IMPLANTS FOR SUCKLING STEER AND HEIFER CALVES AND POTENTIAL REPLACEMENT HEIFERS

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ABSTRACT

Growth promoting implants consistently improve average daily gain of steers and heifers from implanting to weaning. The decision to implant is much more important than the decision of which implant to use. Average daily gain responses of approximately .1 pound per day can be expected for steer calves from zeranol and estradiol-progesterone implants. Gain responses in heifers are slightly greater (.12 to .14 pounds per day).

Replacement heifers that can be identified early in life (such as heifers in seedstock herds) should not be implanted. No advantages from implants in puberty age or dystocia rate exist. Heifers that cannot be identified early in the suckling phase as a potential replacement can be implanted once at approximately 2 months of age with little risk of impaired reproductive performance. However, re-implanting replacement heifers increases the risk of a reduced pregnancy rate. Economic analyses of a simulated commercial cow herd indicates that little economic risk exists if all heifers are implanted once at calf working time. However, risk is increased if a very high replacement heifer rate is used and the ranch has a history of greater than 5% reduction in pregnancy rates due to implanting.

INTRODUCTION

Three types of growth promoting implants are available for use in suckling calves. Several commercially available implants contain 10 mg of estradiol benzoate plus 100 mg progesterone; one commercially available product contains 36 mg of zeranol as the active ingredient; the third calf implant has 24 mg of estradiol 17β (although recent analysis lists indicated that this product has 25.7 mg estradiol 17β). All these products are available for suckling steer calves. The first two types are available and approved for use with suckling heifers including potential replacement heifer calves.

This paper examines the impact of the various implants on average daily gain from implanting to weaning in steer calves, and where appropriate, in heifer calves. Also included is a review of the effects of implants on reproductive performance of implanted heifer calves. All trials included also had non-implanted controls as a treatment group. Average daily gain is the parameter reported rather than weaning weight because weaning age differs. Also non-traditional weaning times are of increased interest. Many additional trials have been conducted that are not included in this review. Implant trials have been very popular for county extension personnel to demonstrate the effectiveness of this technology to local producers. Many such trials were never reported other than in newsletters or obscure proceedings of producer meetings. Therefore, this is not an all-inclusive review of suckling phase implant trials although it should present a representative picture of the response of calves to implants.

Review of trials for steer calves

Tables 1, 2 and 3 summarize trials conducted with suckling steer calves. The increase in average daily gain by zeranol implanted calves (Table 1) and estradiol - progesterone implanted calves (Table 2) was slightly greater than those for the calves implanted with 24 mg of estradiol 17β (Table 3). One impressive finding is that all of the implants consistently improved performance. Nearly all trials had a positive gain response.

Table 1 summarizes 23 trials where 36 mg of zeranol was implanted once during the suckling phase of steer calves. The average response to zeranol implants in these 23 trials was .097 pound per day from implanting to weaning.

Table 1. Performance of 36 mg Zeranol implanted once versus unimplanted controls for suckling steer calves.

Study	Control Average daily gain (lb)	Difference in Implanted calves (lb/d)
McReynolds et al., 1979	1.52	+.06
McReynolds et al., 1979	1.42	+.16
Simms et al., 1983	2.11	+.06
Simms et al., 1983	1.91	+.05
Gill et al., 1984	1.59	+.08
Simms and Schalles, 1984	2.06	+.06
Lamm, 1986	2.24	+.23
Lamm, 1986	2.16	+.08
Lamm, 1986	1.96	+.05
Lamm, 1986	1.92	+.09
Lamm, 1986	1.86	+.10
Simms, 1986	2.08	+.17
Simms, 1986	1.89	+.04
Simms et al., 1986	1.78	+.05
Whittington, 1986	2.32	+.09
Whittington, 1986	1.94	+.07
Whittington, 1986	1.93	+.08
Brazle and Whittier, 1988	1.88	+.22
Brazle and Whittier, 1988	1.80	+.04
Brazle and Whittier, 1988	1.73	+.06
Bagley et al., 1989	1.56	+.07
Wardynski et al., 1990	2.02	+.19
Adams et al., 1991	1.81	+.13
23 Trials	*Average difference in gain*	*+.097*

In thirteen trials comparing steer calves implanted once with a 10 mg estradiol plus 100 mg progesterone implant (Table 2) a very similar response (.11 pound increased average daily gain) was noted for implanted calves.

In table 3, data from 14 trials are compared for steer calves implanted with 24 mg of estradiol 17β to data for unimplanted controls. The average implant response was .07 pounds average daily gain. One trial included in this table (Sawyer et al., 1987) was shorter in duration (79 days) than others and produced the greatest response.

Review of trials using heifer calves

Fewer research trials have been conducted that examined weight gain responses by heifer calves. In many instances, if heifers were included in the trials, data for steers and heifers were not individually reported, but gain response was given only for the entire calf crop. Such data were reviewed previously by **Corah and Blanding (1991)**. However, in some trials, implanted heifer calves have been compared with unimplanted control heifers. Often these trials were part of a study of the effect of implanting on subsequent reproductive performance. In eight trials, zeranol has been tested for heifers (Table 4).

Table 2. Performance of 10 mg Estradiol Benzoate with 100 mg Progesterone implanted once versus unimplanted controls in suckling steer calves.

Study	Control Average daily gain (lb)	Difference in implanted calves (lb/d)
Gill et al., 1984	1.62	+.08
Gill et al., 1984	1.56	+.11
Johns et al., 1984	1.64	+.11
Faulkner et al., 1986	1.39	+.05
Lamm, 1986	2.24	+.17
Lamm, 1986	2.16	+.07
Lamm, 1986	1.96	+.02
Lamm, 1986	1.92	+.09
Lamm, 1986	1.86	+.16
Wardynski et al., 1990	2.55	+.20
Wardynski et al., 1990	2.46	+.18
Adams et al., 1991	1.81	+.05
Mader et al., 1994	2.63	+.14
13 Trials	*Average difference in gain*	*+.11*

Table 3. Performance of 24 mg Estradiol 17β implanted calves versus non-implanted sucking steer calves.

Study	Control Average daily gain (lb)	Difference in implanted calves (lb/d)
Kuhl, 1982	1.92	+.10
Lamm et al., 1983	2.33	+.04
Simms et al., 1983	2.11	+.03
Simms et al., 1983	1.91	+.01
Simms and Schalles, 1984	2.06	+.08
Faulkner et al., 1986	1.39	+.10
Fontenot et al., 1986	1.52	-.05
Greathouse, 1986	2.07	0
Greathouse, 1986	1.62	+.19
Sewell et al., 1986	1.42	-.08
Whittington, 1986	2.10	+.04
Sawyer et al., 1987	1.45	+.27
Bagley et al., 1989	1.56	+.08
Wardynski et al., 1990	2.02	+.13
14 Trials	*Average difference in gain*	*+.07*

Table 4. Comparison of suckling heifer calves once implanted with 36 mg Zeranol versus unimplanted calves.

Study	Control Average daily gain (lb)	Difference in implanted calves
Muncy et al., 1979	1.05	+.09
Bolze et al., 1984	2.31	+.18
Gill et al., 1984	1.53	+.11
Faulkner et al., 1986	1.18	+.04
Goerhing, 1985	1.63	+.10
Brazle and Whittier, 1988	1.75	+.09
Brazle and Whittier, 1988	1.72	+.26
Brazle and Whittier, 1988	1.72	+.08
8 Trials	*Average difference in gain*	*+.12*

Gain response averaged .12 pounds per day.

Table 5. Performance of steer calves twice implanted with 36 mg Zeranol versus non-implanted suckling steer calves.

Study	Control Average daily gain (lb)	Difference in implanted calves
Corah, 1980	2.02	+.23
Lamm, 1983	1.98	+.22
Lamm et al., 1983	2.33	+.12
Simms et al., 1983	2.11	+.19
Simms et al., 1983	1.91	+.04
Lamm and Greathouse, 1984	1.96	+.16
Simms and Schalles, 1984	2.07	+.07
Simms and Schalles, 1984	2.06	+.13
Faulkner et al., 1986	1.39	+.16
Simms, 1986	2.08	+.13
Simms, 1986	1.89	+.06
Simms et al., 1986	1.78	+.09
Bagley et al., 1989	1.56	+.06
Adams et al., 1991	1.81	+.18
14 Trials	Average difference in gain	+.13

Table 6. Performance of suckling steer calves twice implanted with 10 mg Estradiol Benzoate and 100 mg Progesterone versus unimplanted calves.

Study	Control Average daily gain (lb)	Difference in implanted calves
Lamm et al., 1983	2.30	+.11*
Lamm et al., 1983	2.03	+.14
Lamm and Greathouse, 1984	1.96	+.16
Simms and Schalles, 1984	2.07	+.01
Faulkner et al., 1986	1.39	+.18
Adams et al., 1991	1.81	+.08
6 Trials	*Average difference in gain*	*+.11*

Guiterrez (1993) examined the economic impact of implanting replacement heifers; he used an average gain response (from ten trials) of .14 pound per day for his calculations. This was determined by dividing the average weaning weight difference by the days from implanting to weaning. The estimate .14 pound per day is identical to that reported in a Michigan study (Wardynski, 1990). The slightly greater response of heifers than steers to implants is similar to that reported by Nebraska workers (Mader et al., 1994).

Re-implanting suckling steer calves.

Calves often nurse their dams until they are 7 to 9 months of age. Most calves are vaccinated, castrated, and implanted at approximately 2 months of age. Therefore, the first implant often is given to the calf 150 to 210 days before weaning. Because most implants are reported to payout in 120 days or less, re-implanting suckling calves may be desirable. Trials comparing steers implanted twice with zeranol (table 5) or with estradiol benzoate and progesterone are presented (Table 6).

Average daily gain during the entire nursing period was slightly greater with two zeranol reimplants (.13 pounds per day) than with one (.097 pounds per day). In the six trials comparing steer calves implanted twice with estradiol-progesterone gain response (.11 lb/d) was similar to that of calves implanted once (.11 lb/d). This observation contrasts with results of a review by Corah and Blanding (1992), in which slightly greater response to re-implanting was noted from estradiol-progesterone than from zeranol. Few data are available on re-implanting heifer calves. In many of those studies, heifers were

weaned when the second implant was given at about 6 months of age. Those are trials which were designed primarily to examine the implant effect on reproductive performance.

Re-implanting information for 24 mg estradiol 17β implant is not available. Since this implant is designed for longer payout, re-implanting is not considered necessary.

Figure 1 plots the mean gain responses of each trial against the non-implanted control average daily gains. Steer trial data points are illustrated for all the implant types discussed whereas only zeranol implanted heifers trials are plotted in Figure 1. A linear regression equation for both steers and heifer implant trials shows that the ADG response tended to increase slightly as ADG or calves control increased. However, the percentage of variation accounted for by the regression equations is quite a small (< 5%) and implies that many factors beyond ADG influence response to implants.

Implants for suckling heifer calves intended as cow herd replacements

Growth implants have not been widely used in heifer calves because of concern by herd managers about detrimental effects on subsequent reproductive performance of heifers kept as herd replacements. Currently two implants Synovex-C® (estradiol and progesterone) and Ralgro® (zeranol) have received FDA approval for replacement heifer calves. Thorough reviews of this subject have generally concluded that one implant given at or after the heifer is 2 months of age has little or no impact on future reproductive performance (Hargrove, 1994; Deutscher, 1994). Implanted heifers had significantly greater pelvic area when measured at about one year of age, but these differences were very small at the time the heifer delivered her first calf or at about two years of age. Consequently, the implanted heifers had no less calving difficulty than non-implanted heifers.

Lower pregnancy rates during the breeding season is the major concern of ranchers about implanting heifer calves. Following tables present the difference in pregnancy percentages of heifer calves implanted once at birth (Table 7), once at calf-working time (approximately 2 months of age Tables 8 and 9), once at weaning time (Tables 10 and 11), or multiple implants (Tables 11 to 13). Both the 36 mg zeranol implants and the 10 mg estradiol plus 100 mg progesterone implants have been examined. Implanting at birth was detrimental to breeding season pregnancy rates (Table 7).

In contrast, The average loss in percentage pregnant due to one implant (at calf-working time) is quite small (tables 8 and 9).

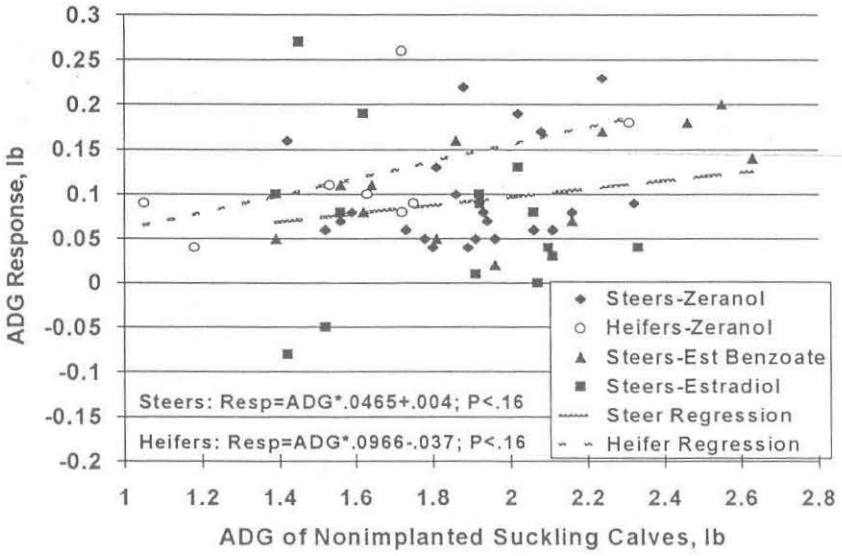

Figure 1. ADG response to implants for calves in various trials gaining at different rates.

Table 7. Summary of pregnancy rate of heifers implanted 1X at birth with Zeranol (36 mg).

Study	Control	Difference from Control Group
Simms et al., 1982	93	-37
Morrow et al., 1983	95	-50
Goerhing et al., 1985	78	-30
3 Trials	*Average difference in percent pregnant*	*-39.0*

Table 8. Summary of pregnancy rate of heifers implanted once at 1 to 3 months with 36 mg Zeranol.

Study	Control	Difference from Control Group
Muncy et al., 1979	46	+4
Sprott et al.., 1979	100	0
Sprott et al., 1979	85	-4
Sprott et al., 1979	59	-4
Fuller et al., 1980	83	-10
Huston et al., 1980	77	-7
Morrow et al., 1983	95	-11
Deutscher et al., 1986	96	0
Goerhing et al., 1985	78	+1
Lamm and Greathouse, 1986	86	0
Bolze and Corah, 1988	86	+4
Marshall and Hargrove, 1989	52	-2
Hixon et al., 1994	72	+19
13 Studies	*Average difference in percent pregnant*	*-0.8*

Table 9. Summary of pregnancy rate of heifers implanted once at 1 to 3 months with Estradiol and Progesterone.

Study	Control	Difference in Implanted Group
Lawrence et al., 1985	92	-2
Ragland et al., 1990	91	-2
Rutter, 1990	97	-6
Carpenter and Sprott, 1991	77	+2
Whittier et al., 1991	89	-7
Rusk et al., 1992	99	-9
Hancock et al., 1993	93	-10
Hixon et al., 1994	72.2	-8*
Hixon et al., 1994	72.2	+3
9 Trials	*Average difference in percent pregnant*	*-3.2*