Field Study of the Effects of Zeranol, Implanted At The Time of Breeding, on Weight Gain and Pregnancy Rate of Beef Heifers

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Abstract

Zeranol implants (Ralgro) were given to yearling heifers at the time of breeding to determine the effects of implanting on weight gain and pregnancy rate. Sixty 14½ month-old crossbred heifers were randomly divided into an implanted group which received 36 mg zeronol one day before exposure to bulls and a control group which was not implanted. Four yearling Angus bulls were used to service the heifers for a 60-day breeding period. Two bulls were assigned to each of two pastures containing 15 implanted and 15 control heifers. All heifers were weighed and slaughtered 120 days later and reproductive tracts were examined. Average weight of heifers (± SD) at time of implanting and at slaughter was 259 ± 28.8 kg and 378 ± 47.8 kg, and 251 ± 26.8 kg and 371 ± 41.3 kg for the implanted and control heifers, respectively. Average weight gain was 119 kg for the implanted heifers and 120 kg for the controls. Fifteen heifers in the implanted group and 15 heifers in the control group were pregnant. Implanting heifers with zeranol prior to the breeding season did not increase weight gain and pregnancy rate was the same for each group.

Introduction

Zeranol, known commercially as Ralgro,[a] is a widely used anabolic agent that has been shown to increase weight gain and improve feed conversion in steers and heifers (1,2,3,4,5).

Zeranol is derived from the mycotoxin, Zearolenone, which is a metabolite of *Gibberella zeae*. Zearolenone is known to produce an estrogenic effect in swine, but not in cattle (6). Zearolenone has recently been shown to interact directly with estrogen receptors and evoke many of the same biological and biochemical responses that are evoked by the natural estrogen estradiol (7). The life span of zeranol implants was estimated to be 90 days using tritiated zeranol (8). This data supports a field study where significant gains which occurred in implanted steers and heifers disappeared by 84 to 112 days (2).

Zeranol is not recommended for use in breeding animals. However, in certain circumstances, breeding cattle have been implanted with zeranol. Heifers are sometimes implanted as suckling calves before their selection as herd replacements. Also, implanted heifers may be purchased as replacement females without a history of prior treatment. It is important to determine the effect of this anabolic agent on reproductive function in beef heifers.

Zeranol implants used in prepuberal bulls will decrease scrotal circumference and retard sexual development (9,10). However, the effect of implanting heifers with zeranol on their subsequent reproductive ability has been studied with mixed results. In an early study, a decreased pregnancy rate was reported in heifers implanted with zeranol 196 days before breeding (11). Another group of workers implanted heifer calves at weaning and again 119 days before breeding. Pregnancy rates of the implanted heifers were 63% vs. 78% for controls (12).

In another work, heifer calves were implanted with either one or two zeranol implants during the suckling period and no obvious effects on later reproductive performance were observed when the heifers were bred as yearlings (13).

However, another worker reported a lower first service conception rate for heifers receiving zeranol implants at 70, 170, 270 days of age compared with heifers receiving only one implant at 70 days for controls (14). Pregnancy rate at the end of a 45-day breeding season was also lower in the heifers receiving three implants. It appeared from earlier work that implanting closer to the time of mating involved the greatest risk of decreased reproductive performance of implanted heifers. In a recent study, multiple administration of zeranol to pregnant heifers during gestation did not result in increased body weight or pelvic areas within one month of

[a] *Ralgro, International Minerals and Chemical Corporation, Animal Health Division, Terre Haute, Indiana.*

parturition, but did increase calving ease. However, the incidence of abortion or reabsorption of fetuses was increased (15).

The present study of the growth and reproductive ability of heifers implanted with zeranol during the breeding period was undertaken to gain more information concerning the effects of zeranol on breeding heifers.

Materials and Methods

The chronological order of the experiment is represented in *Figure 1.* Sixty 14½ month-old crossbred heifers were randomly divided, according to weight and breed type, into an implanted group which received 36 mg zeranol and a control group which was not implanted. Heifers in each group were weighed at the time of implanting and at slaughter 120 days later. Heifers were exposed to bulls for a sixty-day breeding period one day after implanting. The design of the experiment is shown in *Figure 2.* Four yearling Angus bulls, determined to be satisfactory potential breeders after physical and semen quality examinations, were used to service the heifers during the 60-day breeding period. Two bulls were assigned to each of two pastures containing 30 heifers, of which 15 were implanted and 15 were controls. The heifers were fed a silage and grain ration on pasture thirty days prior and throughout the length of the experiment. Reproductive tracts of all heifers were examined at the time of slaughter to determine the number of heifers pregnant in each group. Crown to nose length of fetuses from pregnant heifers were measured to estimate fetal age.

Figure 1. Chronological order of experiment.

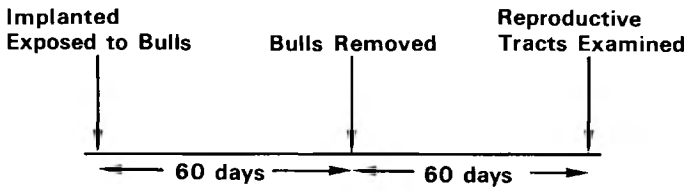
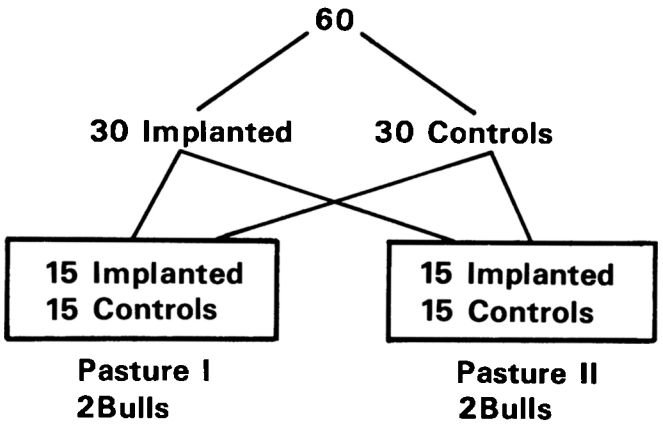


Figure 2. Design of experiment.



Results and Discussion

Average weight of the heifers (± SD) at the beginning of the experiment and at slaughter for the implanted and the control heifers is listed in *Figure 3.* Average weight gain for each group was similar. Implanting heifers with zeranol prior to the breeding season did not increase weight gain. These results are in agreement with an earlier study where no increased body weights or pelvic areas were observed in heifers implanted either 1, 2, or 3 times during gestation.[15] Pelvic measurements were not available in the present study.

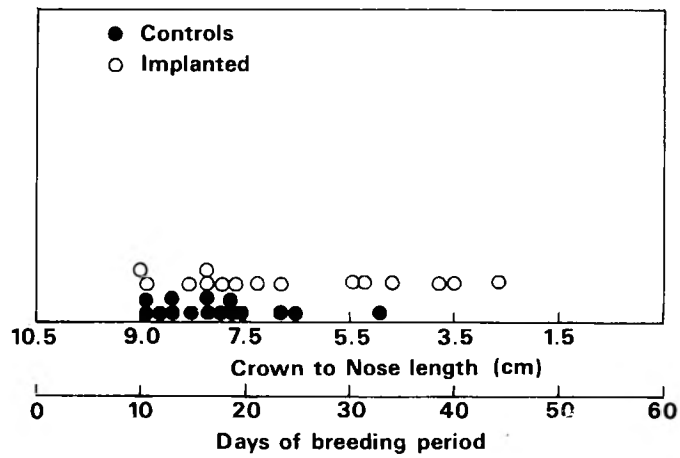
At the time of slaughter, it was determined that 18 of 30 (60%) of the heifers in pasture I were pregnant while 12 of 30 (40%) of the heifers in pasture II were pregnant. The overall pregnancy rate was 50% since 30 of the 60 heifers became pregnant during the 60-day breeding period. Concerning the experimental groups, 15 heifers in the implanted group and 15 heifers in the control group were pregnant, indicating that zeranol implants did not interfere with overall conception during the 60-day breeding period. The low (50%) conception rate of the heifers during the 60-day breeding period was attributed to inadequate body weight for the breed types of the heifers at the beginning of the breeding period.

Figure 3. Average weight gain of implanted and control heifers after 120 days.

Average Weight Gain (kg ± SD)

	30 Implanted	30 Controls
Initial wt.	259 ± 28.8	251 ± 26.8
Final wt.	378 ± 47.8	371 ± 41.3
Gain (120 days)	119	120

Figure 4. Relationship of crown to nose lengths of fetuses from implanted and control heifers to day of conception during the breeding period.



Average crown to nose length of fetuses (± SD) was smaller (6.5 ± 2.1 cm) for the implanted than the control heifers (7.8 ± 1.0 cm). The smaller fetal size at slaughter in the implanted heifers indicated that conception occurred later in the breeding period. Estimation of pregnancy duration by fetal crown-to-nose measurements per rectum in cows of known breeding dates by Ball (16), established the following values: 1.5 cm at 68-70 days, 3.5 cm at 80 days, 5.5 cm at 90 days, 7.5 cm at 100 days, 9.0 cm at 110 days and 10.5 cm at 120 days. Subtraction of days of fetal age from 120 days (duration of study) indicated the day of the breeding period on which each heifer conceived. For example, 7.5 cm crown-to-nose length indicated conception on day 20 (120-100 days fetal age = day 20 of breeding period) *(Figure 4)*. Based on these approximate conception dates, twelve of the controls and seven of the implanted heifers conceived within the first twenty days of the breeding period. The difference in the average age of the fetuses from each group was approximately one week. However, significance could not be attributed to the difference in time of conception between groups because the percentage of cycling heifers in each group at the beginning of the experiment was unknown.

In conclusion, zeranol implanted at the time of breeding did not affect weight gains or pregnancy rate of the implanted heifers.

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