EFFECTS OF NUTRITION, SEX OF CALF AND BREED TYPE ON RESPONSE TO ZERANOL: PREWEANING GROWTH'

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ABSTRACT

An experiment was conducted to evaluate the effects of breed, sex and plane of nutrition on the growth response to zeranol in Angus and crossbred calves prior to weaning. Eighty-eight heifers and 118 steers received either a high or low plane of nutrition using a first and last grazing technique. Half of the calves in each nutrition group received a zeranol implant (36 mg) at an average age of 3.4 mo. Both zeranol and the higher level of nutrition increased (P < .001) growth rate prior to weaning (7.4 mo of age). Zeranol did not affect hip height at weaning (P > .1), but calves on the higher plane of nutrition were taller (P < .01) than calves on the lower plane of nutrition. The zeranol x nutrition interaction was not significant (P > .1) for growth rate or hip height. Steers grew faster (P < .01) preweaning and were taller (P < .01) at weaning than heifers. Crossbred calves gained more rapidly (P < .001) preweaning and were taller (P < .001) at weaning than Angus calves were. Neither sex nor breed interacted with zeranol to influence any of the traits examined. Based on these results we conclude that preweaning growth was affected by zeranol and this effect was consistent across sexes, breeds and planes of nutrition tested.

(Key Words: Cattle, Preweaning Period, Zeranol, Nutrition.)


Introduction

Zeranol3 is used commonly to enhance growth of feeder calves. However, growth responses to this implant appear to be variable during the preweaning phase of growth, perhaps due to variations in pasture conditions. Basarab et al. (1984) found that average daily gains (ADG) of nursing calves implanted with zeranol varied from -7.7 to 15.3% for steers and from -8.0 to 16.9% for heifers, whereas Lesperance et al. (1978) failed to detect an effect of zeranol in calves when availability of forage was low.

Differences in magnitudes of response to zeranol also might be attributed to differences in sex of calf as well as to breed. The objective of this experiment was to determine whether level of nutrition, sex of calf and breed type influence growth responses to zeranol prior to weaning.

Materials and Methods

Angus and crossbred (Angus x Hereford-Holstein, Simmental x Angus or Simmental x Hereford-Holstein) calves were assigned to treatment groups. Groups were balanced for sex, breed type, age of calf, birth weight of calf and age of cow. Calves on either a high or low plane of nutrition either were implanted with zeranol or served as controls. Calves were born in March and April of 1984 (replicate 1), 1985 (replicate 2) and 1986 (replicate 3). Two hundred six cow-calf pairs were utilized (79, 80 and 47 in replicates 1, 2 and 3, respectively). Table 1 shows the number of animals in each treatment group.

Calves received a 36-mg zeranol implant at approximately 3.7 (replicate 1), 2.8 (replicate 2) or 3.9 (replicate 3) mo of age. In order to maintain equal implant intervals, only calves in replicate 2 received a second zeranol implant 28 d prior to weaning. A 112-d
interval was chosen to determine whether the implant response diminishes over time (manufacturer's recommendation for reimplanting is 65 to 100 d). Implants were inserted subcutaneously near the base of the ear.

A first and last grazing technique (Blaser et al., 1959) was used to achieve the two levels of nutrition. In this rotational grazing scheme, a group of cow-calf pairs (first grazers) was allowed to graze approximately one-half the available forage in a given location before they were moved to fresh pasture. A second group of cow-calf pairs (last grazers) then was allowed to consume the remaining forage. This procedure began when calves were implanted and ended when calves were weaned at 7.4 mo of age. The forage was predominantly a mixture of Kentucky bluegrass and ladino clover with lesser amounts of Kentucky-31 tall fescue. Fescue was estimated to be 15% of the total pasture and was approximately 60% infected with endophyte (Acromonium coenophialum).

Calves were weighed at the beginning of the experiment as well as at weaning. Hip heights were measured at weaning. Data were subjected to analysis of variance using the General Linear Models procedure of SAS (1985). The initial statistical model included main effects of implant, level of nutrition, sex of calf, breed of calf and year as well as interactions among main effects. A reduced model, removing effects that were declared statistically and biologically nonsignificant, was used so that meaningful comparisons could be made among estimable least square means. Plotted residuals of the important variables detected no assumption problems.

### Results

Calves in replicates 1 and 3 received their second implant at weaning, but because treatments were imposed earlier in replicate 2, those calves received their second implant 28 d prior to weaning. The average body weight of all replicates at the time the second implant was administered was 237 and 243 kg ($P > .1$) for the control and zeranol groups, respectively. Average daily gains from the first to the second implant (112, 112 and 108 d for replicates 1, 2 and 3, respectively) for control and zeranol groups were .88 and .95 kg/d ($P < .001$), respectively.

A trend toward a significant ($P < .09$) implant × replicate interaction for preweaning ADG was detected (Table 2). Growth rate response to zeranol varied from 15.1% in replicate 3 to only 3.6% in replicate 2. When all replicates were combined, average daily gains from the time zeranol was implanted through weaning (112, 140 and 108 d for replicates 1, 2 and 3, respectively) also was increased ($P < .001$) in the implanted calves (Table 3). Zeranol tended to increase ($P < .08$) weaning weight but did not alter ($P > .1$) hip height at weaning (Table 3).

Calves on the higher plane of nutrition were heavier at weaning and had greater ADG ($P < .001$) than calves on the lower level of nutrition (Table 4). Hip heights at weaning also were increased ($P < .01$) by the higher plane of nutrition (Table 4).

The nutrition × implant interaction was not significant ($P > .1$) for ADG or hip height, indicating that the effects of zeranol on these traits did not depend on level of nutrition.

Steers were heavier ($P < .05$) at weaning and had greater ($P < .01$) preweaning ADG

### Table 1. Numbers of Heifers and Steers of Different Breed Types for Each Treatment

<table>
<thead>
<tr>
<th>Breed</th>
<th>Low Nutrition</th>
<th></th>
<th>High Nutrition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Zeranol</td>
<td>Control</td>
<td>Zeranol</td>
</tr>
<tr>
<td></td>
<td>Heifers</td>
<td>Steers</td>
<td>Heifers</td>
<td>Steers</td>
</tr>
<tr>
<td>Angus</td>
<td>9</td>
<td>14</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Crossbred</td>
<td>12</td>
<td>17</td>
<td>13</td>
<td>16</td>
</tr>
</tbody>
</table>

### Table 2. Zeranol × Replicate Interaction for Daily Gain of Calves

<table>
<thead>
<tr>
<th>Replicate</th>
<th>Preweaning ADG, kg/d</th>
<th>Control</th>
<th>Zeranol</th>
<th>SEb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1984)</td>
<td>.80</td>
<td>.87</td>
<td>.020</td>
<td></td>
</tr>
<tr>
<td>2 (1985)</td>
<td>.83</td>
<td>.86</td>
<td>.018</td>
<td></td>
</tr>
<tr>
<td>3 (1986)</td>
<td>.86</td>
<td>.99</td>
<td>.031</td>
<td></td>
</tr>
</tbody>
</table>

* $P < .09$

bLargest standard error of the least squares means.
than heifers did (Table 5). Hip height at weaning also was greater ($P < .01$) for steers than for heifers (Table 5). Neither sex of calf x implant nor sex of calf x nutrition interactions were significant ($P > .1$) for these traits.

Initial weight, weaning weight, ADG and hip height were greater ($P < .01$) for crossbred calves than for Angus calves (Table 6). The effects of zeranol were not different ($P > .1$) among breed types. In addition, there were no significant breed of calf x nutrition for preweaning traits.

Discussion

The results reported here are consistent with those of other studies that show that zeranol increases ADG (Brown, 1970; Thomas et al., 1970; Lewis et al., 1979; Kunkle et al., 1980; Basarab et al., 1984) but does not influence hip height following weaning (Deutscher et al., 1986). Weaning weight was increased ($P < .08$) only moderately, possibly because of the large variation among animals and the fact that calves weighed approximately 138 kg at the time zeranol treatment began. The different growth rate responses for the different replicates cannot be explained by our results. The lack of a nutrition x implant interaction could be attributed to the possibility that ADG at both nutritional levels was more than the minimum required for zeranol to affect growth.

Average daily gains and hip heights were greater in first grazers than in last grazers because first grazers selectively consumed available forage that presumably was higher in digestibility, CP, energy and fat but lower in crude fiber and lignin (Blaser et al., 1959, 1960; Bryant et al., 1961; Fontenot and Blaser, 1965). It also is likely that first grazers had a greater intake of forage than last grazers (Blaser et al., 1960; Bryant et al., 1961).

Although steers were heavier at weaning and grew more rapidly than heifers, the effects of zeranol on growth were not influenced by sex of calf. Similar observations were reported by others (Lewis et al., 1979; Basarab et al., 1984).

The increased initial weight, weaning weight and ADG of crossbred calves compared to purebred calves agrees with results of Lawlor et al. (1984). The failure of breed type to influence response to zeranol is consistent with results of previous studies (McReynolds et al., 1979; Wiggins et al., 1979).

The results of this study suggest that the variation in growth response to zeranol prior to weaning may not be attributed to differences in level of nutrition, sex of calf or breed type.
Literature Cited


