hereford bull was turned in with each pen on June 6 and removed on July 22 for a 45 day breeding season. At the end of the breeding season, early weaned cows were offered 15 pounds of hay daily and free choice straw. All cows and calves were weighed at the start (May 13), at early weaning (July 7) and at the end (September 16) of the 126 day trial. Cows were condition scored on May 13 and on September 16. The ration offered early weaned calves consisted of 1/3 rolled barley, 1/3 rolled corn grain and 1/3 chopped alfalfa-grass hay by weight as fed. Salt and a balanced mineral were added to the complete mixed ration. Feed costs were calculated on a per pair basis for each group.

RESULTS AND DISCUSSION

Low Input

Low input calves gained 2.50 lbs. per day vs 2.47 lbs. for control calves during the entire trial. Cows on the hay/straw diet lost more weight (59 lbs.) than control cows (18 lbs) and had lower condition scores at the end of the trial. Condition score at the end of the trial reflected weight change of the cows on each diet. One cow in each pen was diagnosed open at fall pregnancy testing.

Daily feed cost for low input pairs was $.18 per day less than control cows. The value of straw can be debated but marketing a residue that is otherwise not usually salable through beef cows adds value to the farming enterprise. No value is placed on manure for fertilizer in this study. Work continues in order to more specifically identify its value.

TABLE 1. PERFORMANCE OF LACTATING DRYLOT BEEF COW/CALF PAIRS ON LOW INPUT VS CONTROL DIETS

	CONTROL	LOW INPUT
Number of Pairs	19	19
CALF DATA		
Start Weight (lbs)	138	137
Mid Weight (lbs)	273	271
End Weight (lbs	465	461
Average Daily Gain (lbs)	2.50	2.47
COW DATA		
Start Weight (lbs)	1183	1188
Mid Weight (lbs)	1146	1143
End Weight (lbs)	1165	1129
Weight Change (lbs)	-18	-59
Number of open cows	1	1
Start Condition Score	5.16	5.21
End Condition Score	5.32	5.11
FEED COSTS*		
Creep feed cost per day ($)	.14	.14
Cow feed cost per day ($)	.73	.55
Total feed cost per day ($)	.87	.69
Feed cost for 126 day trial ($)	109.62	86.94

Based on feed prices of $50 per ton for mixed alfalfa grass hay, $20 per ton for corn silage, $25 per ton for straw and $1.44 per bushel for barley.

Cow weight loss from low input hay/straw diets was not so severe that weight could be regained during post weaning residue grazing before winter. Periodic critical evaluation of cow condition is suggested for any drylot cow herd, especially prior to and during breeding season.

Early weaning

Early weaned calves gained 2.09 lbs. per day vs 2.10 for control calves from July 7 until normal weaning on Sept. 16. Calves weaned at 267 pounds did not present a significant management problem. One calf was treated for a sore eye and one for foot rot. Prior to weaning, calves were consuming 2 to 4 pounds of creep per day. Weaning amounted to removing the cow from the pen and weighing the animals. Cows in the early weaned group gained 64 pounds during the trial with all of the gain coming in the period after weaning. Condition scores were similar at the start and end of the trial for both groups.

TABLE 2. PERFORMANCE DATA FOR CONTROL VS EARLY WEANED DRYLOT BEEF COW/CALF PAIRS		
	Control	**Early Weaned**
Number of Pairs	18	20
CALF DATA		
Start weight (lbs.)	140	135
Early weaning weight (lbs.)	277	267[W]
ADG (May 13-July7) (lbs.)	2.27	2.21
Normal weaning weight (lbs.)	465[W]	461
ADG (July 8-Sept. 16, lbs.)	2.62	2.68
Post weaning weight (lbs.)	541	536
ADG (Sept 16-Oct 22) (lbs.)	2.10	2.09
COW DATA		
Start weight (May 13) (lbs.)	1186	1185
July 7 weight (lbs.)	1153	1138
Sept. 16 weight (lbs.)	1172	1125
Start Condition Score	5.2	5.2
End Condition Score	5.2	5.2
[W] Date respective treatment group weaned.		

Feed costs for calves was highest for the early weaned group as expected at $25.54 which included preweaning creep feed and feedlot rations up to the normal weaning date. Control calves ate $17.36 worth of creep feed. Cow feed costs were lower for the early weaned group at $71.45 vs $91.60 for the control cows. Total feed cost was also lower for the early weaned group at $96.99 or $.770 per day vs $108.96 or $.865 per day for control cow/calf pairs.

TABLE 3. FEED COSTS FOR CONTROL VS. EARLY WEANED DRYLOT BEEF COW CALF PAIRS		
	Control	**Early Weaned**
COWS		
Lactating Period ($)	91.60	39.70
Nonlactating Period ($)	____	31.75
Totals ($)	91.60	71.45
CALVES		
Creep ($)	17.36	2.70
Feed Lot ($)	____	22.84
Totals ($)	17.36	25.54
Total Feed Cost Per Pairs ($)	108.96	96.99
Total Feed Cost Per Day ($)	.87	.78
Total Feed Cost Per lb. of Calf Gain ($)	.58	.50
*** Based on the following feed prices**		
Mixed Hay $50/ton, Corn silage $20/ton, Straw $25/ton, Barley $1.44/bu.		

This study suggests it is possible to reduce feed costs by weaning drylot calves before breeding season is over and placing the cow on a low quality residue diet after breeding season. It is also reasonable to support average milking lactating drylot beef cows on dry rations of alfalfa-grass hay and straw provided hay is of reasonable quality that meets nutritional demands of the cow. Small, young calves can be fed and managed to gain as fast as their herdmates still on their dam.

While past emphasis has been on increasing weaning weights, it is more important to minimize costs, market all available crop products and increase net return all of which are possible with moderately productive cows and less than maximum weaning weights.

ENERGY LEVELS FOR CROSSBRED DRYLOT BEEF COWS

V. L. ANDERSON

SUMMARY

Crossbred beef cows were maintained in drylot from early May until mid September during the summer of 1986 and 1987. Cows in each of two breed groups (Red Angus x Hereford and Tarentaise x Hereford) were randomly assigned to one of two treatments; (1) moderate energy diet and (2) superior energy diet. Cows on the moderate energy diet lost an average of 43 pounds per head during the 133 day trial while cows on the superior diet gained 22 pounds per head. Condition scores reflect the same relationship with -.15 vs +.11 for moderate and superior energy diets respectively. Calf gains were essentially even with moderate calves gaining 362 pounds each vs 356 for superior calves. Creep feed consumption was slightly higher for the superior group at 5.78 pounds per day vs 5.22 for calves in the moderate treatment. Cows on the moderate energy diet calved 3 to 5 days earlier the following year while cows on the superior energy diet calved 0 to 3 days later.

INTRODUCTION

Energy requirements for lactating beef cows are normally met by feeding dry hay or silage from calving until cows are turned out on pasture. Maintaining cows in drylot throughout the summer means complete control of the ration ingredients. One distinct advantage of drylot beef cows is the ability to utilize feeds and forages of little cash value whether from poor market prices or damage from hail, frost or drouth. Previous work at this station suggests straightbred Hereford cows do not increase production from additional energy. Crossbred cows have more genetic potential and can possibly utilize more energy to increase milk production and produce more salable pounds of calf per cow.

Large volumes of corn and alfalfa hay produced under dryland and/or irrigation farming need to be marketed outside of normal channels to reduce excess feed grains and forage supplies. Drylot beef cows can convert corn silage and alfalfa hay to a salable product-beef. This trial was conducted to evaluate performance of cow/calf pairs and economics of offering more than required energy in the diet for drylot lactating crossbred beef cows.

EXPERIMENTAL PROCEDURE

At the conclusion of calving in early May of 1986 and 1987, F1 crossbred cows were ranked by calving date and allotted within breed group to one of two treatment groups (1) moderate energy or (2) superior energy. Moderate energy is defined as the midpoint between average and superior milk production (NRC, Nutrient Requirements of Beef Cattle, 1984). This level targets 15 pounds of milk production per day. The superior energy diet targets 20 pounds of milk production per day. The Red Angus x Herford females with Tarentaise sired calves at side were used as one repetition and Tarentaise x Hereford females with Red Angus sired calves at side for another repetition. Cow numbers were slightly uneven due to different breed groups sizes and pen sizes. Creep feed was offered starting approximately June 1. Breeding was done by natural service sires. One bull was turned into each pen. Tarentaise bulls were rotated between the two pens of Red Angus x Hereford cows when the 45 day breeding season was half over. Red Angus bulls were rotated between the two pens of Tarentaise x Hereford cows at the same interval.

Corn silage and chopped hay were mixed in a truck mounted feed wagon and fed once daily in fenceline bunks. Cows on the superior energy diet were fed 48 pounds of corn silage and 15 pounds of alfalfa hay per day. The moderate energy ration consisted of 40 pounds of corn silage and 12 pounds of alfalfa hay. Trace mineral salt and 12:12 (calcium-phosphorus) mineral were fed free choice to all pens. Creep feed was mixed using ½ barley and ½ chopped alfalfa–grass hay by weight. Trace mineral salt was added as 1% of the diet.

RESULTS AND DISCUSSION

Cows on the superior diet gained more weight than cows on the moderate diet. Calves weighed the same. Cows in both breed groups on the same treatment performed similarly sugggesting no interaction between breed group and energy level. Cow weight change is in agreement with condition score, both indicating cows on superior energy gained more weight and became more fleshy. Table 1 summarizes the performance of all cow/calf pairs in each treatment group.

TABLE 1. PERFORMANCE OF DRYLOT CROSSBRED COW/CALF PAIRS ON TWO ENERGY LEVELS

Two Year Summary	**MODERATE ENERGY**	**SUPERIOR ENERGY**
Number of pairs	66	73
Age of cows (years)	3.85	3.62
Birth date of calf	April 1	March 29
Sex of calf (2=hfr, 3=str)	2.5	2.6
Calving score	1.24	1.16
Starting cow weight (lb.)	1193	1176
Ending cow weight (lb.)	1150a	1198b
Cow weight change (lb.)	-43 a	+22b
Starting cow condition score[1]	5.22	5.26
Ending cow condition score	5.07 a	5.36b
Condition score change	-.15a	+.10b
Starting calf weight (lb.)	159	159
Ending calf weight (lb.)	521	515
Total calf gain (lb.)	359	356
Calf average daily gain (lb.)	2.69	2.67

[1]Condition score is a subjective evaluation of animal condition or fatness using a scoring system of 1=emaciated to 10= obese. Most scores were between 3 and 7 in this trial.
a,b Means in the same row with different letters are significantly different. (P<.05)

The practice of feeding more energy than cows need for their genetic milk production potential may be useful if cows are thin and capable of milking more than past energy consumption allowed. Cows in this study did not return any performance advantage for the added energy fed.

Rebreeding performace plays a major role in establishing any economic benefit for superior energy levels. Table 2 contains data on reproduction from cows in the two treatments.

TABLE 2. REPRODUCTIVE PERFORMANCE OF CROSSBRED DRYLOT BEEF COWS ON TWO ENERGY LEVELS				
	ENERGY LEVEL			
	MODERATE		SUPERIOR	
Breed group*****	**RH**	**TH**	**RH**	**TH**
Number of cows	38	28	40	33
Calving interval (days)	362	360	368	365
Number open	0	1	2	1

* RH=Red Angus x Hereford, TH=Tarentaise x Hereford

It appears that the calving interval was a few days shorter for the cows on moderate energy diet. If differences are in fact due to diet, not only is more feed than needed being fed but at a net loss to calving interval.

ECONOMIC CONSIDERATIONS

The moderate cow ration cost $.700 per day while the superior ration cost $.855 when corn silage is priced at $20 per ton and alfalfa hay at $50 per ton. Adding the creep feed increases feed cost per pair per day to $.844 for the moderate diet and $1.024 for the superior diet. Total summer feed costs for the 134 day trial amount to $113.09 for moderate pairs and $137.21 for superior pairs. A weight advantage for cows on the superior diet of 67 pounds due to ration could be used to offset the added $24.12 feed cost if cows were pounded out at the end of the summer feeding period. Calf gains were essentially equal over the summer lactating period. While the cost of maintaining drylot cows may look high from a strict feed cost point of view, when profit is returned to the feed production, the entire system looks better when marketing hay at $50 per ton and corn silage at $20 per ton.

TABLE 3. ECONOMIC ANALYSIS OF CROSSBRED DRYLOT BEEF COWS ON TWO ENERGY LEVELS		
	MODERATE ENERGY	**SUPERIOR ENERGY**
Daily cost of cow ration ($)*	.700	.855
Daily cost of creep feed ($)*	.144	.169
Total daily feed cost per pair ($)	.844	1.024
Total feed cost for summer ($)	113.89	138.24
Feed cost per pound calf gain ($)	.325	.380
Feed cost per pound of cow and calf gain combined	.325	.304

Feed costs based on alfalfa hay @$50/ton, corn silage @$20/ton and barley @$1.50/bu.

CONCLUSIONS

Recommended energy levels for lactating drylot beef cows should not be exceeded if cows are in moderate flesh after calving. Diets should be matched to the milk production potential of the cows. Excessive energy is converted to extra cow weight rather than higher value calf weight. Reproduction is not hastened following calving by increasing energy levels above recommended levels.

A PROBIOTIC SUPPLEMENT VS BOVATEC FOR WEANING RATIONS

V.L. ANDERSON

SUMMARY

Weaned beef steer calves gained 2.77 pounds per day on a probiotic supplemented diet (n=24) compared to 2.52 pounds for calves on the control diet (n=23). Heifer calves gained 2.38 and 2.24 pounds per day for probiotic supplemented (n=19) and control diets (n=20) respectively. No differences were detected in rumen fluid pH and fiber digestion between treatment groups in the 37 day non replicated field trial. Feed costs per pound of gain during the trial period were $.21 and $.26 for steers and $.23 and $.25 for heifers on the control and probiotic diets respectively. In the 30 day period after the trial ended steer calves that had been on the probiotic treatment gained 3.38 lbs. vs 3.11 lbs. for steers previously on the control diet. If post treatment increased gain is credited to the probiotic supplement, cost of gain for the 67 day feeding period is reduced by $.02 per pound.

INTRODUCTION

Consumers of beef want assurance of a healthy, clean and safe product. While the past record of the beef industry is excellent, consumer awareness of controversial issues such as feeding antibiotics to growing calves suggests investigation of alternative production techniques. Probiotics, a generic term for natural feed supplements that enhance the animals ability to fight off effects of stress, are of interest to producers and consumers alike. Any change in performance, whether positive or negative, immediate or long term, has not been well documented.

Several commercial products are referred to as “probiotic”. No legal definition has been legislated to define ingredients or contents. Most probiotics contain some freeze dried bacteria with *lactobacillus acidophilus, aspergillus oryzae* and *lactobacillus plantarum* frequently represented in the products. Other contents often include vitamins, minerals and flavor enhancers.

Stress is the single greatest detriment to performance for all animals. Weaning time is probably the greatest period of stress for a beef calf after birth. Antibiotics have been relied on in the past for subtherapeutic feeding and treatment of stress induced infections. Continued use of antibiotics is of concern to consumers. Alternative feeding regimes including use of probiotics and rumen conditioners have not been well documented. To gain more information on the effect of probiotics and natural rumen conditioners on the performance of growing calves just after weaning, a non replicated field trial was conducted at the Carrington Research Extension Center-NDSU in the fall of 1987 to compare traditional rations with diets containing probiotic supplements.

EXPERIMENTAL PROCEDURE

At weaning on September 16, 1986, 47 steer calves and 39 heifer calves were allotted randomly by breed group to a control diet or a probiotic supplemented diet. The two pens of steer calves were fed in adjacent lots with a common fenceline waterer as were the two pens of heifer calves. The March and April born straightbred (Hereford) and crossbred (Hereford, Red Angus and Tarentaise) calves were weaned from cows managed under drylot conditions during the summer. Calves had all been allowed access to creep feed consisting of ½ chopped hay and ½ rolled grain sorghum by weight from June 1 until weaning. Vaccinations for 7-way, IBR and Brucellosis (all heifers) and Ralgro implants (all steers) had been given three weeks before weaning. Steer rations were balanced to a target gain of approximately 2.50 lbs. per day while heifer diets were balanced for about 2.25 lbs. per day. All pens of calves were fed once daily in a fenceline bunk. Grains were dry rolled and alfalfa was chopped to 3 to 4 inch lengths. The control calves received Bovatec supplement (230 mg of lasolocid) and 4 oz. of mineral per head per day. Probiotic calves received 5 oz.(steers) and 3.6 oz.(heifers) of supplement with Decoquinate and 4 oz. of a complementary vitamin mineral supplement. The supplement contained 8% potassium, 3% magnesium, 7% sulfur and smaller amounts of zinc, manganese, iron, copper, iodine and cobalt. It also contained Vitamins A, D3, E, riboflavin, d-pantothenic acid, Niacin, Choline and Vitamin B12. Fermentation products in the supplement were *Lactobacillus acidophilus* and *plantarum, Aspergillus oryzae, Streptococcus diacetilactis* and *Bacillus subtilis.* All additives and supplements were thoroughly mixed in the ration prior to delivery to the bunk. Steer weight gains were monitored during a 30 day post trial period. Table 1 gives average daily feed consumption per head for each treatment during the trial.

TABLE 1 DAILY FEED CONSUMPTION PER HEAD

	STEERS		HEIFERS	
	CONTROL	**PROBIOTIC**	**CONTROL**	**PROBIOTIC**
BOVATEC SUPPL. (oz)	5.1	---	5.5	---
MINERAL SUPPL.(oz.)	1.9	---	2.0	---
PROBIOTIC SUPPL.(oz.)	---	5.0	---	3.6
COMPLIMENTARY MIN.(oz.)	---	4.2	---	4.0
GRAIN SORGHUM (lbs.)	7.2	8.3	5.1	5.0
CORN GRAIN (lbs.)	---	----	1.9	2.1
CORN SILAGE (lbs.)	7.2	8.3	7.1	7.0
ALFALF HAY (lbs.)	4.6	4.9	4.0	4.1

Rumen fluid was collected from 6 calves randomly selected from each pen on day 15, 23 and 37 of the trial. pH was determined immediately following sample collection. Six fecal samples were randomly collected from each pen at the same approximate times to determine dry matter content of the feces and proportion of fiber digested. Subsamples from the same animal were dried for dry matter determination and washed to determine undigested fiber. Fiber remaining after washing was dried and weighed. Fiber digestion was estimated based on the proportion of dry matter removed during washing.

RESULTS AND DISCUSSION

Steer calves on the probiotic diet consumed 14.65 pounds of dry matter per day vs 12.96 pounds for control steers. Probiotic steers gained 2.77 pounds per day compared to 2.52 for control steers. Heifers consumed 12.33 pounds of dry matter per day on the probiotic diet compared to 12.14 pounds for the control group. Heifers gained 2.38 and 2.24 pounds per day for probiotic and control groups respectively. One steer in the control group was treated for foot rot and one steer in the probiotic group required treatment for an infected eye dye to foreign matter. No differences in rumen fluid or fiber digestion were apparent. Rumen fluid samples were highly variable in all three samplings but averages tended to be similar for both steers and heifers on the two treatments. In the 30 day period following the end of this trial, probiotic supplemented steers gained 3.38 pounds per day on a high energy finishing diet compared to 3.11 pounds for steers previously in the control group. Table 2 gives performance information for all calves.

TABLE 2. PERFORMANCE OF WEANED CALVES ON CONTROL VS PROBIOTIC SUPPLEMENTED DIETS				
	STEERS		HEIFERS	
	CONTROL	PROBIOTIC	CONTROL	PROBIOTIC
NUMBER OF HEAD	24	23	19	20
STARTING WT (lbs.)	536	542	468	473
ENDING WT (lbs.)	627	642	549	558
FEED CONS.(DM/Day)	12.96	14.65	12.14	12.33
FEED PER GAIN (lbs.)	5.27	5.42	5.59	5.36
ADG during trial (lbs.)	2.52	2.77	2.24	2.38
ADG next 30 days (lbs.)	3.11	3.38	---	---
RUMEN FLUID ph	6.94	6.77	6.65	6.61
FECAL DRY MATTER (%)	24.4	25.73	27.57	26.53
FIBER DIGESTION (%)	59.76	55.90	56.58	54.13

Stress on the calves in this trial was less than most cattlemen impose on their calves by weaning in the late fall after the weather has turned for the worse. Weaning drylot calves amounts to sorting cows from the pen with the calves left behind to eat from the same bunk and drink from the same water fountain. Working calves (vaccinating and implanting) three weeks before weaning also helps reduce stress. Calves in this trial were weaned at about 165 days of age. Prior to weaning, calves were consuming approximately 4 pounds of grain and 4 pounds of chopped hay per day. The potential advantage of a probiotic and/or rumen conditioner added to the diet of highly stressed calves needs further evaluation.

Increased gains partially offset the added cost of the supplement during the trial. The 30 day feeding period after this trial saw a continued advantage for the probiotic fed calves. Translating this continued advantage into returns to the feed reduces the difference in cost per pound of gain. In doing this we need to assume that consumption was equal between steers from the two difference treatments. It is not possible to separate any effect from the probiotic or the rumen conditioner in this study. Further trials could identify specific effect from one or both products. Table 3 summarizes feed costs on a per head basis.

TABLE 3. FEED COSTS PER HEAD PER DAY FOR CONTROL VS PROBIOTIC SUPPLEMENTED WEANED CALVES				
	STEERS		HEIFERS	
INGREDIENT	CONTROL	PROBIOTIC	CONTROL	PROBIOTICS
PROBIOTIC SUPPLEMENT ($)	---	.206	---	.148
BOVATEC ($)	.048	---	.052	---
TRACE MINERAL (411), ($)	.022	---	.023	---
GRAIN SORGHUM ($)	.274	.316	.194	.191
CORN GRAIN ($)	---	---	.076	.085
CORN SILAGE ($)	.072	.083	.071	.070
ALFALFA HAY ($)	.115	.122	.100	.100
FEED COST/HD/DAY ($)	.531	.727	.516	.594

TABLE 4. COST OF GAIN FOR CONTROL VS PROBIOTIC SUPPLEMENTED WEANED CALVES				
	STEERS		**HEIFERS**	
	CONTROL	**PROBIOTIC**	**CONTROL**	**PROBIOTICS**
TOTAL FEED COST/HD ($) FOR 37 DAYS	19.65	26.90	19.09	21.98
TOTAL GAIN/HEAD (LBS)	93.24	102.49	83.88	88.06
FEED COST/LB GAIN($) FOR 37 DAYS	.211	.262	.230	.249
FEED COST/LB GAIN($)				
CALCULATED ON PROBIOTIC ADVANTAGE FROM ENTIRE 67 DAY FEEDING PERIOD*	.211	.243		
* Assumes equal feed consumption for 30 days following supplemented period.				

Feed costs used reflect market prices for grains and retail pricing for purchased supplements. Costs for feeding calves were calculated on the following prices: Ralco Mix Power Pak W/ 0903 mineral and Decox, $1316.00/Ton; Vigortone 411 Mineral, $367.20/Ton; Bovatec Supplement, $300/Ton; Grain sorghum; $3.81/CWT, Corn grain, $2.25/Bu, Corn Silage, $20.00/Ton and Chopped Alfalfa Hay, $50.00/Ton.

The limited time of the 37 day trial does not completely reflect the potential advantages from feeding a probiotic or rumen conditioner. More studies are needed to evalulate the effect of starting (stressed) calves on probiotic feeds and any continued feeding advantage. Several alternative management strategies could be used to reduce supplement costs but maintain the effect of the probiotic product. Each needs to studied more in depth to draw statistically accurate conclusions.

In addition to weaning time, some other specific uses of combination probiotic/rumen conditioner/mineral supplements to counter environmental and or management induced stress may include: replacement heifers wintering in an exposed area on a low quality roughage rations or steers on high energy diets pushed for maximum gains during inconsistent weather.

THIS TRIAL WAS PARTIALLY SUPPORTED BYA GRANT FROM RALCO MIX INC.

PROBIOTICS FOR EARLY WEANED BEEF CALVES

V.L. Anderson

SUMMARY

Two pens of early weaned beef calves (n=28) averaging 230 pounds were fed a high energy diet with one group receiving a probiotic product top dressed at 1 ounce per head daily. Calves consumed an average of 8.87 pounds of dry matter from July 7 to August 7. Average daily gain for probiotic supplemented calves was 2.97 pounds per day vs 2.84 pounds for the control group. Feed per gain was 3.34 pounds per pound of gain for the probiotic group vs 3.47 for the controls. Feed cost per pound of gain was $.170 for the control vs $.181 for the probiotic supplemented group during the 30 day trial.

INTRODUCTION

Early weaning is a management consideration in times of stress such as drought or high efficiency drylot operations where cows can be returned to a low cost residue based ration early after breeding season. Managing light weight calves and getting them off to a good start in the feedlot requires more time and expertise than heavier calves or yearlings. This factor makes early weaning unpopular for most cattlemen. Some new products on the market called probiotics may help calves get their rumens functioning sooner and thereby start on feed easier. Probiotics have no legal description. The term is generally used to refer to feed supplements that help an animal stay healthy and eating in the face of stress. The alternative is treating a sick animal with antibiotics.

MATERIALS AND METHODS

Twenty-eight Hereford and Hereford cross calves were weaned on July 7, 1987 to allow their dams to be fed a lower cost diet, rebreed easier and to study the performance of early vs normal weaned calves. Calves were eating about 3 to 4 pounds of creep feed daily when they were weaned. Steer and heifer calves were randomly allotted to a control or a probiotic treated group. All calves were fed to appetite a ration that was 32% dry rolled barley, 32% dry rolled corn, 6% protein supplement and 32% chopped alfalfa hay. All ingredients were thoroughly mixed and bunk fed once daily. Probiotic calves had their diet top dressed with 1 ounce per head per day of Fastrack manufactured by the Conklin Co. This is a product of lactic acid producing bacteria containing yeast culture, dried *streptococcus faecium,* dried *lactobacillus acidophilus,* dried *aspergillus oryzae* and dried *bacillus subtillis* fermentation products plus carriers. Calves were fed the probiotic supplement for 30 days and monitored for gain, feed efficiency and health problems. Weights were taken on August 7 and again on normal weaning date of September 16.

RESULTS AND DISCUSSION

Both groups of calves started on feed quite well although the probiotic supplemented calves were more aggressive in coming up to the feed bunk during the first week of the trial. Table 1 and 2 contain the data on performance, feed consumption and economics of this trial. No health problems were encountered with either group.

No statistical differences were detectable in the non replicated trial. Control calves gained 91 pounds vs 95 for the probiotic calves amounting to 2.84 and 2.97 pounds of gain per head per day respectively. For about the next month after the trial was over calves maintained even gains.

Table 1. PERFORMANCE OF EARLY WEANED BEEF CALVES FED CONTROL VS PROBIOTIC SUPPLEMENTED DIETS

	CONTROL	PROBIOTIC
NUMBER OF HEAD	14	14
START WT (lbs) July 7	230	229
END WT (lbs) Aug 7	321	324
AVERAGE DAILY GAIN	2.84	2.97
WT (lbs) September 16	445	448

Feed consumption over the 30 day trial was 9.85 and 9.93 pounds of air dry feed daily. Feed per gain averaged 3.47 for the control and 3.34 for the probiotic calves. Weights on 16 Sep were 445 and 448 pounds for control and probiotic calves respectively. with October 22 weights of 517 and 523 pounds. Feed costs per pound of gain were $.170 and $.181 for control and probiotic treated groups.

TABLE 2. FEED CONSUMPTION AND ECONOMICS OF EARLY WEANED BEEF CALVES FED CONTROL VS PROBIOTIC SUPPLEMENTED DIETS.

	CONTROL	PROBIOTIC
FEED CONSUMED PER HEAD (lbs)	286	288
FEED CONSUMED PER DAY (lbs DM)	9.85	9.93
FEED PER GAIN (DM/LB GAIN)	3.47	3.34
FEED COST PER HEAD ($)	15.47	17.19
FEED COST PER POUND OF GAIN ($)	.170	.181

THREE BARLEY/CORN DIETS FOR FEEDLOT STEERS

V. L. ANDERSON AND S. L. BOYLES

SUMMARY

Three barley/corn diets (10, 35 and 60% barley) were fed to Hereford and Hereford cross steers from after weaning to slaughter weight in a three year trial at the Carrington Research Extension Center Livestock Unit. Steers fed the 10 and 35% barley diets gained faster (P<.05) (2.86 and 2.84 lb per day respectively) than steers on the 60% barley diet (2.58 lbs.). Feed conversions were 6.71, 6.49 and 7.02 pounds of dry matter per pound of gain respectively. Carcasses from steers in all three groups were similar in quality and yield grade. Barley should be fed at the 10% level when it is 102 to 118% of the price per bushel of corn. The 35% level produces lowest feed cost with barley at 70 to 102% of corn prices and the 60% diet is most economical when barley is below 70% of the price per bushel of corn.

INTRODUCTION

Feed grain production in North Dakota far exceeds demand. Likewise, feeder calf production exceeds supplies sought by farmers and feeders within the state. Ironically, North Dakotans produce quality feedgrains and quality feeder cattle in high demand by feeders in other states. Cattlemen invest in genetically superior herd sires to produce high performance cattle only to sell off the calf crop at weaning. Similarly, agronomists develop excellent quality feedgrains adapted to North Dakota growing seasons only to have farmers sell their grain and ship it out of state. Producers in this state have an opportunity to add value to both cattle and grain by combining them in a feedlot.

Barley is one of the leading feedgrains in the northern plains states. It contains relatively high levels of protein plus adequate fiber and energy to provide excellent gains for growing calves. It is highly fermentable in the rumen and when fed alone, can occasionally cause acidosis. In combinations with other feedgrains or forages, it is very palatable and safe and is an excellent feed for backgrounding and finishing steers.

Corn grain is the most widely used feed grain in the country. Corn and barley in combination with a roughage source (hay and/or silage) represent an optimum combination of energy and protein for growing and finishing feedlot cattle. Feeding combinations of grains is generally more advantageous than feeding one grain alone. Feeding a rapidly digested grain(barley) and a amore slowly digested grain (corn) may reduce the incidence of acidosis and improve overall starch utilization. Few trials have been conducted on comparing barley corn combinations.

The objective of this research was to study the effect of different proportions of corn and barley on steer feedlot performance, carcass characteristics and the optimum combinations to maximize returns to labor and management.

EXPERIMENTAL PROCEDURE

A three year feeding trial was conducted at the Carrington Research Extension Center Livestock Unit using three barley-corn cominations for growing and finishing steers. Approximately 6 weeks after weaning each year, 48 to 57 straightbred Hereford and Hereford, Red Angus and Tarentaise sired crossbred steers were randomly allotted by breed group to one of three diets. Prior to allotment, all calves had been on a high energy growing ration since weaning in mid-September. The three diets were formulated to meet the energy needs for a gain goal of 2.9 pounds per day (NRC, 1984). Diets were fed to appetite. Table 1 lists ingredients for the three diets. The test weight of barley ranged between 45 and 49 pounds per bushel. Corn test weight ranged between 52 and 56 pounds. All grains were dry rolled.

TABLE 1. COMPOSITION OF THREE BARLEY-CORN DIETS

Ingredient	Diet 1	Diet 2	Diet 3
Barley (dry rolled)%	10	35	60
Corn grain (dry rolled)%	70	47	24
Alfalfa hay (chopped)%	15	15	15
Soybean meal, %	4	2	0
Bovatec supplement, %	1	1	1

The trial started in early November and continued until steers were ready for slaughter. All steers were implanted with Ralgro during the trial. Steers were housed in outside pens with bedding added during severe winter cold. Wind fences, tree belts and buildings provided wind protection. Steers were weighed every 28 days. End point of the trial was determined by weight and visual appraisal of each animal. Steers were marketed in three drafts each year based on relative finish. Slaughtering was done at Aneta Meat Products, Inc. Aneta, ND. Meat animal scientists from NDSU evaluated carcasses at the slaughter plant. All steers were marketed at 11 to 12 ½ months of age.

Differences between treatment groups were analyzed by analysis of variance

RESULTS AND DISCUSSION

All three rations used in this study were very palatable and sustained satisfactory weight gains. Starting weights were similar but end weights tended to be higher for Diets 1 and 2 (Table 2). Days on feed averaged 4 to 5 days longer for steers fed the 60% diet Steers on Diet 3 gained slower (2.63 pounds per day) ($P<.05$) than steers on Diets 1 (2.86) and 2 (2.84). Gains in all three treatments were consistent from start to finish with no interaction detected based on weight, weather or length of time on feed.

TABLE 2. FEEDLOT PERFORMANCE OF STEERS ON THREE BARLEY/CORN DIETS

	Diet 1 10% Barley	Diet 2 35% Barley	Diet 3 60% Barley
Number of head	51	50	50
Starting Weight (lbs.)	639	635	637
Ending Weight (lbs.)	1079	1070	1050
Days on Feed	154	153	158
Average Daily Gain (lbs.)	2.86	2.84	2.58
Feed Per Gain (DM Basis)	6.71	6.49	7.02

Feed conversion or feed per gain appeared to favor the 35% Diet followed by the 10% and 60% Diet.

Carcass information is presented in Table 3. Carcasses were weighed and graded after allowing adequate time for chilling. Cold carcass weights were adjusted to hot weight by adding 2%.

TABLE 3. CARCASS DATA FROM STEERS FED THREE BARLEY/CORN DIETS

	Diet 1 10% Barley	Diet 2 35% Barley	Diet 3 60% Barley
Carcass weight (lb)	623	619	601
Dressing Percent	61.44	61.53	61.20
Fat Thickness (inches)	.39	.40	.36
Kidney, pelvic, heart fat (%)	2.35	2.25	2.32
Loin eye area (sq. inches)	11.60	11.58	11.23
USDA Quality Score*	9.65	9.65	9.47
Yield Grade**	2.71	2.71	2.63

*Quality score is based on point values for each carcass as follows: 7= high standard; 8=low select; 9=high select; 10=low choice; 11=average choice; 12=high choice and 13=low prime.
**Yield grade (YG) is based on fat to lean ratio with 1=very lean and 5=very fat. Industry currently considers yield grades of 1, 2 and 3 as normal. YG of 4 or 5 are discounted for being too wasty.

All carcass values are similar but loin eye area for Diet 3 steers tended to be smaller but carcass weights for cattle on this diet were proportionately lighter. All carcasses ended with an acceptable Yield Grade of 2.63 to 2.71. An economic analysis was conducted with the trial data. Total gain, feed conversion and days on feed were used to calculate feed requirements for the trial. Barley and corn were valued at threee different prices per bushel (1.50, 2.25 and 3.00 respecitively). Alfalfa hay was valued at $40, 70 and 100 per ton. Soybean oil meal was priced at 200, 250 and 300 per ton. The protein sources were combined into one price at each low, medium and high price. It was assumed that the price of protein incresease similarly for alfalfa and soybean oil meal. The ionophore supplement was not calculated into the feed cost as it was fed at a constant level to all treatments. The following table represents the total feed cost per head for the feeding period from after weaning to slaughter. The reader can compare levels of barley, with cost of protein, barley and corn grain.

The most profitable ration is dependent on the price of corn, barley and protein. Normally, when the price spread is large between barley and corn, the feed cheapest ration uses the most of the lowest price feed. Rations of mixed grains have been shown to be more efficient in conversion and gains than any single grain diet.

TABLE 4. FEED COSTS PER HEAD FOR GROWING AND FINISHING STEER CALVES ON THREE BALEY-CORN DIETS USING THREE PRICES FOR BARLEY, CORN AND PROTEIN

	Barley Price ($/bu)								
	$1.50/bu.			**$2.25/bu**			**$3.00/bu**		
Diets	**10**	**35**	**60**	**10**	**35**	**60**	**10**	**35**	**60**
Corn Price $1.50/bu									
CP[a]	85	**81***	82	**90***	96	109	**94***	111	136
MP[b]	95	**88***	**88***	**99***	104	115	**104***	119	143
EP[c]	104	96	**95***	**109***	111	121	**114***	127	149
$2.25/bu									
CP	113	98	**91***	118	**114***	118	**122***	129	145
MP	123	106	**98***	127	**122***	123	**132***	137	152
EP	132	114	**104***	137	**129***	131	**141***	145	158
$3.00/bu									
CP	141	116	**100***	145	132	**128***	150	**147***	155
MP	150	124	**107***	155	139	**134***	159	**155***	161
EP	160	132	**113***	164	147	**141***	169	**162***	168

[a, b, c] Cheap protein, Medium priced protein, and Expensive protein
* Lowest price within row for a particular price of barley

The decision to sell or feed calves is considered every year. More risk is probably encountered with the feedlot, but the potential for profit is greater. One of the key elements to a successful feeding enterprise is to get the calves started early before adverse weather occurs. Calves should be worked 3-4 weeks prior to weaning. It is important that calves learn to eat from a bunk before weaning to reduce the stress from a major diet change at weaning time. Weaning in September or early October enables calves to overcome the stress of weaning and vaccinations before cold fall rains, wind and snow become another stressor to challenge calves health.. Once calves are on a moderate to high energy ration, minimal facilities and care during the winter are necessary to keep animals relatively comfortable. Wind protection from trees, windfences and buildings is important but inside housing is not recommended due to moisture condensation and respiratory problems that often develop. Occasional bedding during cold weather is appropriate.

Appreciation is expressed to Dr. Paul Berg and Mr. Phil Berg, NDSU Department of Animal and Range Sciences for grading carcasses in this trial.

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FEEDLOT AND CARCASS PERFORMANCE OF HEREFORD AND 3 WAY CROSSBRED STEERS

V. L. ANDERSON

Summary

During the past 3 years, 46 straightbred Hereford and 102 3 way crossbred (Hereford, Red Angus and Tarentaise) steers were fed from weaning until slaughter on high energy barley/corn diets. Straightbred Hereford steers gained 2.72 pounds per day for the 160 day feeding period compare to 2.80 pounds for the 153 day feeding period for crossbred steers. Starting weights and ending weights were 75 pounds 69 pounds heavier respectively for crossbred steers.

INTRODUCTION

Crossbred steers are more numerous in the market but represent large potential variation depending on their breeding. The progeny of crossbred cows with moderate milk production are heavier at weaning and continue that advantage through the feeding period. Previous trials at this station suggest that once in the feedlot, straightbred Hereford steers maintained equal growth rate with similar frame size crossbred F1 cattle. The easy keeping nature of Hereford cows make them useful in a harsher climate or under low input management systems. This paper is an evaluation of the growth rate in the feedlot for straightbred Hereford vs Hereford, Red Angus and Tarentaise cross steers.

MATERIALS AND METHODS

The cow herd at the Carrington Research Extension Center is composed of approximately 60 straightbred Herefords maintained as a “low input” herd and used for controls in a crossbreeding systems study. About 80 crossbred cows were developed from the same Hereford base by breeding a third of the Hereford cows to Tarentaise and a third to Red Angus sires. More than 12 sires from each breed were used by artificial and natural service. Cows were managed in drylot throughout the summer on diets of corn silage and alfalfa hay. Calves were offered a creep feed of ½ chopped hay and ½ barley or grain sorghum. Calves were weaned in mid September and placed on a 45 day preconditioning program before starting the feedlot trial. In late October, steers were weighed and allotted to one of three barley/corn diets based on breed. The diets were 10, 35 and 60% barley with 15% chopped alfalfa hay and the balance corn grain. Soybean meal was fed to equalize protein. Grains were dry rolled, mixed with other ingredients and fed once daily in fenceline bunks. Steers were weighed monthly. Each year animals were marketed in three groups two weeks apart with visual appraisal determining marketing time. Carcasses were evaluated by NDSU animal scientists at Aneta Meats Inc. Aneta, ND.

RESULTS AND DISCUSSION

Starting weights for Hereford steers was 75 pounds lighter than crossbred steers probably due to higher milk production potential of mother cows. Mid trial weights taken in January showed a 91 pound difference however final weights were only 69 pounds apart. End weights were lighter than expected especially in the third year of the trial. Days on feed averaged 7 days less for crossbred steers with daily gains of .08 pounds more per head. Hereford steers gained more total pounds in the trial.

TABLE 1. FEEDLOT PERFORMANCE OF HEREFORD AND CROSSBRED STEERS

	HEREFORD	CROSSBRED
Number of head	46	102
Starting weight (lbs.)	585	660
Mid weight (lbs.)	800	891
End weight (lbs.)	1017	1086
Days on feed	160	153
Total gain (lbs.)	432	426
Avg. Daily Gain (lbs.)	2.72	2.80

Steers were fed to maximize gains during the winter feeding period. Herefords finished at much lighter weight than the crossbred steers which may initially suggesting a longer slower feeding period to reach heavier slaughter weights. Looking at the carcass data however indicates animals were done to nearly identical fat content as determined by yield grade. Quality grade of Low Choice is the desired industry grade given a minimum amount of fat. Dressing percent and rib eye area tended to favor crossbreds.

TABLE 2. CARCASS EVALUATION OF HEREFORD AND CROSSBRED STEERS

	HEREFORD	CROSSBRED
Carcass weight (lbs.)	582	640
Dressing Percent	61.00	61.69
Rib Eye Area (sq. in.)	11.02	11.89
Fat Thickness (in.)	.39	.38
Kidney, Pelvic Heart fat (%)	2.07	2.49
Yield Grade*	2.64	2.65
Quality Grade**	5.60	5.58
USDA Grade**	Choice -	Choice-

*Calculated score based on relative amount of fat to lean meat in the carcass.
**USDA Quality grade and score (6.0 = low choice, 5.0= high select) based on internal marbling in the rib eye

These data suggest animals of slightly different frame size can be effectively marketed at a given fat content but final weight may vary with management system and time on feed. Feedlots need to keep current to preclude overfat cattle from reaching market and putting pressure on demand. Cattle fed hard and marketed young may not be as heavy as yearlings when finished. Young beef produce efficient gains when not overfed with greater assurance of tenderness for excellent consumer acceptance.

WINTERING REPLACEMENT HEIFERS ON DIETS WITH SUPPLI-MIX VS. BOVATEC

Dale Burr and V. L. Anderson

INTRODUCTION

There is an increase in interest brought on by consumer concerns in feeding non drug or natural supplements to beef cattle. One such product called Suppli-Mix contains a "rumen conditioner" that is designed to help insure a stable rumen environment and promote efficient digestion. The relative performance of cattle fed natural supplements vs currently approved drugs is important as feed costs increase and possibly reduced gains affect production costs.

EXPERIMENTAL PROCEDURE

Hereford and Hereford cross replacement heifer calves (n=63) were randomly allotted to a wintering trial comparing Bovatec, an ionophore that is well established as a growth promotant to Suppli-Mix, a natural feed supplement manufactured by Ralco-Mix Inc. Marshall, Mn. Suppli-Mix contains lactic acid and cobalt which help maintain even digestion and general good health in times of stress. Cobalt is important to Vitamin B12 synthesis, appetite and optimum digestion. The 125 day trial was conducted at the Carrington Research Extension Center Livestock Unit starting on December 15, 1987. Heifers were fed in fenceline bunks once daily and watered from the same fountain in adjacent pens. No bedding was used but calves were allowed into an open front shed for wind and storm protection in the exposed pen.

The diet offered consisted of corn silage, chopped hay and straw. Table 1 gives average feed per head per day. Daily consumption varied with with the weather and was adjusted based on bunk readings. Suppli-Mix and Bovatec were fed free choice mixed in similar commercial mineral formulations of Ralco High PM Range Mix and GTA BVT720 Mineral respectively. The trial was terminated on April 19.

TABLE 1. DAILY FEED CONSUMPTION FOR WINTERING REPLACEMENT HEIFER CALVES WITH BVT OR SUPPLI-MIX

INGREDIENT	BVT MINERAL	SUPPLI-MIX
Corn Silage	18.00	17.23
Alfalfa Hay (lbs)	9.39	8.95
Wheat Straw (lbs)	1.93	1.84

RESULTS AND DISCUSSION

Daily mineral consumption varied greatly. A target of 4 oz per head daily was higher than the actual consumed amount of 2.7 oz for BVT and 2.8 oz for Suppli-Mix containing minerals.

Table 2. PERFORMANCE OF REPLACEMENT HEIFER CALVES FED BVT OR SUPPLI-MIX IN WINTERING RATIONS

	BVT Mineral	Suppli-Mix
Number Head	31	32
Start Wt. (15 Dec 87) (lbs).	648	644
End Wt (19 April 87) (lbs).	781	783
ADG (lbs)	1.07	1.11
Feed/Gain	14.30	14.43

The two groups gained at similar rates. End weights were in line with target weights for breeding yet heifers were not excessively fleshy. Heifers in both pens were exposed to severe cold and wind chills during the winter and at times were reluctant to come up for feed. Visual observations suggest that the Suppli-Mix group may have been more aggressive at the bunk at feeding time. At the end of the trial, 9 heifers in the BVT pen and 3 heifers in the Suppli-Mix pen were showing symptoms of what was diagnosed as IBR.

Feed efficiency was very close for both groups at 14.30 and 14.43 pounds of dry matter pound of gain for BVT and Suppli-Mix groups respectively. Mineral costs were $.038 per head per day for the BVT mineral and $.068 per day for the Suppli-Mix group. While performance appears to be equal, supplement costs were higher for the Suppli-Mix group.

SECTION IV

SPECIAL REPORT

NEONATAL CALF SCOURS

BY

GEORGE J. SCHAMBER, DVM
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NEONATAL CALF SCOURS
By
George J. Schamber

While I'm talking I want you to keep in mind two basic concepts and try to think of how you could make changes regarding these concepts as they apply to your herd or situation if you have had a scours problem.

Very basically, there are but two ways and only two ways that you can prevent and control an infectious disease. The first is that you alter the susceptible animal's immunity or resistance. The second is to break the disease cycle, i.e. prevent the spread of the disease from an infected animal to a susceptible non-infected animal. These principles could and should be used for any infectious disease but we are going to discuss them in regard to calf diarrhea.

Causes

A neonatal calf is one that is from birth to approximately three weeks old. Neonatal calf scours, diarrhea or call it what you will is an infectious disease, therefore the two principles mentioned above are essential to controlling this problem. We will start by briefly discussing what causes the disease.

Viruses - Rota and corona viruses are the most viral causes of scours. Other viruses such as adeno virus, enterovirus and BVD virus can cause scours but those types of problems are unusual in neonatal calves. Rota virus usually causes diarrhea very early in life, from the first day to four or five days. The affected calves can be severely depressed, salivate or drool, have a profuse watery diarrhea, and lose their appetite. Corona virus usually hits a little older calf, around five to fourteen days old. These calves usually aren't as depressed as with rota virus and often their diarrhea has more mucus present giving the feces the appearance of raw egg white or raw scrambled eggs. Frequently, they continue eating.

These viral infections are most often complicated by a superimposed bacterial infection.

Bacteria

E. coli is the most frequent bacterial offender in calf scours. Frequently, E. coli alone will cause scours. These organisms secrete toxins that alter the ability of the gut to absorb water and, in fact, can cause the gut to secrete water into the lumen of the gut. This gives the feces the fluidity that you see as diarrhea. Occasionally these organisms enter the circulatory system and cause septicemia (blood poisoning).

Salmonella organisms occasionally cause scours in calves but this is infrequent and usually the calves are older. Mostly calves in the three plus week age range are affected and quite often (especially in beef calves) BVD virus is also involved.

Enterotoxemia can also cause scours but usually the affected calves die very suddenly and only occasionally will signs of colic and bloody diarrhea be seen prior to death.

We've seen some reports of scours problems being caused by Campylobacter species. Quite a few years ago our lab tried to isolate these organisms but the results weren't very encouraging. These organisms have been isolated from and are causing problems in other species (especially man) recently and maybe they are becoming more of a problem than we saw previously.

Protozoans

Coccidiosis causes bloody scours but this usually occurs in older calves, generally three or four weeks or older. I've never seen it in younger calves but this is not to say that it couldn't occur. It would be very rare for this to affect a neonatal calf.

Cryptosporidiosis also is a protozoan organism that can cause scours. Usually, when this is seen there are other pathogens (viruses and bacteria) also cauing problems. Furthermore, individuals (of any species) that are affected with this most often have an immune system problem or deficiency.

These infectious agents cause scours but I should mention nutritional (non-infectious) scours briefly. This occurs when some stress factor occurs and disrupts the calf's normal feeding pattern. When the hungry calf gets an opportunity to eat it overeats and problems develop. If the calf is alert and not depressed it will do all right but if not it should be treated because it may have complicated its problem with one of the bacteria mentioned previously.

Prevention and Control

Now that we've got a background on what causes scours, what can we do to prevent and control it. We will start with altering the susceptible calf's resistance and immunity. A newborn calf should get at least 5% of its body weight in colostrum within the first 24 hours of life for this resistance. We have to start with the cow when we talk about calf resistance and first we should consider cow selection. A brood cow should have good udder and teat confirmation so as to facilitate nursing. We must consider the importance of the cow's nutrition. We know that the cow's colostrum is essential for the calf to ward off infectious diseases but we must consider that colostrum should be rich in antibodies which are proteins and for the cow to make colostrum rich in antibodies she must have adequate protein in her diet.

When handling cases of "weak calf syndrome" at the diagnostic lab, I have been able to get serum samples from the mothers of the affected calves and it is not an infrequent finding to have nutritional deficits in these cows. The same can be true regarding mothers of calves with scours. I feel adequate or good nutrition is a management area sometimes overlooked in calf scour problem herds.

Now if the cow has adequate nutrition to supply good colostrum, the next thing to consider is getting the most antibodies into this colostrum. To do this the cow has to respond to antigens and the way we can enhance this is to vaccinate the cow during gestation or prior to calving with the antigens of the more common causes of scours; i.e. E. coli, rota and corona viruses. Sometimes the vaccines are given to the calf but this is a poor second choice. For a vaccine to be effective it has to be given before exposure. The importance of colostrum from a cow with good protein balance from good nutrition and good exposure and sensitization to antigens of calf scour causes can't be over stressed. To reinforce this, we occasionally see scours problems where only the calves of heifers have problems. The heifer may be using protein for her own growth and she often has not had the exposure (either natural or by vaccination) to all of the scours pathogens. This is also the reason for selecting colostrum for freezing from older cows rather than heifers.

We started with two principles and we've briefly talked about one. It must be mentioned that a vaccine program alone cannot prevent scours and good management techniques have to supplement the vaccine program. Now we will consider how to break the disease cycle by considering managerial changes.

All of the organisms that cause scours get into the calf by being eaten or swallowed. Anything the newborn calf touches with his nose or tongue is a potential source of infection. It should go without saying that drainage and sanitation or cleanliness of the maternity area cannot be over-stressed. One of the biggest mistakes that producers make is to crowd the cattle into a maternity area, especially if it is wet or poorly drained. This stress causes the release of cortisone in the cow and this shuts off the immune system and antibody production goes down – how does this affect the quality of the colostrum? Its quality becomes inadequate. When crowding occurs, sanitation problems develop. More cattle in a smaller place yields increased quantities of feces that if infected with the scours pathogens, are going to overwhelm the newborn calf's gut and result in infection. If scours does occur in the calves and the cows that haven't calved are allowed to remain in the area, their calves will be exposed to organisms that now are more pathogenic (more able to cause scours) and are probably becoming more resistant to antibacterials and antibiotics because you've probably tried to treat the sick calves. A good guideline is to look at what successful dairymen have done for scours control.

Their cows calf in <u>clean</u> maternity pens that have plenty of room and they use hutches or other penning techniques that avoid exposure of the newly dropped calf to one that is two weeks old and has diarrhea. They've taken steps to break the disease cycle.

Occasionally we have the history of the introduction of new cattle or (worse yet) the introduction of new calf (often a dairy calf from a sale barn) onto the ranch or farm. Often diary calves from sales have no antibodies against scours causing organisms and their exposure to such organisms at sales barns make them walking time bombs. These are excellent sources of the infectious agents that cause scours. They probably should be avoided regardless of how attractive they or their price appear.

Other stress factors that need to be considered are shelter from not only rain or snow but from the wind as well. Wind alone can be as stressful as temperature and moisture environmental changes and research in humans suggests it may be more harmful than the other environmental elements and worse yet when combined with them. Again, these stress factors drop antibody production in the cow and increase susceptibility to disease in both the cow and the calf.

<u>How can the diagnostic laboratory help?</u>

Our role is to try to identify the infectious agents causing the problem.

If we identify the presence of a virus, you can better prepare your herd the next time around with the proper vaccine. It is important to sample early in the course of the disease because often the offending virus is no longer present a few days into the course of the disease. Our bacterial isolation and sensitivity tests can give you and your veterinarian useful information for better selection of antibacterials to treat with. If at all possible it is best to sample for this test before antibacterial therapy is started.

We also look at and appraise tissues microscopically. By doing this, we are frequently able to detect other problems that complicate treatment or indicate changes in treatment.

Treatment

I would suppose that this is the area of most interest for you but unfortunately I have no new or magic solutions. When we consider treatment we have to concern ourselves with what actual problems are occurring that cause the scouring calf to die.

In our discussin of the pathogens that cause scours, we are somewhat fortunate in that the treatment is the same for E coli, rota and corona viral induced problems. As a result of severe diarrhea, due to any of the infectious agents, severe dehydration occurs. Also, due to the loss of bicarbonate and electrolytes (salts) in the excessive fluid lost with diarrhea, electrolyte imbalances and (even worse) acidosis or increased acidity of the blood occurs. Therefore, the major clinical treatment must revolve around fluid therapy or replacement and restoring electrolyte balance and correcting the acidosis.

The best and most effective treatment is to give the electrolyte and replacement fluids intravenously. Unfortunately this is the most expensive and inconvenient course. Giving oral fluids is also very good and it has the advantages of being less expensive, easier to administer and less time consuming. The calf's stomach can absorb considerable volumes of fluids but if the calf is in shock (cardiovascular collapse) its blood circulation will not adequately pick up the fluids and electrolytes. A severely dehydrated, depressed calf with cold extremities and subnormal body temperature probably will not respond to oral fluid therapy and only IV therapy can save these calves. These cold, shocky calves should also be warmed with heating devices.

Subcutaneous administration works well but, depending on the constituents of the fluids, especially if glucose is present, may not be picked up very well by the circulatory system.

Some home concoctions of fluids can be used and are given at the end of this paper but, most likely, the electrolyte solutions you can purchase from your local practicing veterinarian are equally or more effective and will cost about the same in the long run.

It is important not to administer milk or milk replacer during the treatment period (24 to 48 hours) so as to not restimulate growth of the offending pathogens. It should also be remembered that the nutritional value of these concoctions or commercial preparations are not adequate for over 48 hours. The calf should be returned to the cow (after she has been milked out) as soon as the calf can follow and stay with her.

Commercial absorbing agents and products like Pepto Bismol(R) are often useful as supportive treatment in scours cases. These agents soothe the lining of the gut and also absorb the toxins which lessens or slows down diarrhea. One problem I've noted with the use of these products from observations in the diagnostic lab is that they are given too late to have the proper effect. With any treatment for any disease, it must be given soon enough for it to help the sick animal.

I have intentionally avoided the use of antibiotics up until now because I feel antibiotics are grossly misused. Most of you have used gentimicin for treating scours and this spring I noticed a significant number of E. coli isolates from scours cases (both in pigs and calves) that were resistant to gentimicin. Furthermore, gentimicin can be nephrotoxic and if a calf (or other animal) has decreased kidney function (as seen in dehydration, electrolyte imbalances and acidosis) the drug can damage the kidneys. Again, the culture and sensitivity tests can provide the information regarding which drugs will work and which probably will not.

Several studies and reports indicate that antibiotic therapy may prolong clinical signs and sometimes may cause more problems than they correct. Antibiotics have no effect on viruses and sometimes if a calf has a severe viral problem its failure to respond to antibiotic therapy is attributed to that.

We occasionally see fungal or mycotic problems in calves due to overzealous treatment with antibiotics. In these cases the antibiotics destroy not only the harmful bacteria but those that are beneficial and necessary for digestion. When the normal flora or bacteria are killed off, fungii or mycotic organisms thrive. Generally, these calves will not survive regardless of what is done for them.

Antibiotics are indicated if septicemia (blood poisoning) as a complication of scours occurs. I'm sort of neutral regarding antibiotic use in cases without septicemia. I think that every situation and the use of antibiotics in that situation depends on the circumstances surrounding that situation. I would just advise approaching the use of antibiotics with caution and forethought rather than another scouring calf, another shot of antibiotic approach.

The use of antibiotics does not make a major contribution to the two principles we talked about previously. Unfortunately antibiotic therapy is the most stressed feature of scours control whereas it should have a fourth or fifth priority.

Now's your chance. Any questions?

References

Parts of this presentation have been taken from:

1. Neb Guide Bulletin G75-269, Nove., 1982.
2. Extension Bulletin AS-776, Oct., 1982.

Home Concoctions for Rehydration Therapy

1. Combine 1 can beef consomme, 1 package fruit pectin (Sure Jell or Pen Jel), 2 teaspoons low sodium salt (Morton Lite Salt), 2 teaspoons baking soda, and add enough warm water to total 2 quarts.
2. Combine 1 can beef consomme, 3 cans warm water, and 1 heaping tablespoon baking soda.
3. Combine 1 tablespoon baking soda, 1 teaspoon salt, and 250 cc (8 ounces) 50% dextrose or 8 ounces light Karo syrup, and add enough warm water to total 1 gallon.

Do not overfeed! Administer up to 1 quart of any of these three solutions every three to four hours, depending upon the degree of dehydration and fluid loss.

Always clean and sanitize the tube or feeding apparatus after use and between using it in different calves.