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Effects of MGA in receiving diets on health, performance, and carcass characteristics

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EFFECTS OF MGA IN RECEIVING DIETS ON HEALTH, PERFORMANCE, AND CARCASS CHARACTERISTICS

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Summary

A trial was conducted using 723 crossbred heifers (468 lb initially) to evaluate the effects of including melengestrol acetate (MGA) in receiving diets on growth performance, morbidity, mortality, and carcass characteristics. Treatments were: 1) MGA included in the receiving diet at a rate of 0.5 mg per heifer daily or 2) no MGA in the receiving diet. Diets were fed once daily and contained 42% steam-flaked corn, 45% alfalfa hay, 6% steep liquor, and 2% tallow; monensin and tylosin were included. Receiving diets were fed for 35 days. After 35 days MGA was fed to all heifers, and cattle were stepped up to common finishing diets. Cattle exhibiting clinical signs of bovine respiratory disease (BRD) were treated with Excenel (1 ml/100 lb body weight) for 3 days. Animals requiring follow-up treatment received the same therapy. Cattle pulled a third time received oxytetracycline (4.5 ml/100 lb body weight) and Predef (5 ml/heifer). Initial respiratory pulls (73.9% for MGA and 77.3% for no MGA), re-treatments, and death loss were not different (P>0.40) during the first 35 days. The number of heifers requiring a third antibiotic treatment tended (P=0.09) to be higher for heifers not receiving MGA. Average daily gain (deads out) for the first 35 days tended to be higher for heifers fed MGA (P=0.06), but dry matter intake and feed efficiency were not different between treatments (P>0.17). Gain throughout the 220-day feeding period was 2.6% higher for cattle fed MGA during the receiving phase (P=0.05). Overall, feed intake and feed efficiency were not different (P>0.50) between treatments, but heifers fed MGA during the initial receiving period tended to have heavier carcass weights (P=0.13). No differences were detected in quality grade, yield grade, or marbling (P>0.23). Feeding MGA during the initial 35 days after arrival may improve gain and carcass weights.

Introduction

Bovine respiratory disease (BRD) has enormous economic impact on the cattle industry as a result of its effects on labor cost, antibiotic treatment, feed efficiency, and carcass value. BRD is seldom the result of a single factor, but rather a result of a variety of environmental stresses that facilitate invasion of the lungs by opportunistic pathogenic bacteria such as the gram-negative *Pasteurella multocida* and *Pasteurella haemolytica*. Gram-negative bacterial infections are characterized by the animal's reaction to components of the bacterial cell wall, frequently resulting in elevated body temperatures and production of pro-inflammatory cytokines. Cytokines are protein mediators produced by immune cells in response to a foreign antigen. Cytokines play an important role in immune function, but excess or prolonged production may be deleterious to epithelial tissue. The pro-inflammatory cytokines, which include tumor necrosis factor-alpha, have been implicated as having inhibitory effects on feed consumption, glucose regulation, and glycogen synthesis. Suppressing the release of pro-inflammatory cytokines may be beneficial to the well-being and future productivity of disease challenged animals.

Studies conducted with other animal species have successfully suppressed production of tumor necrosis factor-alpha through administration of exogenous progesterone compounds, thus increasing appetite and weight gain. We hypothesized that melengestrol acetate (MGA), a synthetic progesterone commonly used to suppress estrus in feedlot heifers, may have application in receiving cattle to improve growth performance and health. Our objective was to determine the effects of adding MGA to receiving diets fed to pre-pubertal heifer calves on morbidity, mortality, and growth performance throughout the feeding period, as well as carcass characteristics. This paper summarizes our observations during the initial 35 days following arrival and overall performance at the feedlot.

Experimental Procedures

Seven hundred twenty-three crossbred heifers were transported from Missouri and Kentucky sale barns to the KSU Beef Cattle Research Center in Manhattan, KS. They were placed into pens upon arrival, given free access to water and hay, and processed within 24 hours after arrival. Average weight at initial processing was 468 ± 5 lb. Cattle were identified with uniquely numbered ear tags, individually weighed, and given injections of 4-way viral (Bovishield 4) and 7-way clostridial (Fortress-7) vaccines. Implanting was delayed to avoid hormone interactions with MGA. Cattle were allotted to 12 pens of 46 to 53 head each, and 10 pens of 13 to 14 head each. Pens of heifers were randomly assigned to two treatments: 1) no MGA, or 2) 0.5 mg MGA per heifer daily included in the diet for the first 35 days. A second dose of Fortress-7 was given 7 to 10 days after initial processing.

Initial diets contained 60% concentrate, utilizing steam-flaked corn as the primary energy source (Table 1). The amount of feed offered was determined by a 7:00 a.m. feed call so that only traces of feed remained each day. The entire daily ration for each pen was delivered by approximately 8:00 a.m. each day. Excess residual feed was removed from the bunk to prevent spoilage and was weighed and accounted for in calculating feed intake. On day 21, heifers were transitioned to a 97% concentrate finishing ration containing a mixture of steam-flaked corn and wet corn gluten feed using a series of five steps.

On day 35, MGA was added to all diets, and cattle were individually weighed and implanted with Ralgro. On approximately day 95 cattle were individually weighed, reimplanted with Revalor-H, and then were reallocated equally across treatments to a finishing trial in which diets contained 4.0% tallow or 10% corn germ. Thirteen chronic animals were removed from the study at this point. Cattle were slaughtered in two groups. On approximately day 195, 25% of the cattle from each treatment were shipped for slaughter. The remaining cattle were shipped at approximately day 223. Cattle were slaughtered at a commercial abattoir in Emporia, KS, and carcass data were obtained following a 24-hour chill.

Cattle that exhibited clinical signs of respiratory disease, including depression, lethargy, anorexia, coughing, rapid breathing, and nasal and(or) ocular discharge were treated with a subcutaneous injection of Excenel at the rate of 1 ml/100 lb body weight for 3 days. Cattle were placed into sick pens and then returned to their original pen following treatment. Cattle pulled for a relapse were treated in the same manner. Cattle requiring a third treatment were given oxytetracycline at 6 ml/100 lb body weight and PreDef 2x at 5 ml/heifer one time and returned to their pen.

Results and Discussion

Table 2 summarizes the performance, mortality, and morbidity of heifers during the 35-day receiving trial. MGA tended to increase daily gains (P=0.06), which accounts for the differences in body weight at day 35

(540.5 and 525.8 lbs respectively, *P*=0.07) calculated on a deads-out basis (only animals sent to slaughter). Incidence of respiratory disease treatments was not affected by MGA (*P*=0.41). Likewise, the number of heifers requiring a second antibiotic treatment was not affected (*P*=0.44), but feeding MGA did tend (*P*=0.09) to reduce the number of heifers requiring three treatments for BRD. Death loss was not different between treatments (*P*=0.98). Cattle continued to experience mortality after day 35 with a 15.8 and 17.7% mortality rate for cattle fed MGA and no MGA, respectively (*P*=0.62) for the entire feeding period (Table 3).

Performance throughout the entire feeding period (receiving plus finishing on a deads-out basis) and carcass characteristics are shown in Table 3. Daily gain throughout the entire receiving and finishing period tended to be increased by feeding MGA in the receiving period (*P*=0.05) thus increasing hot carcass weight (679 and 667 lbs, *P*=0.13). However, feed intake and feed efficiency were not affected by feeding MGA during the receiving phase. The percentage of carcasses grading USDA Choice and Prime and USDA yield grades were not different between treatments (*P*>0.50).

Heifers in this study experienced a high incidence of respiratory challenge and mortality, thus leading to relatively poor performance for both treatments during the receiving period. Including MGA in diets of heifers immediately after arrival in the feedlot may be an effective means of reducing chronicity, as indicated by reductions in the number of heifers pulled for BRD three times, and of improving subsequent finishing performance. Further studies utilizing MGA in diets of lightweight receiving heifers are necessary to determine if results can be repeated with more moderate disease challenges.

Table 1. Experimental Diets (% of Dry Matter) Fed During the 35-Day Receiving Period

	Treatment	
Ingredient	MGA	No MGA
Steam-flaked corn	42.0	42.0
Alfalfa hay	45.4	45.4
Steep liquor	6.1	6.1
Tallow	2.0	2.0
Soybean meal	3.6	3.6
Vitamin/mineral premix[1]	0.4	0.4
R-T-MGA premix[2]	2.5	-
R-T premix[3]	-	2.5
Crude protein, analyzed	17.0	17.0

[1]Formulated to provide 1500 IU/lb vitamin A, 20 IU/lb vitamin E, 0.1 ppm Co, 0.6 ppm I, 60 ppm Mn, 0.25 ppm Se, 60 ppm Zn, and 10 ppm Cu.

[2]Rumensin/Tylan/MGA premix was fed in a ground corn carrier and provided 300 mg monensin, 90 mg tylosin, and 0.5 mg MGA per heifer daily.

[3]Rumensin/Tylan premix was fed in a ground corn carrier and provided 300 mg monensin and 90 mg tylosin per heifer daily.

Table 2. Health and Performance During the 35-Day Receiving Period for Heifers Fed No MGA or 0.5 mg MGA per Heifer Daily

	MGA in Receiving Diet			
Item	0.5 mg/day	0	SEM	*P*-value
1st Treatment, %	73.9	77.3	2.87	0.41
2nd Treatment, %	40.6	44.4	3.45	0.44
3rd Treatment, %	20.9	29.5	3.42	0.09
Dead, %	9.8	9.9	2.41	0.98
Performance[1]				
Initial weight, lb	470.9	467.9	4.90	0.70
End weight, lb	540.5	525.8	6.29	0.07
Daily gain, lb	2.00	1.66	0.12	0.06
Feed intake, lb/day	8.76	8.13	0.32	0.17
Feed:gain	4.39	4.89	-	0.28

[1]Deads out basis.

Table 3. Performance Throughout the Receiving and Finishing Period and Carcass Traits for Heifers Fed No MGA or 0.5 mg MGA per Heifer Daily During the 35-Day Receiving Period

	MGA in Receiving Diet			
Item	0.5 mg/day	0	SEM	*P*-value
Performance[1]				
End weight, lb	1051.5	1033.2	7.86	0.12
Daily gain, lb	2.78	2.71	0.02	0.05
Feed intake, lb/day	14.16	13.97	0.24	0.59
Feed:gain	5.09	5.14	-	0.69
Dead, %	15.8	17.7	2.57	0.62
Carcass trait				
Carcass weight, lb	678.6	666.9	5.10	0.13
Dressing, %	64.7	64.3	0.20	0.09
Rib eye area, in^2	11.91	11.67	0.17	0.31
12th rib fat thickness, in	0.55	0.54	0.01	0.82
Kidney, pelvic & heart fat, %	2.50	2.46	0.03	0.32
Marbling score	Small41	Small38	7.0	0.81
Prime, %	4.1	3.2	1.1	0.55
Choice, %	67.7	69.3	2.5	0.66
Avg. Choice or greater, %	17.4	17.2	2.1	0.94
Select, %	27.2	26.1	2.7	0.79
Yield grade 1, %	2.5	4.2	0.9	0.23
Yield grade 2, %	26.8	21.5	3.1	0.25
Yield grade 3, %	53.7	56.5	2.2	0.38
Yield grade 4 & 5, %	17.1	17.9	1.8	0.76

[1]Deads out basis.