THE INFLUENCE OF ZERANOL ON FEEDLOT PERFORMANCE AND CARCASS TRAITS OF CULLED COWS AND HEIFERS

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A total of 126 cows and heifers culled from the University of Alberta beef herd were used in an experiment to study the effects of zeranol, an anabolic growth stimulant. The cattle were divided into two groups: 67 aged less than 4 yr (young) and 59 aged more than 4 yr (mature); within each group, three treatment levels of zeranol were applied (0, 36 or 72 mg/head of the commercial implant Ralgro®). All cattle were fed ad libitum a high-energy diet, and after 68 days the young group were slaughtered at a commercial packing plant; after a further 7 days the mature group were slaughtered at the same plant. Nine carcasses from each treatment level within the young group were fabricated into trimmed commercial cuts at the packing plant. Growth rates among double-implanted (72 mg) cattle were similar to those among single-implanted (36 mg) cattle; in the mature group, the growth rate was also similar in the control (0 mg) cattle. In the young group, implanting zeranol (36 mg or 72 mg) gave a 7–8% ($P>0.05$) increase in growth rate. Zeranol caused no detectable changes in carcass traits or cut-out yields.

On a étudié sur 126 vaches et génisses de réforme provenant du troupeau d'élevage de boucherie de l'université de l'Alberta les effets de l'administration de zéranol, facteur de croissance anabolisant. Les bêtes ont été divisées en deux groupes, soit 67 de moins de 4 ans (jeunes) et 59 de plus de 4 ans (adultes), et dans chaque groupe on a utilisé trois doses d'anabolisant (0, 36 ou 72 mg/tête de l'implant du commerce Ralgro). Toutes les bêtes consommaient à volonté un régime à forte teneur en énergie et au bout de 68 jours les ''jeunes'' ont été abattues dans un abattoir commercial. Le groupe des ''adultes'' a été abattu une semaine plus tard. Neuf carcasses prélevées dans chaque traitement anabolisant sur le groupe des jeunes ont été conditionnées en unités de découpe commerciales. Le taux de croissance observé chez les bêtes recevant la double dose d'anabolisant (72 mg) était le même que pour celles traitées à la dose simple (36 mg). Dans le groupe des vaches adultes, le taux de croissance avec anabolisant n'était pas meilleur que dans le traitement sans anabolisant. Chez les jeunes l'emploi du zéranol a suscité un accroissement de 7 à 8 % du Gain moyen quotidien. L'anabolisant n'a pas causé d'effet observable sur les caractères des carcasses ni sur le rendement à l'abattage.

Key words: Zeranol, cull cows, carcass traits

It has been shown (Price and Berg 1981) that when cows in ''range condition'' (i.e. depleted in both body fat and skeletal muscle) are offered an adequate level of nutrition they have very large appetites (approaching 4% of body weight per day) and are able to gain weight rapidly. In older cows, this weight gain is simply catch-up or compensatory growth (Wilson and Osbourne 1960; Allden 1970). In

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younger cows and heifers, the weight gain consists of both catch-up growth and the normal growth of an immature animal towards maturity. It is probably for this reason that younger cows normally gain weight more rapidly than older cows during realimentation (Price and Berg 1981). The anabolic agent zeranol (a resorcylic acid lactone) has been shown to enhance growth rates, though the mechanism involved is not clear (Wangsness et al. 1981). It is not known, therefore, whether this substance would influence normal and catch-up growth similarly. The following study was conducted to test the effect of zeranol on the growth and carcass characteristics of mature and immature cull range cows during realimentation.

MATERIALS AND METHODS

The study used a total of 126 April- and May-born cows and heifers culled from the beef herd at the University of Alberta ranch at Kinsella, Alberta. They were culled because of reproductive problems (dystocia or failure to conceive) and ranged in age at the beginning of the experiment (January 1981) from almost 2 to almost 14 yr. They were divided into two groups: young (under 4 yr old) and mature (over 4 yr old), and each group was randomly subdivided into three subgroups: subgroup 1 was an untreated control, subgroup 2 was implanted with a normal dose (36 mg as three 12-mg pellets) of Ralgro® (a commercial form of zeranol), and subgroup 3 was implanted with a double dose (72 mg as six 12-mg pellets) of Ralgro®. At the time of implanting the cows were being fed the grain mixture shown in Table 1. They continued to be offered this diet free-choice for the duration of the experiment.

After 68 days (the 'withdrawal' period for the implant being 65 days) all of the cows and heifers were weighed again. The young group was then trucked 150 km to an Edmonton packing plant and slaughtered. After a further 7 days (to allow for processing of the young group carcasses) this procedure was repeated for the mature group. After overnight chilling, Agriculture Canada graders provided a grade and an appraisal (Form ML 107) for each carcass: the carcasses were first placed into physiological age groups (Maturity I, II or III) based on skeletal characteristics, particularly ossification. Under Canadian grading regulations Maturity III carcasses qualify for the Canada D grade, D1 being optimum fatness and D4 grossly overfat. Maturity II carcasses qualify for the Canada C1 grade if they have an optimum level of fatness. Maturity I carcasses can qualify for the Canada A grade, A1 being optimum fatness (defined by ruler measurement of the subcutaneous fat), and A2, A3 and A4 increasingly overfat. Maturity I carcasses lacking sufficient fat for the A1 grade can be graded B1. Carcasses can also be graded Canada B if they have medium-dark-colored muscle. The graders also recorded warm carcass weight, subcutaneous fat thickness at four positions over the longissimus muscle, the cross-sectional area of the longissimus muscle (rib eye area), and a subjective assessment of marbling.

From among the carcasses of the young group that graded A1 or A2, nine carcasses each from the control, single and double implant subgroups were selected, and balanced as closely as possible for weight. Each of the nine carcasses in each subgroup was then fabricated into trimmed commercial cuts at the packing plant according to the specifications of a large supermarket chain. Each individual cut from each side was weighed immediately after vacuum packaging. It was not possible to identify the carcass of origin of each cut, but the subgroup (control, single or double implant) was known in each case.

All data were subjected to analysis of variance; growth traits were compared for the effects of age group, zeranol dose level and their interaction; carcass traits were compared on a

Table 1. Composition of grain mixture fed ad libitum to 126 cull cows and heifers

Ingredient	kg/tonne
Rolled barley	620
Rolled oats	200
Alfalfa pellets	100
Rapeseed meal	58
Calcium carbonate	10
Dicalcium phosphate	5.2
Vitamin mash (A,D_3,E)	2.6
Trace-mineralized salt	2.6
Molasses	1.6
Total	1000.0

within-age-group basis only for the effects of dose level.

RESULTS AND DISCUSSION

The young cows gained 0.12 kg/day more than the mature cows (Table 2), but this difference was not statistically significant. Previous work (Price and Berg 1981; Graham and Price 1981) has also shown nonsignificant growth rate advantages in favor of younger cows. The cause of this lack of significance may well be the inherent variation found within groups of cull cows. The differences themselves are probably biologically meaningful, and if repeatable would certainly translate into economically important differences in profitability. Following removal of the young cows for slaughter, the mature cows stopped gaining weight (Table 2). The reason for this is not clear, since there were no notable changes in the weather or the health of the cows during that week.

The growth rate results (Table 2) suggest a different response to zeranol by the young group compared with the mature group; within the mature group, implanting with zeranol caused a slight (nonsignificant) reduction in growth rate, whereas with the young cows and heifers it caused a 7–8% (nonsignificant) increase in growth rate. The dose rate (36 mg or 72 mg) had no effect on growth rate in either group. Other workers have reported a growth response to zeranol in young cattle, including heifers (Sharp and Dyer 1971; Utley et al. 1976), but the effect on mature cows is not clear. The present results could be explained as a response to zeranol only during true growth, and not during catch-up growth; growth rate would thus be stimulated in immature animals but not in mature animals. Thus, the results indicate that either doubling the recommended dose rate or implanting zeranol into mature cows would be unlikely to elicit a growth response, but that implanting young cows and heifers warrants further investigation.

Because the young and mature groups of cows were fed for different periods of

Table 2. Mean ± SE of liveweight data for 126 cull cows and heifers

		Liveweight (kg)			ADG (kg/day)	
	n	Day 1	Day 68	Day 75	Days 1-68	Days 1-75
Control						
Young	21	397.6 ± 12.9	513.7 ± 18.7	—	1.70 ± 0.14	—
Mature	24	510.8 ± 15.0	628.4 ± 16.2	627.8 ± 15.5	1.73 ± 0.10 NS	1.56 ± 0.09
Single implant						
Young	21	415.1 ± 13.0	539.2 ± 16.5	—	1.82 ± 0.08	—
Mature	19	549.7 ± 12.3	661.2 ± 13.6	659.5 ± 13.1	1.64 ± 0.12 NS	1.46 ± 0.11
Double implant						
Young	25	399.5 ± 11.7	525.0 ± 14.0	—	1.84 ± 0.09	—
Mature	16	531.4 ± 20.8	644.6 ± 25.2	644.7 ± 25.2	1.66 ± 0.10 NS	1.51 ± 0.11
Combined treatments						
Young	67	403.8 ± 7.2	525.9 ± 14.0	—	1.80 ± 0.06	—
Mature	59	528.9 ± 9.8	643.3 ± 10.4	642.6 ± 10.2	1.68 ± 0.06 NS	1.51 ± 0.06
Combined ages						
Control	45	458.0 ± 13.1	574.9 ± 14.8	—	1.72 ± 0.08	—
Single	40	479.0 ± 14.0	597.2 ± 14.5	—	1.74 ± 0.07	—
Double	41	451.0 ± 14.7	571.6 ± 15.8	—	1.77 ± 0.07	—

NS, $P>0.05$.

Table 3. Means and standard errors of carcass traits for cows and heifers aged less than 4 yr at slaughter

	Control	Single† dose	Double‡ dose	SEM	Sig.
Number	21	21	25		
Dressing (%)	52.9	53.4	54.0	0.24	NS
Carcass wt (kg)	272.3	288.1	283.5	5.40	NS
Average fat (mm)§	10.8	10.8	11.8	0.40	NS
Rib eye area (cm^2)	70.0	76.8	74.4	1.32	NS
Marbling score ¶	7.4	7.8	7.6	0.08	NS
Grade (%)					
A3			4.0		
A2	19.0	14.3	32.0		
A1	76.2	66.7	48.0		
B1//		4.8	8.0		
C1††	4.8	14.3	8.0		

†36 mg zeranol /per head.
‡72 mg zeranol per head.
§Average of three measurements over the rib eye.
¶Range 1-10, higher numbers indicate less visible marbling.
//One carcass in the double-dose treatment had a fat level appropriate for A1 grade but was downgraded to B1 for medium-dark-colored muscle. The remaining carcasses had B1 fat levels.
††The control carcass had a fat level appropriate to the B1 grade; all carcasses in the single-dose treatment had fat levels appropriate to the A1 grade; one carcass in the double-dose treatment had a fat level appropriate to the A1 grade, the other to the A2 grade.
NS, $P>0.05$.

time, and were intended for different markets, their carcass data were considered separately. Zeranol had no significant effects on carcass traits in the young (Table 3) or the mature (Table 4) cows. Other workers have also found that, despite the protein anabolic effect of zeranol (Sharp and Dyer 1971), implanting has no significant effect on carcass traits in sheep (Wilson et al. 1972; Wiggins et al. 1979)

Table 4. Means and standard errors of carcass traits for cows and heifers aged more than 4 yr at slaughter

	Control	Single† dose	Double‡ dose	SEM	Sig.
Number	24	19	16		
Dressing (%)	54.9	54.7	54.3	0.26	NS
Carcass wt (kg)	342.3	360.8	349.7	5.68	NS
Average fat (mm)§	15.1	16.9	15.3	5.6	NS
Rib eye area (cm^2)	80.0	81.3	78.6	1.29	NS
Marbling score ¶	7.0	7.1	6.9	0.09	NS
Grade (%)					
A2	8.3				
A1	8.3		18.8		
C1	33.3	31.6	12.5		
D1	45.8	68.4	68.8		
D4	4.2				

†36 mg zeranol per head.
‡72 mg zeranol per head.
§Average of three measurements over the rib eye.
¶Range 1-10, higher numbers indicate less visible marbling.
NS, $P>0.05$.

Table 5. Means and standard errors of trimmed, vacuum-packaged cuts (kg) of block-ready beef from A1- and A2-graded cow and heifer carcasses

	Control	Single† dose	Double‡ dose	SEM	Sig.
Number of sides	18	18	18		
Grades A1	14	14	14		
A2	4	4	4		
Warm side weight	151.6	152.2	151.7		
Boneless hips	53.5	52.9	53.9	0.86	NS
Loins	24.2	23.8	24.3	0.42	NS
Sirloin	13.9	13.6	13.5	0.24	NS
Top butt	18.8	18.2	19.2	0.32	NS
Oven roast	21.5	20.9	20.4	0.39	NS
Rib roast	19.0	19.1	18.7	0.32	NS
Blade roast	27.6	28.0	27.3	0.52	NS
Shoulder roast	7.2	7.2	7.0	0.12	NS
Short rib	13.7	13.4	14.1	0.32	NS
Boneless brisket	17.1	16.7	17.1	0.41	NS
Bone-in shank	7.8	8.0	7.7	0.11	NS
Trim§	42.7	42.2	35.1		

†36 mg zeranol per head.
‡72 mg zeranol per head.
§No statistical analysis possible.
NS, $P>0.05$.

or in cattle (Borger et al. 1973; Utley et al. 1976). Analysis of the yield of block-ready cuts of beef from among the young cows and heifers further confirmed the absence of a response to implanting (Table 5).

It is, therefore, concluded from the present study that while 36 mg per head of zeranol may improve growth rates among young cows and heifers, there is no evidence that it stimulates gain in mature cows, or that doubling the dose causes any change in response. It is also concluded that zeranol has no signifiant influence on carcass characteristics in culled cows and heifers.

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