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Growth and Reproductive Performance of Ewe Lambs Implanted with Zeranol after Weaning, but before Sexual Maturation

B. M. Alexander[1], B. W. Hess[1,3], R. V. Lewis[2], R. H. Stobart[1], and G. E. Moss[1]

Summary

Reproductive and growth performance was evaluated in weaned ewe lambs implanted with zeranol (12 mg, Ralgro, Shering Canada, Inc.) at weaning. In Exp. 1, white-faced ewe lambs (BW = 29.5 ± 0.1 kg) were stratified by body weight and randomly allotted to control (n = 30) or implanted (n = 30) groups. Lambs were fed to achieve gains of 0.23 kg/hd/d for an 84 d period. Five non-pregnant animals from each group were slaughtered during the anestrous season and reproductive tract and ovarian weights were obtained. In Exp. 2, implanted (n = 10) and control (n = 10) ewe lambs (BW = 36.9 ± 0.4 kg) were individually fed a complete ration formulated to achieve gains of 0.23 kg/d for a 63 d period. Ewes were exposed to fertile rams during the breeding season in Exp. 1 and Exp. 2 and pregnancy rates were determined by ultrasound. In Exp. 1, ewes with zeranol implants had greater (*P*=0.01) gain efficiency and gained more (*P*=0.02) weight by 42 d than control ewes. Implanted ewes ended the 84 d growth study heavier (*P*=0.01) than control ewes. Differences were not noted in days to first estrus (*P*=0.58) or overall pregnancy rates (*P*=0.29; 43.3% and 30.0% for control and implanted ewes, respectively). However, ovarian weights (*P*=0.06), but not total reproductive tract weights (*P*=0.47), tended to be lighter in implanted than control ewes. In Exp. 2, ewes with zeranol implants were numerically heavier by the end of the 63 d growth study than control ewes, however, differences did not reach statistical significance (*P*=0.31). Differences in gain (*P*=0.46) or gain efficiency (*P*=0.48) were not noted in Exp. 2. As in Exp. 1, overall pregnancy rates did not differ (*P*=0.37) between control (60%) and zeranol (40%) treated ewes. Implanting weaned ewe lambs with zeranol may enhance growth performance and gain efficiency without affecting reproductive performance. However, numbers in the present study were limited and the numerical trends for decreased reproductive performance of implanted ewe lambs may need to be considered if a large proportion of the ewe lambs will be kept as replacement females.

Key words: Zeranol, Ewe Lambs, Growth, Reproduction

Introduction

Ewes that first lamb at one year of age have a greater lifetime production than ewes first lambing at two years of age (Busch and Slyter, 1986). Numbers of ewe lambs expected to reach puberty during the fall breeding season directly following their birth varies according to age and body weight. Ewe lambs grown rapidly achieve puberty at an earlier age and heavier weight than ewe lambs grown at slower rates (Adams and Robinson, 1994). Selected technologies can be implemented to improve rate and efficiency of body weight gain.

Compounds that modify animal metabolism, such as anabolic steroid implants, can increase production efficiency (NRC, 1994). The anabolic steroid implant approved for use in lambs is zeranol. Zeranol is a fungal metabolite with estrogenic properties that is marketed under the trade name Ralgro. Because of its estrogenic properties, Ralgro may interfere with normal reproductive function, and thus its use in replacement ewes has not been recommended. Implanting suckling beef heifers with a one-time treatment of zeranol, however, did not affect reproductive performance (Hixon et al., 1994). Comparable data regarding the effects of zeranol on growth and reproductive performance of prepubertal ewe lambs following weaning is lacking. Therefore, the objectives of this study were to determine effects of a one-time zeranol implant on the growth and reproductive performance of prepubertal ewe lambs.

Materials and Methods

Experiment 1

Sixty spring-born Rambouillet x Columbia cross ewe lambs (BW 29.5 ± 0.1 kg) were stratified by body weight and randomly allotted to control (n = 30) or Ralgro (12 mg zeranol, Shering Canada, Inc.) implanted (n = 30) groups. Lambs were randomly assigned to one of six pens according to body weight and experimental treatment (10 ewes/pen with 3 pens/treatment). The average of two consecutive BW were taken at the beginning and end of the 84 d growth study. Interim weights were obtained on d 21, d 42, and d 63 of the study. Grass hay (9.0% CP, 57.0% TDN) and water were provided ad libitum. A corn-

1 Department of Animal Science, University of Wyoming, Laramie, 82071

2 Department of Molecular Biology, University of Wyoming, Laramie, 82071

3 To whom correspondence should be addressed: Dept. of Animal Science, POB 3684, FAX: 307-766-5173 Email: brethess@uwyo.edu.

based supplement (11.8% CP, 62.0% TDN) formulated according to NRC (1985) recommendation to provide gains of 0.23 kg/d was fed daily at 0700. The quantity of supplement fed was increased from 0.6 kg/ewe to 1.1 kg/ewe over the course of the study.

At the conclusion of the growth trial (October), all ewe lambs were placed in one large 8.5 x 58.5 m pen. Two vasectomized rams were fitted with marking harnesses and placed with ewes for 28 d. Animals were fed the previously described hay and supplement to allow gains of 0.1 kg/d. Ewe lambs were checked for evidence of estrous activity at 0700 daily. Fertile rams were then placed with ewes (November) for 28 d and pregnancy was detected by ultrasound 50 d following removal of rams. Five ewes from each group determined to be non-pregnant were slaughtered during the anestrous season (April) and their reproductive tracts were evaluated.

Experiment 2

Twenty Rambouillet x Columbia cross spring-born ewe lambs (BW = 36.9 ± 0.4 kg) were randomly assigned to treatments (control, n = 10; Ralgro implant, n = 10) and individually fed for 63 days. Animals were housed in a temperature-controlled confinement facility with free access to water and fed a total mixed ration (13.4% CP, 59.0% TDN) designed to achieve gains of 0.23 kg/d. Feed was provided twice daily to allow ad libitum intake.

Animal weights were obtained on two consecutive days at the beginning and end of the trial with interim weights obtained on d 21 and d 42. At the end of the growth phase (September), ewes were combined into one large pen and fed as a group. Ewes were exposed to a fertile ram for 28 d. Pregnancy was confirmed by ultrasound at approximately 50 d.

Statistical Analysis

Cumulative and 21-d intake and performance data, days to first estrus, and ovarian and reproductive tract weights from Exp. 1 were analyzed as a randomized complete block design using GLM procedures of SAS (SAS Inst. Inc., Cary, N. C.) with treatment as the main effect. Overall pregnancy rates (Exp. 1 and 2) were analyzed using CATMOD procedures of SAS (SAS Inst. Inc., Cary, N. C.). Growth performance and gain efficiency data of Exp. 2 were analyzed as a completely random design using GLM procedures of SAS (SAS Inst. Inc., Cary, N. C.).

Results and Discussion

Experiment 1

Body weights measured over the course of the study are presented in Table 1. Ewe lambs with zeranol implants were heavier from d 42 through d 84. This response appears to be the result of cumulative weight gain throughout the study possibly due to decreased muscle protein degradation (Sinnett-Smith et al., 1983) and increased bone mineral density (Chanetsa et al., 2000). Implanted ewes had only numerical increases in gain on d 21 and d 84, and tended to out-gain control ewes on d 63 (Table 2). Zeranol implanted ewes had the greatest gains within the first 42 d (Table 2), and gained more efficiently than control ewes [17.3 vs 15.4 % (± 0.15) for implanted and control ewes, respectively (Table 2)]. However, increases in gains and increased efficiency were not maintained throughout the 84 d growth study. By 63 d, implanted and control ewes had similar levels of gain efficiency and zeranol-implanted ewes only tended (P=0.10) to out gain control ewes (Table 2). By 84 d all measures of growth performance were similar (Table 2). Thus, the effectiveness of the zeranol implant appears to be 42 to 63 d.

Similar to heifers implanted prepubertally (Brownson et al., 1997), number of days to first estrus did not differ (P=0.58) between implanted and control ewes [19.3 vs 17.9 (± 1.7), respectively]. Overall pregnancy rates were also not affected (P=0.29) by zeranol implants. Overall pregnancy rates were 43.3% for control ewes and 30.0% for zeranol-implanted ewes.

Since age and weight are the two major determinants of puberty, growth promotants may potentiate the onset of puberty. The estrogenic properties of zeranol, however, could also perturb reproduction because estradiol exerts diverse effects on the hypothalamus and anterior pituitary gland (Nett et al., 1990) and induces uterine hypertrophy (Henricks, 1987). It does not, however, appear that the estrogenic activities of zeranol evoked obvious effects on reproductive tissues in the ewes that did not reach puberty in the present experiment. Although ovarian weights tended (P = 0.06) to be lighter in implanted than control ewes (2.43 vs. 1.58 (± 0.27 g), differences were not noted in either total reproductive tract weight (P = 0.47) [44.3 vs. 37.9 (± 5.9) g for control and zeranol-treated ewes, respectively] or tract weight as a percent of body weight (P = 0.38).

Experiment 2

Body weights over the study period are reported in Table 1. Numerical differences in performance were noted throughout the study. Ralgro implanted ewes had cumulative gains of 2.2, 8.7 and 13.2 (± 0.8) kg at d 21, 42, and 63, respectively, and were numerically greater than control ewes (1.9, 8.3, and 12.1(± 0.8) kg at d 21, 42, and 63, respectively). Differences, however, did not reach levels of significance (P=0.46 to 0.73). Similarly, Ralgro implanted ewes had numerically greater (P=0.48 to 0.62) gain efficiency than control ewes [11.5, 16.8, 14.7 (± 1.9) vs 8.5, 15.8, 13.6 (± 1.9) gain/feed, kg/100 kg for Ralgro and control treated ewes on d 21, 42, and 63, respectively]. Lack of statistical significance as observed in Exp. 1 may be a result of too few animals in Exp. 2. Nonetheless, conflicting results on growth performance of heifers with zeranol implants have been reported. Increased gains of beef heifers treated with zeranol implants reported by Hixon et al. (1994) were not observed by Makarechian et al. (1990).

As in Exp. 1, overall pregnancy rates did not differ (P=0.37) between zeranol-implanted and control ewes (40% vs 60%, respectively). Although zeranol implants did not increase reproductive performance in ewe lambs as noted in beef heifers by Hixon et al. (1994), neither was there a detrimental effect noted on overall pregnancy rates as reported by Turner and Raleigh (1984) in beef heifers. However, numbers in the present study are limited and the numerical trends for decreased reproductive performance may need to be considered.

Conclusions

Implanting weaned ewe lambs with zeranol enhanced growth performance and gain efficiency without significantly decreasing

reproductive performance. However, reproductive performance of implanted ewe lambs may need to be considered if a large proportion of the ewe lambs will be kept as replacement females. Producers implanting all ewes at weaning could benefit from increased gain and market weight without an overt negative influence on reproduction.

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Table 1. Body weights of prepubertal ewe lambs reared in drylot conditions with or without a single zeranol implant at weaning.

	Treatment Exp. 1				Treatment Exp. 2			
	Control	Zeranol	SEM[a]	P value	Control	Zeranol	SEM[b]	P value
Initial Weight, kg	29.3	29.4	0.1	.21	36.8	36.9	1.2	.95
21 d weight, kg	33.9	34.3	0.2	.17	38.7	39.2	1.1	.78
42 d weight, kg	38.9	40.3	0.1	.02	45.1	45.6	0.9	.71
63 d weight, kg	43.8	45.3	0.3	.06	48.9	50.2	0.8	.31
84 d weight, kg	47.4	49.1	0.1	.01				

[a]n = 30 per treatment
[b]n = 10 per treatment

Table 2. Exp. 1. Cumulative (21 d collections) growth performance, feed intake and gain efficiency by pen-fed ewe lambs reared in drylot conditions with or without a single zeranol implant at weaning.

	Treatment			
Item	Control	Zeranol	SEM[a]	P value
		21 d		
Gain kg/pen	4.6	4.9	0.1	.21
ADG, kg/d	0.22	0.23	0.01	.20
Total intake, kg/pen	28.7	28.0	1.1	.69
Gain/feed, kg/100 kg	16.0	17.5	0.7	.29
		42 d		
Gain kg/pen	9.6	10.8	0.1	.02
ADG, kg/d	0.23	0.26	0.003	.02
Total intake, kg/pen	62.5	62.6	0.5	.88
Gain/feed, kg/100 kg	15.4	17.3	0.2	.01
		63 d		
Gain kg/pen	14.5	15.8	0.3	.10
ADG, kg/d	0.23	0.25	0.01	.10
Total intake, kg/pen	103.9	103.3	1.7	.84
Gain/feed, kg/100 kg	14.0	15.4	0.5	.21
		84 d		
Gain kg/pen	18.0	18.9	0.3	.21
ADG, kg/d	0.21	0.23	0.004	.19
Total intake, kg/pen	144.9	146.9	0.4	.09
Gain/feed, kg/100 kg	12.4	12.9	0.3	.36

[a]n = 30 per treatment