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Mari Lubberstedt
University of Nebraska-Lincoln

Terry L. Mader
University of Nebraska-Lincoln, tmader1@unl.edu

Jill Heemstra
University of Nebraska-Lincoln, jheemstra3@unl.edu

Kelly Letchenberg
Consultant Midwest Veterinary Research, Oakland, Nebraska

Evaluation of Growth-Promoting Systems for Heifer Calves Finished in the Feedlot

Mari Lubberstedt
Terry Mader
Jill Heemstra
Kelly Lechtenberg[1]

Optimum growth-promotant systems for finishing heifer calves include an initial implant with either Synovex-C or Synovex-H, followed by replanting with Synovex-H and Finaplix-H.

Summary

Two-hundred ten head of predominantly British and/or British x Continental cross heifers were assigned to six implant/reimplant treatment groups (five pens/treatment). In addition, melengestrol acetate (MGA) was provided to four treatment groups from day 28 until 48 hours prior to slaughter. Heifers not fed MGA had the greatest number of immature ovaries, although they were also the most efficient in feed conversion (lower feed to gain ratio). Heifers fed MGA and implanted with Finaplix were the least efficient in feed conversion.

Introduction

Generally, a recommended implant-reimplant program consists of an initial implant with estrogenic activity, followed by a second implant exhibiting both estrogenic and androgenic effects 70 to 100 days prior to slaughter. However, feeding melengestrol acetate (MGA) is another option for improving gain and efficiency in heifers. Issues concerning estrogen/androgen combinations and MGA feeding have not been fully addressed. Due to potential implant failure, and the possible additive effects of MGA in combination with an implant, producers may feed MGA plus implant cattle as well. The benefits of feeding MGA are primarily associated with heifers with functional, mature ovaries. The effects of implants on the development of the reproductive tract can vary. Characterization of implant effects on ovarian development are needed. Few studies provide data relevant to growth promoting systems for heifers fed more then 150 days, such as with heifer calves. Previous studies have found benefits to programs utilizing low dose (estrogenic) implants followed by high dose (estrogenic or estrogenic and androgenic) implants in long-fed steers and heifers. The objective of this study was to evaluate low dose/high dose implant systems when used in combination with the feeding of MGA for heifer calves finished in the feedlot.

Procedure

Two-hundred ten head of predominantly British and British x Continental cross heifers were eartagged and vaccinated for seven-way clostridial, IBR, PI3, BRSV and H. Somnus. Heifers were fed a receiving diet for approximately 10 days, after which time they were assigned to blocks based on their average initial weight and randomly assigned to pens (seven head/pen). The initial weight was the average of weights taken on two consecutive days before feeding. Pens were randomly assigned to six implant treatment (Trt) groups (five pens/treatment). On day zero, the heifers were weighed and implanted according to the treatment assignments; Synovex-C was implanted in groups 1 through 3 and Synovex-H was implanted in groups 4 through 6. On day 70, the heifers were implanted with Synovex-H and/or Finaplix-H, according to the experimental design (Table 1).

(Continued on next page)

Table 1. Experimental design.

Study Group	Implant treatments[a] Day 0	Day 70	MGA fed[b]	Replicates (No. of pens)	Animals assigned per pen
1	Synovex-C	Synovex-H + Finaplix H	none	5	7
2	Synovex-C	Synovex-H + Finaplix-H	yes	5	7
3	Synovex-C	Finaplix-H	yes	5	7
4	Synovex-h	Synovex-H + Finaplix H	none	5	7
5	Synovex-H	Synovex-H + Finaplix-H	yes	5	7
6	Synovex-H	Finaplix-H	yes	5	7

[a]Synovex-C contains 10 mg estradiol benzoate and 100 mg progesterone; Synovex-H contains 20 mg estradiol benzoate and 200 mg testosterone propionate; Finaplix-H contains 200 mg trenbolone acetate.
[b]Melengestrol acetate (MGA) was provided to all heifers at .45 mg/hd/day from day 28 to 48 hours prior to slaughter.

Table 2. Diet Composition.

Item	Diet number						
	1	2	3	4	5A	5B	5C
Days fed	5	5	5	6	7	98	46
Diet, % DM	74.02	72.66	70.18	70.98	68.96	69.08	66.39
Ingredients, % diet DM							
Corn silage	—	—	—	—	—	—	7.50
Alfalfa hay	37.60	25.70	15.77	7.19	—	—	—
Ground high-moisture ear corn	25.00	25.00	30.00	30.00	30.00	30.00	15.00
Ground high-moisture corn	17.42	22.61	24.31	28.18	31.63	30.59	34.34
Dry-rolled corn	17.42	22.61	24.31	28.18	31.62	30.58	34.33
Mineral-vitamin premix[a]	1.25	0.92	0.54	—	—	—	—
Rumensin supplement[b]	1.31	1.31	—	—	—	—	—
Liquid supplement[d]	—	1.85	3.04	4.42	4.72	4.72	4.72
Rumensin/Tylan supplement[c]	—	—	2.03	2.03	2.03	2.03	2.03
Control/MGA supplement[e]	—	—	—	—	—	2.08	2.08
Content, DM basis							
Crude protein, %	12.55	12.50	12.00	12.00	12.03	12.08	12.12
Neg, Mcal/cwt	52.00	56.00	59.00	62.00	64.64	64.24	64.17
Nem, Mcal/cwt	80.74	85.16	88.59	91.95	94.95	94.46	94.12
Calcium, %	0.73	0.74	0.69	0.66	0.60	0.64	0.65
Phosphorous, %	0.34	0.34	0.34	0.34	0.35	0.35	0.34
Potassium, %	0.91	0.84	0.75	0.70	0.63	0.64	0.67
Magnesium, %	0.20	0.18	0.17	0.15	0.14	0.14	0.15
Sulfur, %	0.19	0.18	0.17	0.16	0.15	0.15	0.15
Salt, %	0.25	0.30	0.30	0.28	0.30	0.30	0.30

[a]Corn based supplement containing on DM basis 19.85% salt, 14.21% Ca, 3.85% P, .21% K, .17% Mg, .27% S, .066 ppm Mn, .066 ppm Zn, .066 ppm Fe, .0066 ppm Cu, .002 ppm I, .00067 ppm Co, and 237,254 IU vitamin A/kg.

[b]Contained on DM basis 96.72% ground corn, 2.14 % molasses, 1.14 % Rumensin 60 (60g monensin/lb).

[c]Contained on DM basis 96.05% ground corn, 2.13 molasses, 1.14% Rumensin 60 and 0.68% Tylan 40 (40g Tylosin/lb).

[d]Contained on DM basis 50% CP, 47% NPN, 12.30% Ca, 6.3% salt, .79% P, 4.76% K, .15% Mg, .35% S, .0035% Zn, .0010% Fe, .0028% Mn, .0013% Cu, .0008% I, .0001% Co, 105,000 IU vitamin A/ kg, 24,500 IU vitamin D and 35 IU vitamin E/kg.

[e]Control supplement contained on DM basis 36.51% ground corn, 30.62% soybean hulls, 19.96% wheat midds, 4.21% molasses, 5.61% limestone, and 3.10% soybean meal. MGA (melengestrol acetate 441 mg/kg) was put in at .5% of control supplement formulation to make the MGA supplement.

Melengestrol acetate (MGA) was provided to groups 2, 3, 5 and 6 at .4 to .45mg/hd/day from day 28 until it was withdrawn from the feed 48 hours prior to slaughter. The feeding of MGA was delayed until day 28 when cattle were on the highest energy diet, a common practice in feedlots where supplement formulations and levels fed are designed for feeding in the final ration only.

At the start of the trial, all heifers were stepped-up to a high-energy finishing ration and were on full-feed by day 28 (Table 2). Heifers were fed Rumensin and Tylan throughout the 172 day feeding trial. Full-weights were taken on days 28, 70, 126 and prior to slaughter (day 172). Ovarian data, hot carcass weight and liver abscesses were determined on day of slaughter. Marbling score, fat thickness, percent kidney, pelvic and heart fat (KPH), yield grade, number of dark cutters and ribeye area were recorded following a 24-hour (minimum) chill. During the study, three heifers were removed due to death or health-related problems independent of treatment assignment and were not included in the statistical analysis.

Statistical analyses for this trial were conducted using the GLM procedures of SAS (1991). Preplanned contrast included initial implant (IMP; group 1, 2, and 3 versus 4, 5 and 6); growth promotant regimen (GP; groups 1 and 4 versus 2 and 5 versus 3 and 6) and IMP x GP interaction except for characteristics which were compared using chi-square test. For those, the model included IMP, GP and a comparison between initial implant groups that received only MGA (Treatments 2 and 3 versus Treatments 5 and 6). In addition, contrasts were performed between treatment groups receiving MGA versus groups fed no MGA (Treatments 1 and 4 versus Treatments 2, 3, 5 and 6) and between Synovex-H in combination with Finaplix versus Finaplix alone (Treatments 3 and 6 versus 1, 2, 4 and 5). Liver abscesses, ovarian data, percent dark cutters and quality grade were analyzed by the frequency procedure of SAS (1991) using the chi-square option.

Results

The implantation of Synovex-H increased average daily gains and decreased feed required per unit of gain in the first 28 and 70 days of the study (Table 3). The addition of melengestrol acetate (MGA) to the diet at day 28 did not significantly affect average daily gains or dry matter intake. No differences in dry matter intake were observed among the growth-promotant treatments. Feed required per unit of gain was the least from zero to 70 days and over the entire trial for heifers not fed MGA. At the end of the trial, the least efficient in feed conversion were heifers fed MGA and implanted with only Finaplix.

Heifers not fed MGA had the largest ribeye area, while heifers implanted with Finaplix only had the smallest ribeye area (Table 4). Lower yield grade was also observed for heifers not fed MGA. Heifers initially implanted with Synovex-H showed an increased occurrence of liver abscesses. No differences in quality grade were found.

There was an unusually large incidence of dark cutter carcasses. This could not be attributed to any one experimental treatment, but possibly was caused by factors, including weather. The two days prior to slaughter, for example, were abnormally hot and humid. In addition, heifers were held overnight at the packing plant prior to slaughter and were not fed MGA 48 hours prior to slaughter. Heifers were not segregated by treatment at the packing plant.

Ovarian data (Table 5) indicate

Table 3. Initial implant (IMP) and overall growth promotant regimen (GP) effects on animal performance and carcass characteristics[a].

Feed additive:	Treatment (Trt) group						Contrast P-Values by treatment number				
	None	MGA		None	MGA						
Implant (day 0):	C	C	C	H	H	H	IMP	GP (1 & 4 vs	IMP		
Implant (day 70):	H/F	H/F	F	H/F	H/F	F	(1 2 3 vs	2 & 5 vs	by GP	1 & 4 vs	3 & 6 vs
Trt No.:	1	2	3	4	5	6	4 5 6)	3 & 6)	Interaction	2 3 5&6	1 2 4 & 5
Total no. head (reps)	35(5)	34(5)	34(5)	35 (5)	34 (5)	35 (5)					
Weight, lb											
Initial	614	615	616	614	616	616	.98	.99	1.00	.94	.95
28 d	701	702	703	714	710	711	.66	.99	.99	.97	.98
70 d	850	844	843	873	860	863	.45	.95	.99	.75	.89
Final (172 d)	1165	1171	1146	1196	1177	1163	.59	.79	.95	.63	.51
Adj. final wt.[b]	1168	1160	1131	1185	1165	1148	.69	.67	.98	.49	.42
ADG, lb											
0-28 d	3.10	3.11	3.11	3.56	3.35	3.39	.02	.81	.75	.530	.84
28-70 d	3.55	3.39	3.33	3.78	3.59	3.63	.07	.40	.94	.181	.46
0-70 d	3.37	3.28	3.24	3.69	3.49	3.53	.02	.44	.91	.210	.53
70-172 d live wt	3.09	3.20	2.98	3.17	3.10	2.92	.84	.24	.75	.476	.01
70-172 d adj wt	3.08	3.06	2.79	3.03	2.96	2.77	.59	.12	.95	.183	.05
0-172 d live wt	3.20	3.23	3.08	3.38	3.26	3.18	.26	.32	.78	.272	.15
0-172 d adj wt	3.20	3.15	2.98	3.30	3.17	3.08	.42	.16	.92	.128	.08
DMI, lb											
0-28 d	18.28	19.07	18.31	19.11	18.89	18.92	.52	.89	.80	.88	.75
28-70 d	19.09	19.13	19.02	19.58	9.76	19.62	.37	.98	.99	.94	.91
0-70 d	18.77	19.11	18.74	19.39	19.41	19.34	.42	.95	.97	.91	.84
70-172 d adj wt	20.30	21.30	20.16	21.08	21.23	21.98	.36	.55	.76	.70	.49
0-172 d adj wt	19.68	20.41	19.59	20.40	20.49	20.31	.37	.73	.86	.78	.62
Feed/gain											
0-28 d	5.90	6.15	5.97	5.38	5.65	5.61	.03	.57	.94	.33	.91
28-70 d	5.37	5.67	5.73	5.19	5.52	5.42	.09	.08	.85	.03	.28
0-70 d	5.56[cd]	5.84[d]	5.80[d]	5.25[c]	5.56[cd]	5.48[cd]	.01	.05	.98	.02	.39
70-172 d adj wt	6.37	6.38	6.60	6.48	6.61	6.95	.16	.18	.82	.22	.07
0-172 d adj wt	6.15[c]	6.49[e]	6.61[e]	6.20[cd]	6.45[de]	6.60[e]	.96	.001	.89	.01	.01

[a]C = Synovex-C, H= Synovex-H, F = Finaplix-H, and MGA = Melengestrol acetate, fed from day 28 to 170.
[b]Based on hot carcass weight and 62% dress.
[cde]Means within a row with different superscripts differ ($P < .05$).

Table 4. Initial implant and overall growth promoting regimen (GP) effects on carcass characteristics[a].

Feed additive:	Treatment (Trt) Group						Contrast P-Values by treatment number					
	None	MGA		None	MGA							
Implant (day 0):	C	C	C	H	H	H	IMP	GP (1 & 4 vs	IMP			
Implant (day 70):	H/F	H/F	F	H/F	H/F	F	(1 2 3 vs	2 & 5 vs	by GP	1 & 4 vs	3 & 6 vs	2&3 vs
Trt No.:	1	2	3	4	5	6	4 5 6)	3 & 6)	Interaction	2 3 5&6	1 2 4 & 5	5&6
Hot carcass weight, lb	723.9	720.0	702.0	734.8	722.2	711.9	.70	.68	.99	.49	.42	—
Dressing percentage	62.13	61.43	61.15	61.42	61.37	61.22	.48	.34	.58	.17	.26	—
Fat thickness, in	0.38	0.40	0.45	0.33	0.47	0.39	.68	.05	.09	.02	.36	—
KPH, %	2.37	2.31	2.41	2.10	2.25	2.40	.14	.20	.34	.20	.09	—
Rib-eye area, in	13.01[c]	12.14[b]	11.90[b]	13.26[c]	12.28[b]	11.95[b]	.53	.01	.95	.01	.01	—
Marbling score[e]	506	520	514	495	532	512	.97	.24	.73	.15	.98	—
Quality grade[f]	18.20	18.32	18.36	18.00	18.58	18.40	.90	.39	.65	.85	.80	—
Yield grade	2.20[c]	2.38[cd]	2.52[d]	1.91[b]	2.24[c]	2.30[cd]	.07	.02	.90	.01	.04	—
Liver abscesses, %[g]	0.00	0.00	5.71	5.71	2.86	14.29	.05	.04	—	.34	.01	.15
Dark cutter, %[g]	40.00	52.38	43.81	42.86	38.09	45.71	.63	.87	—	.60	.84	.45
Quality grade, %[g]												
Prime (Pr)	0.0	2.9	0.0	0.0	0.0	0.0	.31	.36	—	.47	.48	.31
Choice	54.3	58.8	61.8	57.1	64.7	57.1	.24	.60	—	.50	.92	.42
Select	45.7	38.2	35.3	40.0	35.3	42.9	.47	.43	—	.50	.92	.44
Standard (Std)	0.0	0.0	2.9	2.9	0.0	0.0	1.00	.59	—	.63	.62	.31
Choice+Pr	54.3	61.7	61.8	67.1	64.7	57.1	. 27	.66	—	.44	1.00	.45
Select+Std	45.7	38.2	38.2	42.9	35.3	42.9	.23	.48	—	.44	1.00	.41

[a]C = Synovex-C, H = Synovex-H, F = Finaplix-H, and MGA = Melendgestrol acetate, fed from day 28 to 170.
[b,c,d]Means within a row with different superscripts differ ($P < .05$).
[e]450 = Slight average, 550 = Small average, 650 = Modest average.
[f]17 = Select average, 18 = Select high, 19 = Choice low.
[g]P-values based on chi-square analysis.

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Table 5. Effect of initial implant (IMP) and overall growth promoting regimen (GP) on ovary development and function[a],

Feed additive:	Treatment (Trt) group						Chi-square (P-values) by treatment number				
	None	MGA		None	MGA						
Implant (day 0):	C	C	C	H	H	H	GP I MP	(1 & 4 vs			
Implant (day 70):	H/F	H/F	F	H/F	H/F	F	(1 2 3 vs	2 & 5 vs	1 & 4 vs	3 & 6 vs	2&3 vs
Trt No.:	1	2	3	4	5	6	4 5 6)	3 & 6)	2 3 5&6	1 2 4 & 5	5&6
Missing, %	0.0	0.0	0.0	2.9	0.0	0.0	.31	.35	.15	.48	—
Very immature,(<15mm),%	0.0	0.0	0.0	0.0	0.0	0.0	—	—	—	—	—
Immature, (15-20mm), %	5.7	0.0	0.0	5.7	5.9	0.0	.36	.08	.05	.08	.14
Mature, (>20mm, no follicle), %	28.6	35.3	17.6	34.3	38.2	20.6	.66	.41	.35	.02	.49
Mature (graafian follicle), %	60.0	61.8	82.4	54.3	52.9	73.5	.36	.37	.39	.01	.21
Mature (multiple follicle), %	5.7	2.9	0.0	2.9	2.9	5.9	.67	.83	.54	.79	.26
Mature (Corpus Luteum), %	0.0	0.0	0.0	0.0	0.0	0.0	—	—	—	—	—

[a]C= Synovex-C, H = Synovex-H, F = Finaplix-H, and MGA = Melengestrol acetate, fed from day 28 to 170.

implanting with Finaplix alone reduced the number of immature ovaries and number of mature ovaries with no follicle, but increased the number of mature ovaries with graafian follicles. Heifers not fed MGA had the greatest number of immature ovaries. However, these heifers were the most efficient in feed conversion (lower feed to gain ratio).

Data suggest optimum growth promotant systems for heifer calves, managed under the above-mentioned conditions, includes an initial implant with either Synovex-C or Synovex-H, followed by reimplant with Synovex-H and Finaplix-H.

[1]Mari Lubberstedt, research technician, Terry Mader, professor, Animal Science and Jill Heemstra, former research technician, Northeast Research and Extension Center, Concord; and Kelly Lechtenberg, Consultant Midwest Veterinary Research, Oakland, Nebraska.