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Summary

Over a 104-day feedlot period, Revalor-S, Compudose 100 and Synovex-S implanted Droughtmaster-Santa Gertrudis-Brahman composite steers achieved a higher level of animal performance than non-implanted (Control) or Component T-S implanted steers when fed for the Shortfed Japanese Export Market. For most measured parameters Revalor-S, Compudose 100 and Synovex-S implanted steers were similar. Steers implanted with Component T-S did not perform any better than non-implanted (Control) steers. The steers implanted with Ralgro were generally intermediate in performance.

Revalor-S, Compudose 100 and Synovex-S implanted steers recorded significantly greater ($P<0.05$) finishing period (Day 22-104) dry matter intakes, Day 70 and exit liveweights, average daily gains (ADG) to Day 70 and to exit and carcase weights and significantly lower ($P<0.05$) overall feed conversion ratios than Control and Component T-S implanted steers. The Ralgro implanted steers were never uniquely superior in measured parameters compared with the Control and Component T-S implanted steers. Component T-S steers had less subcutaneous fat at the P8 site than the other treatments.

Preputial disorders as a result of hormonal growth promotant (HGP) implantation were observed across all treatments except the Control. A significantly lower ($P<0.05$) proportion of preputial disorders were recorded in Control (0%) and Component T-S steers (5%) compared with 30% for Compudose 100 and Synovex-S, 39% for Ralgro and 43% for Revalor-S. Preputial disorders were first observed at Day 6. Veterinary treatment was required for 2 steers from each of the Compudose 100, Synovex-S and Revalor-S treatments. Steers with a Bullpower assessment sheath score of >4 had significantly ($P<0.01$) less (17%) preputial disorders than steers with a sheath score of ≤4 (40%).

A number of relationships between steer characteristics and performance and carcase attributes were investigated. Steers with hip heights at induction of 1400-1425 mm and >1425 mm had significantly heavier ($P<0.001$) carcases (336 and 337 kg respectively) than steers with induction hip heights of <1400 mm (321 kg). Steers with an Australian body condition score (AUS BCS) of ≤5 or 6 at induction had significantly less ($P<0.01$) subcutaneous fat depth at the P8 site (14.1 and 15.3 mm respectively) than steers of AUS BCS 7 (19.0 mm). A similar result was achieved when the steers were scored using a United States body condition scoring system (US BCS). Steers with a US BCS of ≤5 had a significantly greater ($P<0.05$) ADG over the complete study period (1.67 kg/hd/day) than steers of US BCS 6 or 7 (1.52 and 1.42 kg/hd/day respectively).

There was a significant interaction ($P<0.05$) between HGP treatment and induction US BCS for carcase P8 fat depth. Induction US BCS did not influence carcase P8 fat depth of Ralgro, Synovex-S, Revalor-S and Component T-S treated carcases, whereas an induction US BCS of 7 resulted in significantly more ($P<0.05$) P8 fat depth in the Control and Compudose 100 treated carcases compared with lower US body condition scores.

The steers used in the study were from 2 origins. Steers from the 2 origins differed in a number of body characteristics and also in performance in the feedlot.

Introduction

Animal pharmaceutical companies in Australia continue to release new hormonal growth promotants (HGP's). These products are separable into eight groups based on their active compounds. Some products are recommended for grazing animals only, however, the majority of products are generally used in feedlot cattle of both sexes.

The various HGP's are used for different purposes in the feedlot, eg. to improve growth rate or carcase specifications through modification of body composition.

Due to the number of HGP's now available, the selection of the most suitable HGP for the Brigalow Research Station Feedlot Research Facility for use in steers destined for the Shortfed Export market was constrained by a lack of comparative data. The opportunity was taken in the Brigalow Research Station feedlot to screen for this market over 100 days a number of HGP's selected as representative of the 5 implant groups that are generally specific to feedlot use.

Method

The study was conducted at the Queensland Department of Primary Industries' Brigalow Research Station, Theodore, Queensland (240° 50'S, 149° 48'E) between March 2000 and July 2000. The Feedlot Research Facility is a Queensland Government licensed Class 2 feedlot and AUS-MEAT accredited (No. 390). This approved study was conducted under the guidelines of the Tropical Beef Centre Animal Experimentation Ethics Committee.

Design

In March 2000, 144 Droughtmaster – Santa Gertrudis – Brahman composite steers of mean unfasted liveweight of 495 kg were randomly allocated on liveweight within origin (Theodore or Alpha) to one of 12 pens. There were 12 steers per feedlot pen at a stocking rate density of 1 steer / 12.5 m^2 with four steers from Theodore and eight steers from Alpha. Six treatments were allocated to the 12 pens as a randomised complete block design with 2 replicates of each treatment. The Theodore cattle arrived at Brigalow in February 1999 and the Alpha cattle in May 1999. All steers were in common grazing for five months prior to induction.

Treatments

The six HGP treatments were:-
T1- Control, nil HGP
T2- Ralgro® (36mg Zeranol), Coopers Animal Health
T3- Compudose 100® (20mg Oestradiol), Elanco Animal Health
T4- Synovex - S® (20mg Oestradiol benzoate and 200mg Progesterone), Fort Dodge.
T5- Revalor - S® (28mg Oestradiol benzoate and 140mg Trenbolone acetate), Intervet.
T6- Component T - S® (140mg Trenbolone acetate), Elanco Animal Health.

Experimental procedure

At induction on March 29, 2000, all steers were weighed, assessed for various anatomical characteristics, vaccinated for botulism (Singvac®), treated with Bayticol Pour-On® and the relevant steers implanted with their treatment HGP. The anatomical characteristics recorded were hip height, an Australian Body Condition Score (AUS BCS) with a 9 point scale from 1 – Emaciated to 9 – Overfat (Holroyd, 1978), a US Body Condition Score (US BCS) also with a 9 point scale from 1 – Thin condition to 9 – Fat Condition (Herd and Sprott, 1996) and Prepuce/Sheath scores based on the 5 point Bullpower Assessment System of 2 – unacceptable, to 9 - excessively clean (Holroyd *et al.*, 2000; Appendix A). As described in the Bullpower Assessment System, the prepuce consists of two parts; the external hair covered appendage or sheath and the inner part or prepuce proper.

Following induction, all steers were fed introductory rations for the first 21 days. The introductory period comprised a 'step-up' program of three energy levels to gradually increase the grain content.

The finishing ration was fed from Day 22 onwards and was composed of 69% dry rolled grain (50% wheat: 50% sorghum blend), 2.5% molasses, 1% cottonseed meal, 4.5% supplement, 2.5% blended oil mix, 10% whole cottonseed, 2% hay and 8.5% sorghum silage for days 22 to 60. From days 61 to 104, the ration was composed of 72.5% dry rolled sorghum, 2% molasses, 4.5% supplement, 2% blended oil mix, 9% whole cottonseed, 2% hay and 8% sorghum silage. The ration composition was changed when wheat supplies were exhausted and the cost of alternative sources of wheat were prohibitive.

Each treatment pen was fed twice per day at approximately 7.00am - 8.00am (AM) and 3.00pm - 4.00pm (PM) with approximately 35% of daily feed offered in the AM and 65% in the PM. The total allocation of daily feed on a pen basis (PM and following AM) was determined prior to feeding in the PM (Clean Bunk at Midday program (Lawrence, 1998)). Samples of rations were collected from each pen twice per day at feeding. Residues of spoilt rations were collected whenever such rations were discarded. Health and welfare inspections of the steers were made daily, including inspection for prepuce related problems assessed as animals were encouraged to move from a stationary position. A true preputial prolapse occurs when a male beast is unable to retract the prepuce into the sheath. The incidence of preputial tipping (prepuce exposed to approximately 50 mm in length beneath the preputial opening) and the incidence of swollen exposed prepuces were recorded as preputial disorders. Steers with significant preputial prolapses were inspected by a veterinarian and treated as required.

Unfasted liveweights were recorded from approximately 11.00am – 1.00pm on Days 21 (end of the introductory period), 70 (estimated completion of HGP payout for most of the HGP's) and 104. On day 104, the steers were again assessed for a number of anatomical characteristics, excluding the Prepuce/Sheath score.

During the course of the study, 9 steers were removed for various reasons. The data analysed in the study were based on the remaining 135 steers.

A set procedure at turnoff for slaughter at the end of the feedlot period was carried out. Following liveweight recording on Day 104, all steers were returned to their treatment pens and fed as normal in the PM of that day. From 8.00am of the following day (Day 105), the steers were transported for 2 hours to a Biloela abattoir. Upon arrival the steers were held overnight with access to water. During the following morning, all steers were slaughtered and AUS-MEAT feedback carcase data recorded.

Nutritional analysis

Rations during the finishing period were suitable for finishing steers for the desired market. A nutritional analysis of the finishing rations, on a dry matter basis, is presented in Table 1.

Table 1. Nutritional analysis for finishing rations on a dry matter basis.

	DM (%)	Ash (%)	Fat (%)	ME (Mj/kg)	Protein (%)	Crude Fibre (%)	Ca (%)	P (%)
Sorghum-wheat ration	86.5	5.8	7.9	13.6	16.6	7.0	0.93	0.45
Sorghum ration	84.5	5.0	9.3	13.8	15.1	8.4	0.80	0.36

Statistical analysis

Average daily liveweight gains (kg/d) were calculated for all periods (introductory period, end of introductory period to end of pay-out, entry to end of pay-out, end of pay-out to exit, entry to exit, end of introductory period to exit). Average feed intake per animal per day (kg/hd/d), on a dry matter basis and feed conversion ratios (kg fed / kg weight gain) were calculated for the same periods as average daily liveweight gains.

Liveweight at each weighing time, average daily gain, feed intake and feed conversion ratios over each of the 6 periods, hip height at feedlot entry and exit and change in hip height, hot standard carcase weight, dressing percentage and subcutaneous fat depth at the P8 site were analysed by analysis of variance. Pen variation was used to test the effects of the HGP treatments while animal variation was used to test differences in steer origin and its interaction with HGP treatments.

Body condition scores (both AUS BCS and US BCS) at feedlot entry and exit and the change over the study were analysed as both continuous and discrete data. Treating BCS as continuous data, analysis of variance was used to test HGP treatment effects as described above. Chi-squared analysis for contingency tables was used to analyse BCS when considered as discrete data. Due to low cell counts for individual scores, the following categories were considered: three categories for BCS (both AUS and US) at entry to the feedlot (score ≤5, 6 or 7); two categories for BCS at feedlot exit (score ≤7 or score of 8); and two categories for change in BCS (≤ 1 unit change or > 1 unit change).

To investigate the relationships of hip height and BCS (both AUS and US) at feedlot entry with carcase weight, dressing percentage, P8 fat and average daily gain over the 70-day pay-out period and over the 104-day feedlot period, factors were derived from hip height and BCS as follows: hip height with 3 levels (< 1400 mm, 1400-1425 mm, > 1425 mm) and BCS (both AUS and US) with 3 levels (score ≤5, 6, 7). The data were then analysed with the animal variation partitioned into one of these 3 factors. As the data were unbalanced, they were modelled by residual maximum likelihood (REML).

If a steer is likely to suffer from preputial disorders (preputial tipping or swollen prepuce) resulting from treatment with a HGP, it was most likely to occur in the period immediately following implantation and entry into the feedlot. Also, it was expected that a steer observed to have preputial tipping or a swollen prepuce would show symptoms for a number of days rather than a one-off occurrence which is more likely to be an observation error. Therefore, incidence of preputial disorders was defined as two or more consecutive observations of preputial tipping or swollen prepuce in the first 14 days following feedlot entry. Log-linear modelling was used to test independence among incidence of preputial disorders, HGP treatments and sheath score which was categorised as unacceptable (score ≤ 4) or acceptable (score > 4).

Results and discussion

Seasonal conditions

Rainfall was above average in April 2000 (84.2 over 9 wet days, compared to long term average of 51.9 mm) and below average in May (23.5 mm over 9 wet days, compared to long term average of 55.9 mm) and June 2000 (28.8 mm over 4 wet days, compared to long term average of 56.9 mm). Rainfall in April resulted in ongoing wet pen conditions and the continuation of rainfall over a number of days in May resulted in the pens remaining in a less than desirable condition. Temperatures were considered mild over the experimental period.

Steer characterisation

Most of the treatments had a similar distribution of sheath scores except Compudose 100 which recorded the lowest proportion of Score 4 and highest proportion of Score 6 steers (Table 2). The major difference in score distribution between origin of steers was that Theodore had more Score 2 and 4 steers while Alpha had more Score 8 steers.

Table 2. Distribution of sheath scores (%) at induction.

	No.	Sheath Score [1]				
	steers	2	4	6	8	9
Treatment						
Control	23	5	26	30	30	9
Ralgro	23	9	35	26	30	-
Compudose 100	23	4	9	70	13	4
Synovex S	23	4	30	40	22	4
Revalor-S	21	5	29	57	9	-
Component T-S	22	9	23	50	18	-
Origin						
Theodore	48	12	33	43	12	-
Alpha	87	3	21	45	26	5

[1] Sheath scores (Holroyd *et al.*, 2000) – refer to Appendix A where:

9 Excessively clean
8 Optimum: sheath hangs at a 45° angle and is well controlled.
6 Acceptable: sheath hangs at a 45° angle but has slightly more leather than desired.
4 Marginal: excessive loose leather in navel area; slightly pendulous sheath that opens at a 90° angle to the body.
2 Unacceptable: extremely pendulous sheath at 90° angle or extremely large preputial opening.

The range in individual steer hip heights at induction was 1275 to 1525 mm and at exit was 1325 to 1575 mm. Hip heights at induction and exit and the increase in hip heights over the feeding period did not differ (P>0.10) among HGP treatments (Table 3). The steers from Theodore had significantly lower (P<0.001) hip heights at both induction and exit but recorded a significantly greater (P<0.001) increase in hip heights than the steers from Alpha.

Table 3. **Hip heights of steers from two origins given different growth promotants. Means within columns followed by the same letter are not significantly different at P = 0.05.**

	Hip height (mm)		Change in hip height (mm)
	Induction	Exit	
Treatment	n.s.	n.s.	n.s.
Control	1414	1447	33.4
Ralgro	1411	1455	43.3
Compudose 100	1406	1454	47.4
Synovex S	1423	1470	46.5
Revalor-S	1416	1464	48.5
Component T-S	1419	1458	39.1
l.s.d. (P = 0.05)	43	47	12.1
Origin	***	***	***
Theodore	1373 [b]	1427 [b]	53.1 [a]
Alpha	1436 [a]	1474 [a]	38.0 [b]
l.s.d. (P = 0.05)	14	15	8.1

n.s. - not significant (P>0.10); *** P<0.001

At induction there was no difference among treatments in body condition score using either of the two scoring systems (Table 4). At exit, steers from the Ralgro, Compudose 100 and Revalor-S treatments had significantly greater (P<0.05) AUS BCS's than the Control and Component T-S treatment steers. Similar but weaker differences among treatments were observed in scores assessed by the US system at exit. There was no difference in change in body condition among treatments using either system.

At feedlot exit there was a significantly greater (P<0.05) proportion of Ralgro and a lesser proportion of Component T-S steers with AUS BCS of 8 compared with the other treatments. A similar result was observed for the US BCS at exit.

Steers from both origins were similar (P>0.10) in body condition at induction when assessed using either system. At exit, using either system, the Theodore origin steers recorded significantly greater (P<0.001) scores and a significantly greater (P<0.05) change in body condition throughout the study than the Alpha steers.

Overall, both body condition scoring systems were generally similar as both indicated the same trends due to treatment and origin of steers.

Table 4. **Body condition score (BCS) and change in BCS of steers from two origins and given different growth promotants. Means within columns followed by the same letter are not significantly different at P = 0.05.**

	Australian BCS[1]			US BCS[2]		
	Induction	Exit	Change	Induction	Exit	Change
Treatment	n.s.	*	n.s.	n.s.	P=0.055	n.s.
Control	6.0	7.2 [b]	1.2	6.1	7.2	1.1
Ralgro	6.1	7.6 [a]	1.5	6.1	7.6	1.5
Compudose 100	6.1	7.5 [a]	1.4	6.0	7.4	1.4
Synovex-S	6.1	7.3 [ab]	1.3	5.9	7.3	1.3
Revalor-S	6.1	7.5 [a]	1.4	6.2	7.4	1.2
Component T-S	6.0	7.1 [b]	1.2	6.0	6.9	1.0
l.s.d. (P = 0.05)	0.3	0.3	0.4	0.5	0.4	0.8
Origin	n.s.	***	**	n.s.	***	*
Theodore	6.0	7.6 [a]	1.5 [a]	6.1	7.6 [a]	1.4 [a]
Alpha	6.0	7.3 [b]	1.2 [b]	6.0	7.2 [b]	1.1 [b]
l.s.d. (P = 0.05)	0.2	0.2	0.2	0.2	0.2	0.2

[1] Nine point scoring system from 1 (emaciated) to 9 (overfat).
[2] Nine-point scoring system from 1 (thin condition) to 9 (fat condition).
n.s. – not significant (P>0.10); * P<0.05; ** P<0.01; *** P<0.001

Feed intake

Feed intakes on a dry matter basis are presented in Table 5. The period from Day 1 to 70 approximated the payout period for all implants except Compudose 100. For this reason, periods prior to and beyond the approximate payout date have been included.

Over the finishing period (Day 22 to 104), the Compudose 100, Synovex S and Revalor-S treatments were similar and recorded significantly greater (P<0.05) intakes than the Control and Component T-S treatments. The Compudose 100 treatment also recorded significantly greater (P<0.05) intakes than Ralgro over the same period. Intake for all other periods did not differ significantly among treatments although there was a trend across all periods for Compudose 100 and Synovex-S treatments to have the greatest intakes, Control and Component T-S to have the least while Ralgro and Revalor-S were often intermediate.

It is interesting to note that the greatest mean intakes were recorded in the post HGP payout period for all treatments. However, these greater intakes were most likely due to the change of grain in the ration from a sorghum-wheat blend to sorghum alone which occurred at Day 60 when wheat supplies became limiting.

Table 5. **Dry matter basis feed intakes (kg/day) for steers from different hormonal growth promotant treatments. Means within columns followed by the same letter are not significantly different at P = 0.05.**

Treatment	Introductory period (Day 1 – 21)	Finishing Period (Day 22 – 104)	Overall (Day 1 – 104)	Induction to end of payout[1] (Day 1 – 70)	End of payout to exit (Day 71 – 104)
	n.s.	*	P=0.079	n.s.	n.s.
Control	8.69	11.79 [c]	11.17	10.37	12.82
Ralgro	9.49	12.17 [bc]	11.63	10.87	13.18
Compudose 100	10.92	12.88 [a]	12.48	11.86	13.77
Synovex-S	10.09	12.78 [ab]	12.23	11.64	13.44
Revalor-S	8.71	12.61 [ab]	11.82	11.11	13.29
Component T-S	9.51	11.67 [c]	11.23	10.58	12.59
l.s.d. (P = 0.05)	3.33	0.70	0.97	1.24	1.29

[1]Day 70 considered end of payout for Ralgro, Synovex-S, Revalor-S and Component T-S
n.s. – not significant (P>0.10); * P<0.05.

Liveweight performance

There were no differences in liveweight among any of the treatments at induction or at the end of the introductory period (Table 6). At the end of payout for most of the HGP's (Day 70), steers in the Compudose 100, Synovex-S and Revalor-S treatments were similar in liveweight and were all significantly heavier (P<0.05) than steers in the Control and Component T-S treatments while steers in the Ralgro treatment were intermediate (Table 6). At the same time, the Revalor S treatment was also significantly heavier (P<0.05) than the Ralgro treatment. At exit, there were no differences in liveweight among Ralgro, Compudose 100, Synovex-S and Revalor-S and all these except Ralgro were sigmficantly heavier (P<0.05) than the Control and Component T-S treatments.

At induction, the steers from Alpha were significantly heavier (P<0.01) than those from Theodore (Table 6). This difference reduced so that by the end of payout (Day 70) and at exit there was no differences in liveweight between place of origin of the steers.

Table 6. **Liveweights (kg) of steers from two origins and given different hormonal growth promotants. Means within columns followed by the same letter are not significantly different at P = 0.05.**

	Induction	End of introductory period (Day 21)	End of payout[1] (Day 70)	Exit (Day 104)
Treatment	n.s.	n.s.	*	*
Control	494.7	505.5	584.2 [c]	626.2 [b]
Ralgro	497.2	510.3	597.4 [bc]	650.4 [ab]
Compudose 100	491.4	518.9	611.7 [ab]	667.9 [a]
Synovex-S	497.5	521.3	610.6 [ab]	666.1 [a]
Revalor-S	498.8	516.6	621.7 [a]	677.9 [a]
Component T-S	497.9	508.3	588.3 [c]	633.4 [b]
l.s.d. (P=0.05)	9.2	28.5	21.1	29.1
Origin	**	P=0.073	n.s.	n.s.
Theodore	475.8 [b]	506.6	602.0	647.0
Alpha	506.5 [a]	516.9	602.5	657.0
l.s.d. (P=0.05)	9.1	11.3	13.6	14.4

[1]Day 70 considered end of payout for Ralgro, Synovex-S, Revalor-S and Component T-S.
n.s. – not significant (P>0.10); * P<0.05; ** P<0.01.

There were no significant differences in ADG among the treatments over either the introductory period or finishing period, although similar trends in each period resulted in differences among treatments over the entire study (Table 7). Over the entire study period and over the 70-day payout period, the Revalor-S, Compudose 100 and Synovex-S treatments recorded similar ADG's which were significantly greater ($P<0.05$) than for the Control and Component T-S treatments while Ralgro was intermediate. Revalor-S also resulted in significantly greater (both $P<0.05$) ADG's than Ralgro over both these periods while over the payout period, Compudose 100 had significantly greater ($P<0.05$) ADG's than Ralgro.

Differences in ADG between origin of steers were recorded for each period, with the weakest ($P=0.060$) evidence over the finishing period (Table 7). The Theodore steers recorded greater ADG's than the Alpha steers for each period except from the end of payout to exit in which the Alpha steers recorded significantly greater ($P<0.001$) ADG's than the Theodore steers.

Table 7. **Average daily gains (kg/had/day) of steers from two origins and given different hormonal growth promotants. Means within columns followed by the same letter are not significantly different at P = 0.05.**

	Introductory period (Day 1 – 21)	Finishing Period (Day 22 – 104)	Overall (Day 1 – 104)	Introduction to end of payout[1] (Day 1 – 70)	End of payout to exit (Day 71 – 104)
Treatment	n.s.	n.s.	*	*	n.s.
Control	0.51	1.40	1.27 c	1.28 c	1.24
Ralgro	0.62	1.62	1.47 bc	1.43 bc	1.56
Compudose 100	1.31	1.72	1.70 ab	1.72 a	1.65
Synovex-S	1.14	1.67	1.62 ab	1.62 ab	1.63
Revalor-S	0.85	1.70	1.72 a	1.76 a	1.65
Component T-S	0.49	1.39	1.30 c	1.29 c	1.33
l.s.d. (P=0.05)	1.04	0.35	0.24	0.26	0.54
Origin	***	P=0.060	***	***	***
Theodore	1.47 a	1.69	1.65 a	1.80 a	1.32 b
Alpha	0.50 b	1.53	1.45 b	1.37 b	1.60 a
l.s.d. (P=0.05)	0.31	0.17	0.10	0.13	0.12

[1]Day 70 considered end of payout for Ralgro, Synovex-S, Revalor-S and Component T-S.
n.s. – not significant ($P>0.10$); * $P<0.05$; *** $P<0.001$.

Feed conversion ratios

Feed conversion ratios (FCR) for various periods of the study are shown in Table 8. There were no significant differences in FCR among treatments for either the introductory period (due primarily to large variation in liveweight gains over this period; Table 7) or the finishing period (Table 8). For the overall period of the study, Revalor-S, Compudose 100 and Synovex-S had a similar FCR which was significantly lower ($P<0.05$) than for the Control and Component T-S treatments while the FCR for Ralgro was intermediate. Over the 70-day payout period, differences were similar to the overall period except Revalor-S recorded a significantly lower ($P<0.05$) FCR than Synovex-S.

Table 8. **Feed conversion ratios (kg feed (DM basis) / kg weight gain) of steers from different hormonal growth promotant treatments. Means within columns followed by the same letter are not significantly different at P = 0.05.**

Treatment	Introductory period (Day 1 – 21)	Finishing period (Day 22 – 104)	Overall (Day 1 – 104)	Introduction to end of payout[1] (Day 1 – 70)	End of payout to exit (Day 71 – 104)
	n.s.	n.s.	*	*	n.s.
Control	25.32	8.14	8.83 [a]	8.11 [a]	10.55
Ralgro	22.71	7.21	7.92 [ab]	7.64 [ab]	8.47
Compudose 100	8.66	7.17	7.36 [bc]	6.91 [bc]	8.33
Synovex-S	8.89	7.35	7.56 [bc]	7.21 [b]	8.29
Revalor-S	13.19	6.49	6.88 [c]	6.33 [c]	8.19
Component T-S	36.34	7.75	8.63 [a]	8.19 [a]	9.52
l.s.d. (P=0.05)	45.78	1.27	0.97	0.87	2.67

[1]Day 70 considered end of payout for Ralgro, Synovex-S, Revalor-S and Component T-S.
n.s. – not significant (P>0.10); * P<0.05.

Preputial disorders

Preputial disorders were first observed at Day 6. The incidence of preputial disorders is shown in Table 9 where incidence was defined as ≥2 consecutive observations of preputial disorders over the first 14 days following induction.

Table 9. **Incidence of preputial disorders categorised by hormonal growth promotant treatment and sheath score (≤4 or >4). Overall percentage incidence is shown in parentheses.**

Treatment	Incidence of preputial disorders (No. with disorders/No. in sheath score category)		
	Sheath score		Total incidence
	≤4 (Unacceptable)	>4 (Acceptable)	
Control	0/7	0/16	0/23 (0)
Ralgro	6/10	3/13	9/23 (39)
Compudose 100	2/3	5/20	7/23 (30)
Synovex-S	4/8	3/15	7/23 (30)
Revalor-S	4/7	5/14	9/21 (43)
Component T-S	1/7	0/15	1/22 (5)
Total	17/42 (40)	16/93 (17)	33/135 (24)

There was no interaction between HGP treatment and sheath score (acceptable (score >4) or unacceptable (score ≤4)). A significantly lower (P<0.05) proportion of steers from the Control (0%) and Component T-S (5%) treatments were observed with preputial disorders compared with the other treatments (30%, 30%, 39% and 43% for Compudose 100, Synovex-S, Ralgro and Revalor-S respectively). Also, a significantly greater (P<0.01) proportion of steers with a sheath score of ≤4 had preputial disorders compared with steers with sheath scores >4 (40% versus 17% respectively). The results highlight that for similar genotypes consideration could be given to selecting steers on sheath score to avoid preputial disorders associated with the use of HGP's.

Some steers required veterinary treatment for preputial prolapses with 2 from each of the Compudose 100, Synovex-S and Revalor-S treatments. Ralgro implanted steers, while recording a 39% incidence of preputial disorders, did not require veterinary treatment for prolapsed prepuces.

Carcase attributes

Apart from 2 steers (1.5%) all graded for the Shortfed Japanese Export Market. Carcase attributes recorded at slaughter are shown in Table 10. There was no significant difference in carcase weight among Compudose 100, Synovex-S and Revalor-S treatments. However, Compudose 100, Synovex-S and Revalor-S carcases were significantly heavier ($P<0.05$) than Control and Component T-S treatment carcases while Revalor-S carcases were significantly heavier ($P<0.05$) than Ralgro carcases.

Comparatively, carcase weight was 3.4% (Ralgro), 6.6% (Compudose 100), 6.9% (Synovex-S), 9.8% (Revalor-S) and 1.2% (Component T-S) greater compared with the carcase weight of the Control treatment. The response reported for Compudose 100 and Synovex-S is similar to other studies, the response to Revalor-S is greater than normally reported and the responses for both Ralgro and Compudose T-S were lower than normally reported.

Overall, dressing percentage was 50.8%, a reflection of the time of liveweight recording at exit resulting in conditions of significant rumen fill. There were no significant differences in dressing percentage among treatments.

There was weak evidence ($P=0.066$) of differences in subcutaneous fat depth at the P8 site among treatments with carcases from the Component T-S steers having less subcutaneous fat thickness than the other treatments. Component T-S is a strongly adrenogenic compound and was included in the study for the purpose of monitoring its influence on carcase fatness. Component T-S is an implant that is normally recommended for use in combination with an oestrogenic implant.

There were no significant differences in carcase weight or dressing percentage between origin of steers, however the Theodore steers had significantly greater ($P<0.01$) subcutaneous fat depth at the P8 site than the Alpha steers.

Table 10. **Carcase attributes of steers from two origins and given different hormonal growth promotants. Means within columns followed by the same letter are not significantly different at P = 0.05.**

	Hot standard carcase weight (kg)	**P8 fat depth (mm)**
Treatment	*	P=0.066
Control	317.3 [c]	16.2
Ralgro	328.2 [bc]	15.5
Compudose 100	338.2 [ab]	17.9
Synovex-S	339.3 [ab]	15.2
Revalor-S	348.3 [a]	16.0
Component T-S	321.2 [c]	13.4
l.s.d. (P=0.05)	15.1	2.6
Origin	n.s.	**
Theodore	330.0	17.2 [a]
Alpha	333.1	15.0 [b]
l.s.d. (P=0.05)	7.5	1.7

n.s. – not significant (P>0.10); * P<0.05; ** P<0.01.

The AUS-MEAT chiller assessment data from this study were not analysed due insufficient variability as the majority of carcases recorded nil marbling, 1B in meat colour and '0' or '1' in fat colour.

Relationships between steer characteristics and liveweight gain and carcase attributes.

Steers with hip heights of 1400 – 1425 mm and >1425 mm at feedlot induction had significantly heavier (P<0.001) carcases (336 and 337 kg respectively) than steers with induction hip heights <1400 mm (321 kg). There were no significant relationships between hip height and dressing percentage, subcutaneous fat depth at the P8 site, or ADG over the 70-day payout period or the overall period.

There were no significant relationships between the AUS BCS at induction and carcase weight, dressing percentage and ADG to the end of payout or over the overall period. Steers with an AUS BCS of ≤5 or 6 had significantly less (P<0.01) P8 fat depth (14.1 and 15.3 mm respectively) than steers of AUS BCS 7 (19.0 mm).

Similar to the AUS BCS, there were no significant relationships between US BCS at induction and carcase weight or dressing percentage. In respect to growth rate, steers of US BCS ≤5 recorded a significantly greater (P<0.05) ADG (1.75 kg/hd/day) to the end of payout (70 days) than steers of US BCS 6 or 7 (1.51 and 1.43 kg/hd/day respectively). Similarly, for the overall period, steers of US BCS ≤5 had a significantly greater (P<0.05) ADG (1.67 kg/hd/day) than steers of US BCS 6 or 7 (1.52 and 1.42 kg/hd/day respectively).

There was a significant interaction (P<0.05) between HGP treatment and induction US BCS for carcase P8 fat depth but some cell numbers are quite low (Table 11). Induction US BCS did not influence carcase P8 fat depth of Ralgro, Synovex-S, Revalor-S and Component T-S treated carcases, whereas an induction US BCS of 7 resulted in significantly more (P<0.05) P8 fat depth in the Control and Compudose 100 treated carcases compared with lower US BCS's.

Table 11. Carcase P8 fat depth means across induction US BCS categories and hormonal growth promotant treatments. Cell numbers are given in parentheses.

Treatment	Induction BCS categories ≤5	6	7
Control	14.00 (3)	15.20 (15)	20.60 (5)
Ralgro	13.00 (3)	15.46 (13)	16.57 (7)
Compudose 100	16.50 (4)	16.00 (15)	27.00 (4)
Synovex-S	17.50 (6)	13.92 (12)	15.60 (5)
Revalor-S	10.00 (1)	16.07 (15)	17.20 (5)
Component T-S	7.00 (1)	13.65 (20)	16.00 (1)

Implications

Steers implanted with Revalor-S, in particular, and steers implanted with Compudose 100 or Synovex-S HGP's out-performed and were more suitable to the Shortfed Market than non-implanted or Component T-S implanted steers. Steers implanted with Ralgro were generally similar to the Control or Component T-S steers or intermediate in performance to the other implants.

Consideration of genotype and sheath score should be given in the selection of steers for implantation with HGP's. For the genotype considered in this study, implantation with HGP's, except Component T-S, resulted in a significant number of preputial disorders.

For the Brigalow Research Station Feedlot, Revalor-S, Compudose 100 and Synovex-S are suitable for implantation in similar steers intended for the Shortfed Export Market. However, consideration of sheath score and the incidence of preputial disorders would be necessary.

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