RESPONSE OF FALL BORN CALVES TO SYNOVEX®C IMPLANTS AND REIMPLANTS

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Story in Brief

Two trials, involving 469 steer and heifer calves, were conducted to evaluate the practices of implanting or reimplanting suckling fall born calves with Synovex®C implants. Calves having an average initial weight of 148 lb were randomly allocated within sex and location to remain either as nonimplanted controls or to receive a Synovex®C implant in the late fall, in the spring, or in both fall and spring. Nonimplanted calves in Trial 1 gained 1.26 lb/day during the winter months, and Synovex®C implants improved growth rate by 7% to 1.34 lb/day ($P<.05$). Average daily gain (ADG) of calves during the winter months of Trial 2 was only .45 lb/day, and was not affected by implanting with Synovex®C. ADG of calves during the spring and summer was improved an average of 4.3 to 10% ($P<.05$) by Synovex®C in both trials regardless of when they were implanted. ADG of calves over the entire 8-month trials was 1.46 lb/day for nonimplanted calves and was improved ($P<.01$) to 1.55, 1.55 and 1.56 lb/day for calves on the two single implant and reimplant schedules, respectively. Implanted calves gained an average of 23 lb more than nonimplanted calves during the study.

(Key Words: Synovex®C Implants, Suckling Calves, Growth Promotion.)

Introduction

Research with Synovex® implants has demonstrated that a 4-pellet implant containing 10 mg of estradiol benzoate and 100 mg of progesterone is both safe and effective for improving growth rates of suckling steer and heifer calves (Spires et al., 1983; FDA, 1983). All efficacy trials supporting those claims, however, were conducted using spring calves in which cows and calves were grazing pastures of sufficient quality to maintain minimum ADG of calves above 1.4 lb/day at all times during the study (Spires et al., 1983; Gill et al., 1984). Rearing of fall calves constitutes a different situation than rearing of spring calves, since poor pastures decrease available dietary energy to the suckling calf at a time when cold environmental temperatures increase the maintenance energy requirement. Consequently, gains of suckling calves on winter pastures typically are lower than on spring pastures and the benefits of implanting with Synovex®C under those conditions have not been established. Furthermore, effects of early calfhood implanting upon growth rate of the calf several months later also is a subject on which little information is available.

This study was conducted to monitor the performance until weaning of fall calves which were implanted with Synovex®C, either in the fall, the spring, or both the fall and spring, and to compare those gains with calves that remained nonimplanted throughout the entire study.

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Materials and Methods

Four hundred sixty-nine suckling calves, having an average initial weight of 148 lbs, were selected for two trials. One hundred thirty-eight steer and 155 heifer Hereford calves were used for Trial 1 near Claremore, Oklahoma, while 82 steer and 94 heifer Hereford and Hereford X Angus cross calves were used for Trial 2 at Mill Creek, Oklahoma. Calves were pastured with their dams on native bluestem range throughout the study. The forage was dormant from the start of the trials until the beginning of the growing season, about May 1. Calves were individually identified by eartags and were randomly assigned, within sex, to one of the following four treatments: (1) control-control, no implants throughout the study; (2) Synovex-control, implanted only on the first day of the study; (3) control-Synovex, nonimplanted during the first period of the study but received an implant just prior to green grass; and (4) Synovex-Synovex, implanted both at the beginning of the trial and reimplanted just prior to green grass. The start, reimplant, and end dates were November 30, April 17, and July 25, respectively, in Trial 1, while the same dates for Trial 2 were December 8, April 5 and August 15.

Synovex®C implants were placed in the top central one-third of the ear. All calves were weighed on the first day of the study and received blackleg vaccinations. All bull calves were castrated at that time. Calves were reweighed at the reimplant dates and again at the end of the trials. ADG of each calf was calculated for both the first and second periods and for the total trial. Data were analyzed by analysis of variance (GLM, SAS, 1979) and treatment means were compared by Duncan's Multiple Range Test in the event that a treatment effect ($P<.05$) was detected.

Results

Performance of calves between the two locations was different (Table 1, $P<.0001$). Calves in Trial 2 were larger than in Trial 1 at the start of the study, but calves in Trial 1 gained faster in both the winter and summer months so that the average weights of calves at reimplanting and weaning were larger in Trial 1 than in Trial 2. Steers and heifers gained at a similar rate during the winter months, but steer calves gained slightly faster than heifer calves (2.20 -vs- 2.10 lb/day across all treatments) when green grass was available ($P<.01$). No interactions between locations, sex and implant treatments were detected, indicating that both sexes tended to respond similarly to implants at both of the trial locations (Table 1).

In Trial 1, nonimplanted calves gained 1.26 lb/day during the winter months, and Synovex®C implants improved ADG approximately 7% to 1.34 lb/day (Table 2, $P<.05$). However, during the winter months in Trial 2, ADG of all calves was less than .5 lb/day, and no differences in growth rates of implanted -vs- nonimplanted calves were observed (Table 3). Consequently, the combined results for both studies illustrate a trend toward improved ADG of implanted calves during the winter months (Table 4), but the lack of response in the slower gaining calves in Trial 2 precluded statistical significance.

The combined analysis revealed that ADG of calves in the summer months was increased by Synovex®C implants regardless of when the calves had been implanted (Table 4) and the same observation was apparent in both of the individual trials (Tables 2 and 3). Calves which remained nonimplanted throughout the entire study gained 2.04 lb/day

Table 1. Analysis of variance of average daily gain[a] of calves implanted or reimplanted with Synovex®C.

Source of Variation	df	Prob F for Average Daily Gain		
		Period 1	Period 2	Cumulative
Location	1	.0001	.0001	.0001
Treatment	3	.2191	.0009	.0080
Location x treatment	3	.4103	.6552	.5610
Sex	1	.5379	.0070[b]	.1560
Location x sex	1	.7837	.4712	.9458
Treatment x sex	3	.6817	.8249	.5594
Location x treatment x sex	3	.1652	.4123	.0792
Error	468	--	--	--

[a]Error mean square was used as the error term to compute all F-ratios.
[b]Steers gained faster than heifers during Period 2.

Table 2. Performance of calves implanted with Synovex®C at the Ingersol Ranch (Trial 1).

Variable	Control-Control	Synovex®C-Control	Control Synovex®C	Synovex®C-Synovex®C	SE
Number of calves	75	75	70	73	--
Initial wt, lb	141	139	133	137	4
Reimplant wt, lb	315	322	305	328	8
Period 1 ADG*, lb	1.26[ab]	1.32[lab]	1.24[a]	1.37[b]	.04
Final wt, lb	524	547	533	544	10
Period 2 ADG, lb	2.12[a]	2.29[b]	2.31[b]	2.20[ab]	.05
Overall ADG, lb[c]	1.62[a]	1.72[b]	1.69[ab]	1.72[b]	.03
% increase		6.2	4.3	6.2	

[ab]Means with different superscripts differ (P<.05).
[c]Length of trial was 139 days for Period 1 and 99 days for Period 2.
*ADG of calves implanted with Synovex®C during Period 1 was 1.34 lb/day compared with 1.25 lb/day for nonimplanted calves (P<.05).

Table 3. Performance of calves implanted with Synovex®C at the Daube Ranch (Trial 2).

Variable	Control-Control	Synovex®C-Control	Control Synovex®C	Synovex®C-Synovex®C	SE
Number of calves	45	44	52	45	--
Initial wt, lb	165	165	164	162	8
Reimplant wt, lb	215	214	220	218	7
Period 1 ADG, lb	.43	.41	.47	.47	.03
Final wt, lb	467	480	495	489	11
Period 2 ADG, lb	1.91[a]	2.02[ab]	2.09[b]	2.05[b]	.04
Overall ADG, lb[c]	1.20[a]	1.26[ab]	1.32[b]	1.30[b]	.03
Percent increase		5.0	10.0	8.3	

[ab]Means with different superscripts differ (P<.05).
[c]Length of trial was 119 days in Period 1 and 132 days in Period 2.

Table 4. Performance of calves implanted with Synovex®C in the two trials combined.

Variable	Control-Control	Synovex®C-Control	Control Synovex®C	Synovex®C-Synovex®C	SE
Number of calves	120	119	112	118	--
Initial wt, lb	150	148	145	147	4
Reimplant wt, lb	278	282	273	286	5
ADG, winter, lb	.95	.98	.95	1.03	.03
Final wt, lb	502	522	519	523	7
ADG, summer, lb	2.04[a]	2.19[b]	2.23[b]	2.14[b]	.03
Overall ADG, lb[c]	1.46[a]	1.55[b]	1.55[b]	1.56[b]	.02
Percent increase		6.2	6.2	6.8	

[ab]Means with different superscripts differ (P<.01).
[c]Weighted average length of the two trials was 131 days for Period 1 and 110 days for Period 2.

during the last 110 days of the trial (Table 4). ADG of calves which were implanted with Synovex®C only at the beginning of the trial was 2.19 lb/day, while ADG of calves implanted during the last 110 days and those implanted both at the beginning and middle of the study were 2.23 and 2.14 lb/day, respectively. Summer gains of calves which were implanted either at the start of the study, the middle of the study, or at both times were greater than gains of calves that remained nonimplanted (P<.01), but no differences in ADG of calves among any of the three implanting schedules were observed.

ADG of calves calculated over the entire study also was increased by Synovex®C regardless of the time of implanting. ADG of calves implanted either at the beginning of the study or at the midpoint was 1.55 lb/day compared to 1.46 lb/day for calves which were not implanted (Table 4, P<.01). Reimplanted calves also gained faster than nonimplanted controls (1.56 lb/day, P<.01), but no benefit of reimplanting compared with a single implant either at the beginning or middle of the study was observed.

Discussion

The growth rate of suckling fall calves implanted with Synovex®C averaged 6 to 7% faster than nonimplanted calves. Consequently, the final weaning weights, adjusted for equal starting weights, averaged 22 lbs heavier for calves implanted once during the trial and 24 lbs heavier for calves which were reimplanted with Synovex®C. This 6 to 7% improvement in performance of fall calves agrees closely with the percentage increases previously observed when Synovex®C and other anabolic implants have been used in trials with spring calves (Basarab et al., 1984; Gill et al., 1984; Lamm and Greathouse, 1984; Lewis et al., 1978; Simms, 1984; Spires et al., 1983).

This study helped to allay some of our primary concerns regarding the use of growth promoting implants in suckling calves pastured on dry winter pastures. It has been reported that the estrogenic implants (Synovex®S, zeranol, and formerly DES) increase the concentration of thyroxin in plasma by increasing its secretion from the thyroid gland

(Gopinath and Kitts, 1982; Kahl et al., 1978). In addition, slight increases in heart rate, fasting urinary nitrogen excretion and fasting heat production also have been observed in cattle fed or implanted with DES and implanted with Synovex®S which suggest that the estrogenic implants slightly increase maintenance energy requirements (Rumsey et al., 1973; Rumsey et al., 1980; Tyrell et al., 1975). Early research also indicted that animals fed a submaintenance diet lost weight more rapidly if DES was included (Oltjen et al., 1973). More recently, Rumsey and Hammond (1984) demonstrated a typical 22% increase in ADG of feedlot steers implanted with Synovex®S and fed ad libitum, but they were unable to detect a response to Synovex®S in steers fed a restricted energy diet which supported an ADG of only 1.9 lb/day. Consequently, one of the major concerns in designing this trial was the prospect that performance of calves over winter might actually be depressed if maintenance energy requirements were increased by the Synovex®C implants.

Fortunately, no depression in growth rate of implanted calves over the winter was observed. ADG of nonimplanted calves in Trial 2 was only .45 lb/day during the winter months and average growth rate of calves implanted with Synovex®C during that period also remained at the same rate or .45 lb/day. Calves on better pastures and gaining 1.26 lb/day during the winter in Trial 1, however, benefited from Synovex®C during that time period. Consequently, maintenance energy requirements were not increased by Synovex®C implants to an extent that their use was contraindicated over the winter months. In previous studies conducted to identify the optimum steroid combination and optimum dose for suckling calves, it was found that the 8-pellet Synovex®H implants were not as effective as a half dose of the same estradiol benzoate-testosterone propionate formulation in calves gaining less than 1 lb/day (Spires et al., 1983). Likewise, the same tendency also was true when the 8-pellet Synovex®S implant was compared with the 4-pellet Synovex®C. Those observations also support the hypothesis that the growth promoting implants may tend to increase maintenance energy requirements and, consequently, was a major reason that a 4-pellet -vs- an 8-pellet Synovex implant was developed for suckling calves.

The extended effectiveness into the spring and summer months of the Synovex®C implant in calves implanted only in the fall was not really expected. Overall ADG throughout the trials, which averaged 241 days, did not differ among any of the implant treatments, regardless of when the implants were administered. Furthermore, performance during the average 110 days in the spring-summer period of these trials was improved more than 7% ($P<.01$) by implanting calves during the preceding winter, 131 days before the spring-summer period began. Rumsey et al (1984) recently reported that approximately 75% of the original doses of both progesterone and estradiol were absorbed by 60 days and 85% by 120 days in growing-finishing steers implanted with Synovex®S. Those observations seem somewhat inconsistent with out observation that a larger improvement in the performance of suckling calves was observed during the period from 131 to 241 days after implanting than from 1 to 131 days. Greathead (1984) recently reviewed studies with zeranol implants and concluded that the response may be large and of relatively short duration in rapidly growing cattle on high levels of energy intake. However, smaller improvements in growth rate, but occurring over a longer duration, are more typically observed in cattle gaining less than about 1.5 lb/day. Observations we have made in studies with Synovex®C also tend to support that hypothesis (H.R. Spires, et al., unpublished observations). However, any differences in absorption, tissue distribution and/or metabolism and elimination of the implant materials, which may explain those different responses, have not been elucidated.

Observations that a positive response from Synovex®C can be realized regardless of whether fall calves are implanted in the fall or the spring gives cow-calf producers considerable flexibility in implementing an implant program.

Literature Cited

Basarab, J.A. et al. 1984. Growth response of beef cattle at pasture to zeranol or progesterone-estradiol implants. Can. J. Anim. Sci. 64:119.

FDA. 1984. Implantation of injectable dosage form new animal drugs not subject to certification. Progesterone and estradiol benzoate in combination. Fed. Regist. 49:13873.

Gill, D.R. et al. 1984. Synovex®C or Ralgro implants for nursing calves. OSU MP-116:140.

Gopinath, R. and W.D. Kitts. 1982. Kinetic parameters of thyroxin metabolism in steers implanted with anabolic compounds. J. Anim. Sci. 55(Suppl. 1):384.

Greathead, K.D. 1984. The effects of zeranol on growth and fattening in beef calves before weaning. Aust. Vet. J. 61:20.

Kahl, S. et al. 1978. Effect of Synovex®S on growth rate and plasma thyroid hormone concentrations in beef cattle. J. Anim. Sci. 46:232.

Lamm, W.D. and G.A. Greathouse. 1984. Evaluation of the Synovex calf implant (Synovex®C) and Ralgro for improving growth rate of suckling calves. Colorado State University Beef Program Report, Special Series 32:46.

Lewis, P.E. et al. 1978. Effect of Ralgro implants on ADG in suckling calves. J. Anim. Sci. 47 (Suppl. 1):135.

Oltjen, R.R. et al. 1973. Feedlot performance and blood plasma amino acid patterns in beef steers fed diethylstilbestrol under ad libitum, restricted, and compensatory conditions. J. Nutr. 103:1131.

Rumsey, T.S., and A.C. Hammond. 1984. Effect of nutritional status on response to Synovex®S by beef steers. J. Ani. Sci. 59 (Suppl. 1):212.

Rumsey, T.S. et al. 1984. Performance response to reimplanting beef steers with Synovex®S. J. Anim. Sci. 59 (Suppl. 1):136.

Rumsey, T.S. et al. 1973. Physiological changes and blood lactic acid values in beef steers fed DES under ad libitum, restricted and compensatory conditions. J. Anim. Sci. 37:1201.

Rumsey, T.S. et al. 1980. Effect of diethylstilbestrol and Synovex®S on fasting metabolism measurements of beef steers. J. Anim. Sci. 50:160.

Simms, D.D. 1984. Comparison of Compudose, Ralgro and Synovex®C for suckling steer calves. J. Anim. Sci. 59 (Suppl. 1):377.

Spires, H.R. et al. 1983. Synovex implants for suckling calves. J. Anim. Sci. 57 (Suppl. 1):411.

Tyrell, H.F. et al. 1975. Effect of DES on fasting metabolism of beef steers. J. Anim. Sci. 41:423.