CHAMPION Feed Services Ltd.

Growth Implant Strategies

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Take Home Message

- ✓ Growth implants are useful in backgrounding and finishing cattle. Correct product selection is important to achieve desired results.
- ✓ Implants may influence carcass quality. This should be considered when planning your implant strategy.
- ✓ Understanding the factors involved in implant strategies are important when designing an implant program for your feeding situation.
- ✓ There are many potential implant strategies. Select several which will meet your individual needs and learn to implement them correctly.

Implant Use for Pasture Cattle

Growth promoting implants can improve Average Daily Gain (ADG) and Feed Conversion (F/G) for grass cattle. However, there are several points which must be considered to use implants correctly.

Only implants approved for use in growing and backgrounding should be used while cattle are on grass. Use of higher-dose implants containing trenbolone acetate (TBA) will not enhance weight gain on pasture since the plane of nutrition is not sufficient to allow the animal to respond to higher doses of hormone. There is also the risk of undesirable side effects (i.e. increased buller rates) if higher dose implants are used on pasture. Finally, the use of higher-dose implants during growing phases may reduce performance in subsequent phases of production (**7**).

The expected increased live weight gain due to implants is relative to the quality and quantity of the forage the animal consumes. As forage quality (pasture quality) increases from low to high, so does the gain response from the implant. In situations when animals are on a low plane of nutrition because of poor pasture quality (ADG of 1.0- 1.25 lb/day), the response to implants is poor. In these situations, use of estrogenic implants may be of little value.

Implants should not be administered within 60 days of a previous implant. The systemic levels of hormone do not start to decrease until after 60 days, and therefore reimplanting before this point may lead to side effects such as diminished performance, increased riding activity and vaginal prolapses in heifers. Consequently, it is important to know as much history about recently purchased cattle as possible. A single implant is sufficient to last an entire grazing season, unless the forage quality is excellent or the cattle are supplemented later in the season. In this case, consider using a longer lasting product such as *Compudose*®.

Spayed heifers must be implanted if performance is to be optimized. Removal of the ovaries removes an endogenous source of estrogen and there is much trial data to show that unimplanted spayed heifers gain poorly when compared to unimplanted intact heifers (**8**). There is no difference in gain of spayed heifers when implanted with a steer product or heifer product.

Effects of Growth Implants on Carcass Quality

There are several aspects to carcass quality that must be considered:

Marbling

Growth promoting implants have been implicated with reduced marbling (**5**). Marbling is the term used to describe the intramuscular fat present in muscle. Implants, including those containing TBA, do not change the absolute amount of fat that is deposited in the muscle. They increase protein deposition (i.e. muscle) so that the same amount of fat is deposited in a larger muscle area. Studies have shown that steers implanted with *Revalor-S*® deposited similar amounts of fat for 120 days after implanting as compared to unimplanted controls (**5**). In the same experiment the *Revalor-S*® implanted steers deposited approximately 10 kg more protein than the controls, most of which was deposited during the first 40 days after implanting. Because the same amount of fat is deposited in a larger muscle, the percent intramuscular fat decreases consequently lower marbling scores.

In another trial using genetically identical steers (clones), carcass responses to various implant programs were measured (**Table 1**) (**4**). The only significant variable in this trial was the implant. There was the usual improvement in performance of the implanted animals over the control. However carcass

Table 1. Cloned Calf Study: Slaughter and Carcass Characteristics.

	Implant Treatment		
	Control	Synovex-S®	Revalor-S®
Live Weight lb.	1118[b]	1179[a]	1211[a]
Carcass Weight lb.	721[b]	766[a]	792[a]
ADG lb.	1.95[b]	2.39[a]	2.68[a]
F/G	11.94[b]	9.99[a]	9.53[a]
Dressing %	64.5	65	65.4
Quality Grade	Ch^0	Ch^-	Ch^0
Overall Palatability[1]	4.73	4.55	4.58

[1]On a scale of 1 to 8; 1.00 is extremely dry, tough, and undesirable and 8.00 is extremely juicy, tender and desirable.
[a,b]Means in the same row with different superscripts are significantly different ($p<0.05$).

quality and palatability traits between the 2 groups were very similar. Only the estradiol implanted steers had slightly reduced marbling. This trial illustrates that by removing genetic variation, implants have little effect on carcass and palatability traits in cattle. To minimize any carcass effects from growth implants producers must learn to work with the genetic potential of the cattle on feed.

In feedyard situations where genetics cannot be controlled, we do expect to see a reduction in marbling and quality grade in implanted cattle. Under most situations producers can expect a reduction in AAA carcasses by 5-10% with estradiol implants and by 0-15% with TBA implants when compared to unimplanted control groups (**7**). As we will illustrate later in this paper, there are strategies that can help minimize these quality grade reductions while maintaining performance benefits of growth promoting implants.

Dark Cutting Beef

Dark Cutting Beef (DCB) is caused by depletion of glycogen stores in the muscle prior to slaughter. Glycogen depletion and an increased production of lactic acid cause a lowering of the muscle pH and increased water-holding capacity of the muscle. The water retention reduces oxygen diffusion so that the characteristic cherry red bloom of fresh beef does not occur. Growth promoting implants do not cause DCB. Implanted animals, especially those involved in an aggressive implant program, may be susceptible to DCB should other DCB causing factors occur prior to slaughter. These factors would include weather changes, breed, gender and stressful management practices. An example of an aggressive implant program would be 2 TBA implants back to back prior to slaughter. Operators utilizing aggressive implant programs need to understand that this type of implant program does carry an element of risk for their cattle grading B4.

Component TE-S® is an estradiol/TBA combination implant approved for use as the terminal implant in finishing steers. It is similar to *Revalor-S®* in that it contains 120 mg. of TBA and 24 mg. of estradiol 17ß.

Revalor H® is a combination implant for use in finishing heifers. It contains 140 mg of TBA and 14 mg of estradiol 17ß.

Implant Programs for Finishing Feedlots

There has been much trial work in the last 5 years to determine what is the most effective way to use the commercially available implants (**1-3**). Table 2 lists multiple factors that must be considered when designing an implant program. As a general rule of thumb, the more mg of hormone an animal is exposed to in it's implant program, higher performance response will be observed, but as well the greater the undesirable side effects will be (reduced marbling, behavioural effects, DCB). Our knowledge of what a particular hormone or hormone combination will do in a specific type of cattle over a specific number of feeding days is usually greater than the ability of the feedlot manager to utilize in his overall cattle management system. It is important for feedlot manager's to understand the facts, decide what is important and achievable under their management system. This information will help them to decide what implant strategies to utilize. It is common for most feedlot managers to have several strategies that cover various cattle classe!s and marketing options.

Table 2. Factors to Consider for Implant Strategies.

1	Genetics of cattle
2	Cost of feed
3	Relative importance of ADG and F/G
4	Relative importance of marbling
5	Tolerance for DCB
6	Tolerance for behavioral effects
7	Projected days on feed
8	Timing available for reimplanting (booster vaccines)
9	Carcass weight considerations
10	Nutrition program

Selection of products can be difficult and confusing. There is sufficient trial data to show significant performance and economic advantages in using implants compared to unimplanted cattle. In addition, the performance advantages of TBA combination implants when compared to estradiol implants have been demonstrated. All of the products in each type of implant work well when used at the correct time during the appropriate stage of production. Producers are

well advised to spend time and effort learning how to use them properly instead of trying to decide which product outperforms the others in its type. Implants work well when used correctly.

Yearlings

There has been much research directed toward utilization of TBA implants in yearlings and minimizing undesirable side effects such as riding that can go along with their use (**1**, **2**). Reducing the amount of anabolic hormone the animals are exposed to initially in the feeding period can help. It has been shown that yearling steers given a *Ralgro®* on arrival to the feedlot will have fewer behavioural problems and improved marbling compared to steers given a TBA implant on arrival (**1**).

Table 3. Nebraska Yearling Steer Study.

	Ralgro®[1+] Revalor-S®	Ralgro®[1+] Synovex-S®	Synovex Plus®
In Weight lb.	798	799	797
DOF	147	147	147
ADG lb.	3.11	3.11	3.07
F/G	7.34[a]	7.33[a]	7.54[b]
Initial Rider Rate	3.99[a]	5.06[a]	9.93[b]
% Choice	67[a]	63[b]	63[b]

[1]Reimplant at Day 70.
Means in the same row with different superscripts are significantly different ($p<0.05$).

Table 3 shows data from a two-implant trial conducted at a feedlot in Nebraska which compared *Ralgro®* as the initial implant to *Revalor-S®* and *Synovex Plus®*. In both treatment groups that utilized *Ralgro®* as the initial implant, the rider rate and percent choice carcasses were improved.

Another approach used in shorter fed yearling steers (114 days of feed) involves delaying implanting until the steers have been on feed for several weeks and acclimatized to the social environment in their pen to reduce the incidence of riding. Table 4 shows a another large pen study from Nebraska where yearling steers were either implanted with *Revalor-S®* on arrival, given *Ralgro®* on arrival then *Revalor-S®* after 35 days or implanting delayed until day 35 when *Revalor-S®* was administered. Although performance and carcass characteristics are similar, there were significantly less

Table 4. Delayed Implant Trial Performance Summary.

	Revalor-S® Day 0	Ralgro®[1] Revalor-S®	Delay 35 Revalor-S®
Final Weight lb.	1312	1308	1302
Weight Gain lb.	402	397	392
DOF	113	113	114
ADG lb.	3.54	3.5	3.44
DM/G	7.14	7.18	7.21
% Choice	57.6	57.4	60.7
Initial Rider Rate	3.87[a]	*2.87[ab]*	2.41[b]

[1]Reimplant Day 35.
Data based on live weight.
Means in the same row with different superscripts are significantly different ($p<0.05$).

riders in delayed implant programs. This is a strategy for cattle less than 120 days on feed when there is insufficient time for *Ralgro*® as the initial implant.

Although these programs do reduce side effects such as bulling, especially in TBA implant programs, the animals must be processed a second time during the feeding period. Most producers elect to manage the side effects and administer a single implant on arrival for yearlings on feed less than 120 days.

The behavioural problems and effects on marbling seen in yearling steers are less pronounced in yearling heifers. Generally a TBA on arrival is the preferred strategy for heifers.

Calves

Canadian feedlots tend to feed more calves than their US counterparts. Although the same factors we discussed for yearlings hold true for fall placed calves, there are others that must also be considered. All calves require a second implant to maintain adequate hormonal support throughout the feeding period. Timing of this implant is often coordinated with booster vaccination programs to minimize the number of times animals are processed. The duration of activity of the initial implant becomes very important so that at reimplanting the second implant is not administered to soon and cause "stacking". In this situation the animal is under the influence of two separate implants at the same time and side effects such as riding or reduced marbling can occur. Projecting the total days on feed is important in designing calf implant programs. The initial implant decision will vary from a 180-day calf compared to a calf projected to be fed 230 days to slaughter.

Table 5. Calf Reimplant Trial.

	Ralgro®[1] Revalor-S®	Ralgro® Synovex Plus®	FE72®[2] Revalor-S®	FE72® Synovex Plus®	Synovex-S®[3] Revalor-S®	Synovex-S® Synovex Plus®
DOF	182	182	182	182	182	182
ADG Live	3.18^{a}	3.27^{ab}	3.20^{a}	3.28^{ab}	3.21^{a}	3.38^{b}
F/G Live	6.43^{c}	6.25^{ab}	6.42^{ac}	6.32^{bc}	6.36^{bc}	6.15^{b}
% AAA	37	36	39	28	31	29

[1]Ralgro reimplant day 70.
[2]FE72 reimplant day 105.
[3]Synovex-S reimplant day 60.
[a,b,c]Means in the same row with different superscripts are significantly different ($p<0.05$).

Table 5 illustrates data from a Canadian trial in which three different initial programs were compared to two terminal implants. All calves were fed for a total of 182 days, but the time of reimplanting varied with each initial implant. ADG of the *Synovex S*®/*Synovex Plus*® group was the highest of all the strategies when terminal implants were contrasted. Animals receiving *Synovex Plus*® had higher ADG than those receiving *Revalor-S*®. Similar trends were seen in F/G.

Strategies

Implant strategies require advanced planning so that decisions are already made prior to arrival of the cattle. There are many sources of information for producers if they need assistance when designing implant programs to meet their needs. Their veterinarian, nutritionist or local beef specialist are all qualified. In addition, most of the pharmaceutical companies who manufacture implant products have technical specialists who are trained to assist in the proper use of their products. The crucial bits of information required to design a strategy include the pros and cons to using each type of growth promoting implant in each type of cattle and also the duration of anabolic activity. **Table 6** gives a comparison of the implant products available for use in beef production. Producers should have an implant strategy designed for each class of cattle they may possibly feed as they head into the feeding season.

Table 7 illustrates some examples of implant strategies that producers may use in their feeding program. These strategies are designed for finishing cattle. Backgrounders need to be aware of finishing strategies as well so their implant programs will not conflict with that at the finishing feedlot. It is appropriate when backgrounding cattle are sold and moved into a finishing feedlot, to make the implant history of backgrounded cattle available to the finishing feedlot.

Summary

Proper use of growth promoting implants is important for economic survival in cattle feeding operations. Producers must understand how to use implants appropriately in the different phases of cattle feeding. Effects on carcass quality and how this may affect marketing options is important. Producers must have strategies for implant use available for the each type of cattle they feed.

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Table 6. Growth implants Registered for Use in Canadian Beef Cattle.

Registered Products	Active Ingredients	Effective Time	Nursing Calves (days)	Grass Cattle	Backgrounding Steers	Backgrounding Heifers <800 lb	Feedlot Cattle Steers <800 lb	Feedlot Cattle Heifers	Breeding Cattle Bulls	Breeding Cattle Heifers
Ralgro										
Ralgro FE72	36 mg zeranol	60-80	yes	yes	yes	yes	yes	yes	no	>30 days to weaning
Ralgro FE72	72 mg zeranol	?	no	yes	no	no	yes	no	no	no
Synovex										
Synovex-S	200 mg P + 20 mg EB	~120	no	yes	yes	yes	yes	no	no	no
Synovex-H	200mg T + 20 mg EB	~120	no	yes	no	yes	no	yes	no	no
Synovex-C	100 mg P + 10 mg EB	?~120	yes	yes	>410 lbs	>410 lbs	no	no	no	>45 days to <410 lbs
Synovex Plus	200 mg TBA + 20 mg EB	~120	no	no	no	no	yes	yes	no	no
Component										
Component E-C	100 mg P + 10 mg EB	?~120	yes	yes	>410 lbs	>410 lbs	no	no	no	>45 days to <410 lbs
Component E-H	200 mg T + 20 mg EB	~120	no	yes	no	410-800 lbs	no	410-800 lbs	no	no
Component E-S	200 mg P + 20 mg EB	~120	no	yes	410-1,000 lbs	no	410-1,000 lbs	no	no	no
Component TE-S	120 mg TBA + 24 mg E17ß	~120	no	no	no	no	550-1,000 lbs	no	no	no
Compudose	24 mg E17ß	~168	steers >175 lbs	>575 lbs	>575 lbs	>575 lbs	>575 lbs	>575 lbs	no	no
Revalor										
Revalor-S	120 mg TBA + 20 mg E17ß	~120	no	no	no	no	550-1,000 lbs	no	no	no
Revalor-H	140 mg TBA + 14 mg E17ß	~120	no	no		no	no	>660 lbs	no	no

Abbreviations: E17ß - estradiol 17ß; EB - estradiol benzoate (activity = 72% of E17ß); P - progesterone; T - testosterone; TBA - trenbolone acetate (anabolic activity = 8-10 times that of testosterone). Zeranol has one-third the anabolic activity of E17ß.

Table 7a. Implant Strategies For Feedlot Yearling Steers Fed 90 to 140 Days and Winter Placed Calves fed 120 to 140 days.

1. On feed less than 120 days: TBA implant on entry, no reimplant.

< 120 days

TBA ---------- >Slaughter

2. Delayed implant strategy, delay implanting until steers are settled onto feed .

35 days < 85 days

No Implant ---------- >TBA ---------- >Slaughter

Some reduction in performance, little effect on quality grade, reduced 'bulling'.

3. On feed 120 to 140 days.

- *Conservative Strategy*: large frame exotics, Holsteins, desire high quality grade, or selling to the US, TBA on entry and no reimplant.

120-140 days

TBA ---------- >Slaughter

35 days < 85 days

No Implant ---------- >TBA ---------- >Slaughter

Some reduction in performance, little effect on quality grade, reduced 'bulling'.

- *Intermediate Strategy 1*: Improves performance over conservative program with minimal effect on quality grade. Ralgro implant on entry, reimplant with TBA at 70 days on feed. Has also been shown to reduce 'bulling' incidence.

45-70 days 70-85 days

Ralgro ---------- >TBA ---------- >Slaughter

- *Intermediate Strategy 2*: may improve performance over the above programs but quality grade may be reduced. Estradiol implant on entry, reimplant with TBA at 70 days on feed.

70 days 50-70 days

Estradiol ---------- >TBA ---------- >Slaughter

- *Aggressive Strategy*: quality grade not an issue, implant with TBA on entry and reimplant with TBA at 60 to 70 days on feed.

60-70 days 60-70 days

TBA ---------- >TBA ---------- >Slaughter

Estradiol implant choices are Component E-S, Ralgro FE-72 or Synovex-S.
TBA implant choices are Revalor-S or Synovex Plus.

Table 7b. Implant Strategies For Fall Placed Steer Calves Fed 180 to >200 Days.

- *Conservative Strategy 1*: Implant with Ralgro on entry, reimplant at 45 to 60 days with TBA.

  45-60 days >120 days
  Ralgro ---------- >TBA ---------- >Slaughter

  Having TBA in for a longer period should produce the most pounds of gain with no effect on quality grade.

- *Conservative Strategy2*: Implant with an estradiol implant on entry; reimplant with TBA at 60 - 70 days.

  60-70 days >120 days
  Estradiol ---------- >TBA ---------- >Slaughter

  Trial results show this strategy resulted in a significant increase in ADG and improvement in feed conversion while maintaining carcass quality grade.

- *Intermediate Strategy 1*: Implant with an estradiol implant on entry, reimplant with TBA at 90 days.

  90 days 90-110 days
  Estradiol ---------- >TBA ---------- >Slaughter

  Moderate performance increase over an estradiol program, good program for calves on feed over 200 days, little effect on quality grade.

- *Intermediate Strategy 2*: Implant with Ralgro 36 on entry, reimplant with TBA at 70 days.

  70 days 110+ days
  Ralgro ---------- >TBA ---------- >Slaughter

  This strategy gives good performance reduces "Bullers" while maintaining quality grade.

- *Aggressive Strategies*: Implant strategies for long fed fall-placed calves.

  50-70 days 50-70 days 110+ days
  Ralgro ---------- >Ralgro ---------- >TBA ---------- >Slaughter

  45-70 days 70-90 days 90-120 days
  Ralgro ---------- >Estradiol ---------- >TBA ---------- >Slaughter

Estradiol implant choices are Component E-S, Ralgro FE-72 or Synovex-S.
TBA implant choices are Revalor-S or Synovex Plus.

Table 7c. Implant Strategies For Yearling Heifers Fed 70 to 150 Days and Winter Placed Heifer Calves Fed 120 to 150 Days.

- *Conservative Strategy*: TBA on entry and no reimplant.

	70-150 days	
TBA	----------	>Slaughter

- *Intermediate Strategy 1*: Ralgro implant on entry, reimplant with TBA at 50 - 70 days on feed. Improves performance over conservative program with minimal affect on quality grade.

	50-70 days		60-70 days	
Ralgro	----------	>TBA	----------	>Slaughter

- *Intermediate Strategy 2*: Estradiol implant on entry, reimplant with TBA at 60 days on feed. Similar performance to a Ralgro/TBA program but quality grade may be reduced.

	70 days		60-80 days	
Estradiol	----------	>TBA	----------	>Slaughter

- *Aggressive Strategy*: Implant with TBA on entry and reimplant with TBA in 60 to 70 days.

	60-70 days		60-70 days	
TBA	----------	>TBA	----------	>Slaughter

Estradiol implant product choices are Component E-H or Synovex-H.
TBA implant product choices are Revalor-H or Synovex Plus.

Table 7d: Implant Strategies For Fall Placed Heifer Calves Fed 180 to >200 Days.

- *Conservative Strategy1*: Implant with an estradiol implant on entry, reimplant with TBA at 70 days.

	70 days		>110 days	
Estradiol	----------	>TBA	----------	>Slaughter

Trial results with lightweight heifers showed this strategy reduced quality grade equal to more aggressive strategies without the same performance benefit of more aggressive strategies.

- *Conservative Strategy2*: Implant with Ralgro on entry, reimplant at 50 - 70 days with TBA.

	50-70 days		>110 days	
Ralgro	----------	>TBA	----------	>Slaughter

Re-implant trials with light weight heifers showed a marginal decrease in performance compared to more aggressive strategies but quality grade was equal to non-implanted heifers

- *Intermediate Strategy*: Implant with an estradiol implant on entry, reimplant with TBA at 90 days.

	90 days		>90 days	
Estradiol	----------	>TBA	----------	>Slaughter

- *Aggressive Strategy*: Implant with Ralgro 36 on entry, reimplant with TBA every 60-70 days.

	50-70 days		60-70 days		>70 days	
Ralgro	----------	>TBA	----------	>TBA	----------	>Slaughter

Estradiol implant choices are Component E-H or Synovex-H
TBA implant choices are Revalor-H or Synovex Plus