Implant Strategies for High Quality Grade Beef Production[1]

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Introduction

Growth promotants administered to cattle as implants are powerful tools that increase the efficiency of beef production. These products improve ADG by as much as 20%, improve feed efficiency by 10 to 15%, and increase carcass weight substantially at a common age or days on feed. When cattle are harvested at a constant body weight, carcasses from implanted cattle have a greater proportion of lean and less fat than occurs in carcasses from non-implanted cattle. From a production standpoint, the influence of implants mimics an increase in frame size that only occurs while the implant is active.

There is a down side to these products. Intuitively, we would anticipate that if lean growth is stimulated, there may be a reduction in intramuscular fat deposits. That response has been frequently documented. Other problems such as bullers and dark cutters are more prevalent in implanted cattle but are not exclusively caused by implant exposure. These are complex problems that are apparently precipitated by an unfortunate combination of factors that include stressors such as weather, disposition, season, implant exposure, etc.

If one carefully reviews the data that are available, it is interesting to see that the problems associated with implants are not uniformly distributed among the pens of cattle being fed. Low quality grades or high numbers of dark cutters happen within specific groups of cattle. In other groups the same implants stimulate production with minimal negative effects on carcass quality. This inconsistency suggests that other aspects of cattle management have a great deal to do with whether an implant strategy is a success or a disappointment. While I cannot fully characterize the causes of unfortunate experiences with implant use, I can describe several management conditions that allow optimizing the relationship between quality grades and production efficiency.

Background Information

We have all had experiences with implants and others regularly share their experiences with us. In the course of things, we sometimes forget how uneven the playing field is when we look at implants and quality grades. Table 1 depicts information on two sets of black-hided steers fed in the same feedlot in summer-fall season of two different years. The first group performed very well, got very fat quickly, and in spite of a high Yield Grade, had very poor marbling. Implanted or non-implanted, these steers didn't grade. Had this been a commercial feedlot trying a new implant for the first time, the conclusion would have been very negative.

The second set of cattle depicted in Table 1 all received a Synovex Plus and were harvested much leaner than the first set of steers. Depending on the diet, there were 20 to 26% of these carcasses qualifying for CAB. Under aggressive implant management, these steers were at or above the norm for CAB qualification rates. Experimenting with any new choice of implants would have looked very favorable if applied to this pen of steers. Two points are made by these data sets in regard to implant strategies. First is to be careful to not make decisions or draw conclusions on isolated cases. The interpretations could be very misleading. The second is that management concerns other than final implant selection influence outcomes.

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[1] Reference to only one product when comparable alternative products exist may occur to simplify reading. It is not intended as an endorsement of one product over another.

The type of cattle (their genetics, age, nutritional background) and the feeding program that is planned should be optimized by a specific implant program. The days on feed are driven by the feeding program and are not effectively altered by the implant strategy used. An excellent example was reported in the Ft. Dodge Technical Bulletin for Synovex Plus and is depicted in Table 2. When cost of gain, cutability, and quality grades are all considered, the optimum strategy for these cattle was to feed them for 127d using Synovex Plus on day 1 as the implant strategy. More aggressive strategies reduced quality grades. Less aggressive strategies inflated cost of gain.

We can simplify developing the appropriate implant strategy to match the cattle type and feeding program by classifying implants by their potency and payout characteristics. Potency can be distinguished based upon the type and dosage of active ingredients included in an implant (Table 3). Potency is a classification for assigning suitability to specific production situations. It is not a ranking of superior or inferior products. As an example, Synovex-C, a low potency implant is a 50% dose of Synovex-S, a moderate potency implant. It was developed as a more appropriate dosage for suckling calves. Recently, Synovex-C was also approved as the initial implant in re-implant programs using Synovex-Plus.

The principle associated with potency is to use lower potency products on more immature cattle and during phases of production when energy intake is lower. As cattle mature and are fed higher energy diets, potency can increase. The highest potency products available today contain combinations of estradiol or estradiol benzoate (E_2) and trenbalone acetate (TBA). In a high quality grade program these E_2TBA high potency implants need to be used only as the final implant in well-fleshed cattle on high-energy diets.

Research has not clearly discerned the effective payout window for each implant. The payout window days reported in Table 3 are suggestions for application in developing strategies. The rationale is in part empirical and to a degree intuitive. We have had decades of practical experience with some of the moderate potency implants and generally fit them into an 80 to 120d window. Shorter periods (80d) maximize production rates, but longer periods (120d) still provide significant economic responses.

In some instances we have partial dosage implants (Ralgro vs. Magnum; Synovex-C vs Synovex-S; Component E-C vs component E-S; and revalor-g vs revalor-s). During the initial 30 to 50d after implanting, the partial dosage implants stimulate ADG as much or nearly as much as the full dosage contemporaries. Subsequent performance favors the higher dosage products. The difference in potency manifests itself primarily as a difference in effective payout. Consequently, potency is an important consideration when determining elapsed time between implants as well as for matching potency to energy intake/level of production.

Matching Implants to Production

The genetic code dictates the normal growth curve for cattle. Inherent in that growth curve is a lean growth potential. We frame out feeder cattle by growing them for extended periods of time at an ADG below their lean growth potential. We make feeders fleshy by supplying enough energy to allow them to grow faster than their lean growth potential. Since implants increase the lean growth potential of steers and heifers, they work best when energy intake is greater than needed for normal growth. The higher the energy intake is above the requirement for "normal" growth, the higher the acceptable potency of the implant used. Following through with this logic, I would recommend that for high quality grade programs, implants should not be used while feeders are being framed out. Generally this applies when ADG are less than 1.75 lb. If ADG are higher, up to 2.25 lb, a low potency implant would be acceptable. Moderate potency implants would be appropriate if feeders were being fed enough energy to be gaining 2.5 lb/d or more. The emerging information on the effects of early weaning-high energy feeding programs on quality grades suggests that positive influences on marbling may begin to occur very early in growth. Until research suggests differently, it is probably prudent to assume excess exposure to growth promotants early in a calf's development may adversely affect the development of marbling. The use of high potency implants would be reserved for heavier feeders in that phase of production when energy intake is maximized and when lean growth potential is slowing.

We have some examples of applications how this approach to implant management affects quality grades. The poor-grading steers described in Table 1 demonstrated compensatory growth during the first half of the 105d feeding period. At the same time, feed intake at 22.9 lb (DM basis) was well below peak intake of over 28 lb/d that occurred later. Lean growth potential was probably very high early in the feeding period and the steers could not be adapted to a high-energy diet quickly enough to meet demand. The non-implanted steers graded poorly, and this was exacerbated by using implants. A similar problem can occur in cattle that are being programmed or restricted fed. Several studies have indicated that if the restriction continues throughout the feeding period, marbling will be lower than in full fed cattle harvested at a similar Yield Grade.

Under normal conditions it will take newly placed feeders 30 to 40 days to achieve a near maximum level of energy intake. Five years ago it would have been customary to administer implants at initial feedlot processing and in this situation of 125 to 150d feeders this would very likely have been a terminal implant. This would create a situation where lean growth potential is maximized before energy intake is maximized and could influence marbling. The imbalance can be resolved by delaying the implanting process or preferably by starting with a low potency implant and re-implanting with a terminal implant after the cattle are up on full feed.

We observed this occurring in an experiment where we used four treatments: no implant (control), Synovex Plus administered on day 1, revalor-s administered on day 1; and Ralgro (day 1) followed by revalor-s (day 56). There were no differences in production traits among the implant treatments. Two groups of steers were involved and implants and steers affected quality grade distributions (Table 4). The advantage of a low potency-high potency strategy was in improved grading and was more pronounced in Group II steers. We attribute the interaction occurring between implant treatment and group to be due in part to differences in the amount of flesh and maturity between the two groups of steers at the onset of the experiment.

We recently created an experimental scenario that would be very likely in a CAB program. Black-hided calves that were predominantly straight Angus were purchased at weaning in October. They were backgrounded until January and gained 2.3 lb/d during this phase. The calves were in good flesh at weaning and maintained this condition during backgrounding. No implants were used during backgrounding. Calves were placed on feed weighing 702 lb and fed for 144d.

During the finishing phase steers received one of the following treatments: no implant, revalor-s(day 1), revalor-s(day 35), revalor-s(day 70), revalor-g(day 1) + revalor-s (day 35), or revalor-g (day1) + revalor-s (day 70). This gave us the opportunity to look at the concept of delayed implanting and low potency-high potency implant programs. There were no differences in carcass quality among implant treatments allowing us to pool these records for comparison against non-implanted controls (Table 5). Implants caused a 41 lb increase in carcass weight and an 11% improvement in feed efficiency with no differences in the distribution of quality grades. In this situation, it appears the steers had sufficient flesh and maturity to tolerate aggressive implant strategies.

Example Implant Strategies for Cattle Sold on a High Quality Grade Grid

Backgrounding Programs. Programs allowing ADG of 1.75 lb or less should probably not include an implant. If ADG allowed is targeted at 1.75 to 2.25 lb, a low potency implant is recommended with a window of 50 to 80d. If ADG allowed is greater than 2.5 lb, a moderate potency implant with a window of 80 to 110d is recommended. If dealing with large-framed steers, increase the ADG targets by .25 lb for each growth rate category.

Previously Weaned 575 lb Calves Scheduled to be Fed for 200d. You could use a low potency implant with a 60 to 70d window followed by a high potency implant. A moderate potency implant (80d) followed by a high potency implant will probably improve production efficiencies. This more aggressive strategy would be better suited to bunk-broke calves carrying good condition.

Backgrounded 650 lb Steers Scheduled for 150 to 160d on Feed. In lower energy finishing programs (58 Mcal NE_G) two moderate potency implants would work. There are some trends in data suggesting that zeranol based implants may cause less pressure on marbling than estradiol based implants. Allow at least 75d between re-implanting with moderate potency implants. For lower conditioned cattle, a low potency (50d)-high potency implant strategy can work well. In cattle of good condition, a moderate potency-high potency program would be effective.

Young 750 lb Cattle Fed for Less Than 140d. If these cattle have been well fed throughout their life, the implant strategy can be aggressive to increase carcass weight. A low potency (50d)-high potency strategy works well. It is not well described whether two moderate potency implants would offer any advantage in this situation. If cattle are of good flesh, a single high potency implant could be used.

Older Cattle Weighing 750 lb or More and Fed for Less Than 130d. If these cattle are capable of substantial compensatory growth, they may not be suited to a high quality grade grid. Delay implanting until cattle are on full feed. With limited days remaining, a moderate potency implant seems more appropriate.

Conclusions

When considering all of the possible combinations of cattle weights, body conditions, feeding programs, and implants available, it is quickly evident that we may never have adequate comparisons of all management options. Strategies outlined here were intended for production with high quality grade constraints and aren't uniformly useful for other marketing programs. Trade-offs between cost of production and quality grade create moving targets depending on relative feed prices and carcass premiums. Obviously these vary within and across years and between regions of the country.

I tried to emphasize examples of research using good quality, predominantly black-hided cattle in well-replicated data sets. The principles outlined by these data have been repeatable in commercial settings. The example strategies offered are only intended as guidelines to aid your decision-making process. Certainly not all situations are represented and any specific strategy may be affected by other factors outside the scope of this paper. The most obvious to me are the influences of weather conditions, diets, and animal health. Clearly, implants can be used to lower production costs in high quality grade marketing programs. The successful use of these tools does require thorough planning and a responsive management system.

Tables

Table 1. Quality Grade Distributions in Two Sets of Black-Hided Yearling Steers

	Initial BW	Yield Grade	Marbling Score[a]	Hi Choice & Prime	Average Choice	Low Choice	Select	Standard
				%				
Blacks & Baldies 105d 270 head								
Non-implant	866	3.41	4.93	4	1	40	53	1
Implanted	863	3.38	4.70	1	0	27	70	2
Blacks & Baldies 125d 180 head								
Synovex Plus								
Diet A	826	2.74	5.46	13	13	43	33	0
Diet B	827	2.77	5.37	14	6	39	41	0

[a]4.0 = Slight°; 5.0 = Small°

Table 2. Relationships Between Implant Strategies and Days on Feed and Production and Carcass Variables

Day 0	None	Synovex Plus	Synovex-S	Synovex Plus
Day 61	None	-	Synovex Plus	Synovex Plus
Days on Feed		Feed/Gain		
127	6.0		5.2	5.3
148	5.9	5.8	5.2	5.2
169	6.2	5.8	5.8	5.7
		Yield Grade		
127	3.2		3.0	3.0
148	3.7	3.8	3.8	3.9
169	4.1	3.7	4.0	4.1
		≥ Choice, %		
127	79		57	46
148	81	71	70	58
169	100	93	91	75

[a]shaded areas depict unsatisfactory values

Synovex Plus Tech Manual

Table 3. Implants Currently Available for Beef Production

	Application	Days[b]	Active Ingredients	Dose
Low Potency[a]				
Ralgro	steers, heifers, calves	50 to 75d	zeranol	36 mg
Synovex-C Component E-C	steers, calves calves	50 to 75d	estradiol benzoate progesterone	10 mg 100 mg
Moderate Potency[a]				
Compudose	steers, heifers, steer calves	150 to 200d	estradiol	25.7 mg
Encore	steers, heifers, steer calves	400d	estradiol	43.9
Component E-S Synovex-S	steers steers	80 to 120d	estradiol benzoate progesterone	20 mg 200 mg
Component E-H Synovex-H	heifers heifers	80 to 120d	estradiol benzoate testosterone	20 mg 200 mg
Magnum	steers	80 to 120d	zeranol	72 mg
revalor-g	stocker steers	60 to 80d	estradiol trenbalone acetate	8 mg 40 mg
Finaplix-H Component T-H	heifers	60 to 100d	trenbalone acetate	200 mg
Component T-S	steers	60 to 100d	trenbalone acetate	140 mg
High Potency[a]				
Component TE-S revalor-s	steers steers	80 to 120d	estradiol trenbalone acetate	24 mg 120 mg
Synovex Plus	steers, heifers	100 to 140d	estradiol benzoate trenbalone acetate	28 mg 200 mg
revalor-h	heifers	80 to 120d	estradiol trenbalone acetate	14 mg 140 mg

[a]relative classification based primarily on dosage
[b]intended as a reference point when formulating implant strategies for cattle intended for slaughter

Table 4. Distribution of Quality Grades Among Implant Treatments and Groups of Cattle.[a]

	Treatment				
	Control	Synovex Plus	revalor-s	Ralgro revalor-s	
	%				
Avg Choice or Higher	21	5	10	11	
Low Choice	47	38	41	49	
Select	32	53	48	40	
Standard	0	4	1	0	
	% Choice or Higher				Initial BW
Group I	67	54	58	59	782
Group II	69	32	44	60	661

[a]400 head fed for 131 days (Group I) or 145 days (Group II)

Table 5. A Comparison of Implant Treatments in Black, Calf-fed Steers[a]

	Non-implanted	Implanted
ADG	2.83	3.27
Feed/Gain	7.46	6.63
Carcass weight	694	735
Yield Grade	3.27	3.32
Avg. Choice or Higher, %	24	21
Low Choice, %	50	50
Select, %	26	29

[a]480 steers fed for 144d