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Studies with zeranol implantation of grazing cattle in central-western Queensland

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Summary

During the period 1981 to 1983, nine experiments were undertaken in central-western Queensland to measure the response, by various classes of cattle, to zeranol treatment.

Response to a single zeranol treatment by steers aged 18 to 36 months ranged from 0.252 ($P<0.005$) to 0.035 kg/hd/day ($P>0.05$) over eight observations at five different sites.

There was little advantage at day 606 or day 224 to repeat treatments given either 168 or 84 days after initial treatment.

In one experiment, advantages to zeranol treatment were maintained for 606 days post implant. But in another, advantages present at day 224 after implantation, had been eroded away by day 547.

Zeranol treatment of spayed cows gave a response of 0.138 kg/hd/day ($P<0.005$) over 82 days.

In two experiments with suckling steer calves, there were non significant advantages of 2 and 7% to zeranol treatment.

INTRODUCTION

Zeranol, a non-steriod anoabolic agent, was released in Australia during 1979 for use with castrate male cattle. The likely response to zeranol treatment is well documented for this class of cattle grazing forage crops and improved and native pastures in coastal and sub-coastal regions (Hodge *et al.* 1983; Venamore *et al.* 1982; Wood and Bonner 1982; Wellington and Geldard 1980). Comparable information for cattle grazing native pastures that grow under the extremely variable rainfall of western Queensland is limited to five sites in the north-west (Dodt *et al.* 1984; Hodge *et al.* 1983). This paper reports on a series of experiments undertaken to evaluate zeranol treatment of cattle grazing various pastures in the semiarid, central-western region of Queensland.

MATERIALS AND METHODS

Pastures

The nine experiments were carried out on six commercial cattle properties, all within 130 km of Barcaldine and over three basic pasture types (Table 1):

1. Wholely or predominately buffel grass (*Cenchrus ciliaris*) pasture (Experiments 1, 2, 3, 5, 6 and 8).
2. Mitchel grass (*Astrebla* spp.) pastures (Experiments 4 and 7).
3. Open eucalypt woodland with mainly desert blue grass (*Bothriochloa ewartiana*), wire grasses (*Aristida* spp.) and spinifex (*Triodia* spp.), but some buffel grass had been established (Experiment 9).

Complete descriptions of these pastures and land types are given by Orr and Holmes (1984), Turner (1979) and Anon. (1978).

Pasture conditions at the times of treatment were estimated to have been average to above average. Rainfall was above normal in the autumn and early winter of 1981. No

rain, or falls well below normal, were recorded for the 12 months April 1982 to March 1983. Barcaldine rainfall is given as a guide to the rainfall pattern of the six co-operator properties (Table 2).

Table 1. Pasture, cattle breed, age and class for the nine experiments

Experiment	Pasture	Cattle		
		Breed	Age	Class
1	Buffel	Santa Gertrudis	3 yrs	Bullocks
2	Buffel	Devon	3 yrs	Bullocks
3	Buffel	Hereford	2 yrs	Steers
4	Mitchell	Hereford	2 yrs	Steers
5	Buffel	Devon	20 months	Steers
6	Buffel	Hereford	18 months	Steers
7	Mitchell	Santa Gertrudis	Mature	Spayed cows
8	Buffel	Hereford	2–4 months	Steer calves
9	Open eucalypt	Hereford × Bradford	3–4 months	Steer calves

Cattle

Three classes of cattle were used: castrate males older than 1 year; females (spayed 18 months prior to the start of the experiment); and castrate male calves, 2 to 4 months of age. Breeds and ages are given in Table 1.

Cattle were allocated to groups at random as they came up the crush. All liveweights were recorded after an overnight fast. In each experiment, control and treated cattle ran together in the same paddock.

Treated animals were implanted with 36 mg of zeranol (Ralgro®, Wellcome Australia Ltd.).

Table 2. Rainfall for Barcaldine preceding and during the experimental period and long term averages* (mm)

Month	1980–81	1981–82	1982–83	Long term
June	0	60	0	27
July	59	76	4	23
August	5	9	0	15
September	0	0	0	16
October	50	24	0	30
November	32	56	12	35
December	52	88	22	59
January	118	83	60	86
February	85	41	6	78
March	22	76	27	67
April	88	1	105	37
May	98	0	255	29
Annual	609	514	493	502

* Source: Climatic Averages Queensland, Department of Science and Consumer Affaris, Bureau of Meteorology, Metric Edition, Australian Government Publishing Service, Canberra 1975.

Treatments

Experiments 1, 2, 3, 7, 8 and 9 comprised a control group and a treatment group compared over approximately 100 days.

In Experiment 4, the treatment group was subdivided into two implant position cells to look at whether the implant site was important. When Ralgro® was first brought on to the market, the recommended implant position was between the skin and the cartilage of the back of the ear, about 60 to 80 mm away from the head (conventional site). The

manufacturer subsequently claimed better results from an implant site between the skin of the back of the ear and the annular cartilage, about 20 mm away from the head (alternative position).

Experiment 5 compared a single zeranol treatment against a repeat treatment six months later.

Experiment 6 had three zeranol subgroups. The Early zeranol group was treated shortly after grass producing rains, the Late zeranol group was treated three months after the early group and the Repeat zeranol group was treated on both occasions.

Treatments and weighing periods are given in Table 3.

Table 3. Treatments, group numbers, weighing and treatment dates of the nine experiments

Experiment	Treatment	No.	Weighing and treatment dates			
			Start	Interim	Interim	Finish
Steers						
1	Control	58	29 Jan 81			6 May 81
	Zeranol	59	29 Jan 81z*			6 May 81
2	Control	30	25 Jun 81			16 Oct 81
	Zeranol	26	25 Jun 81z			16 Oct 81
3	Control	58	18 Jun 81			15 Oct 81
	Zeranol	57	18 Jun 81z			15 Oct 81
4	Control	27	27 Mar 81			17 Jun 81
	Zeranol–conventional	29	27 Mar 81z			17 Jun 81
	Zeranol–alternative	58	27 Mar 81z			17 Jun 81
5	Control	27	25 Jun 81	10 Dec 81		21 Feb 83
	Single zeranol	25	25 Jun 81z	10 Dec 81		21 Feb 83
	Repeat zeranol	60	25 Jun 81z	10 Dec 81z		21 Feb 83
6	Control	43	10 Feb 81	5 May 81	22 Sep 81	11 Aug 82
	Late zeranol	20	10 Feb 81	5 May 81z	22 Sep 81	11 Aug 82
	Early zeranol	21	10 Feb 81z	5 May 81	22 Sep 81	11 Aug 82
	Repeat zeranol	40	10 Feb 81z	5 May 81z	22 Sep 81	11 Aug 82
Spayed cows						
7	Control	27	27 Mar 81			17 Jun 81
	Zeranol	29	27 Mar 81z			17 Jun 81
Calves						
8	Control	33	18 Jun 81			19 Oct 81
	Zeranol	32	18 Jun 81z			19 Oct 81
9	Control	24	7 Apr 82			26 Jul 82
	Zeranol	24	7 Apr 82z			26 Jul 82

*z = treatment date.

Statistical analyses

Effects of zeranol implantation were estimated using standard analyses of variance for data with unequal subclass numbers. The partial regressions of liveweight gain on initial liveweight were fitted to adjust for the small differences in liveweight between treatment groups that are inherent in the method of allocation.

RESULTS AND DISCUSSION

Single implantation

Results of single zeranol treatments, 82 to 123 days before recording final liveweight are tabulated in Table 4.

Table 4. The effect of a single zeranol implant on daily liveweight gain by experiment

Experiment	Class of animal	Start date	Initial liveweight (kg)	Duration (days)	Liveweight gain	
					control (kg/day)	zeranol (kg/day)
1	Steers—3year	29 Jan 81	423	97	0.847	1.099***
2	Steers—3year	25 Jun 81	561	113	0.321	0.445†
3	Steers—2year	18 Jun 81	330	119	0.622	0.762***
4‡	Steers—2year	27 Mar 81	229	82	0.374	0.409n.s.
4§	Steers—2year	27 Mar 81	229	82	0.374	0.423n.s.
7	Spayed cows	27 Mar 81	379	82	0.403	0.541***
8	Steers—calves	18 Jun 81	121	123	0.788	0.804n.s.
9	Steers—calves	7 Apr 81	119	110	0.444	0.474n.s.

*** $P<0.005$ n.s. (not significant) $P>0.05$

† Final liveweights were taken in groups of 3 to 8 head therefore statistical analyses were not possible.

‡ Conventional implant position.

§ Alternate implant position.

The response to zeranol treatment by 2 to 3 year old steers ranged from 0.035 ($P>0.05$) to 0.252 ($P<0.005$) kg/hd/day. These levels of response are comparable with those reported by Venamore *et al.* (1982), and Hodge *et al.* (1983). The variation in response to zeranol treatment across experimental sites is consistent with variation between sites in previously published data (Venamore *et al.* 1982; Hodge *et al.* 1983) and tends to be associated with level of liveweight gain.

In Experiment 4 the response to zeranol in the conventional implant position was not significantly different from that in the alternate implant position. However, because the effect of zeranol was not significant in this trial it is not possible to say whether there was no effect of position or whether this was a reflection of the lack of response to zeranol.

Response to zeranol treatment by spayed cows was 0.138 kg/hd/day ($P<0.005$) and falls into the range of responses made by steers. There is a lack of information on the likely treatment response by spayed cows grazing pasture to indicate whether this response is typical.

The lack of treatment responses by the suckling steer calves in Experiments 8 and 9 were in contrast with most other reports (Anon. 1981; Plasto 1981; Sully 1982; Nicol, *et al.* 1984). However, Nicol *et al.* (1984) did report a non significant response to a single implant of zeranol in a similar class of animal.

The lack of significance in these two calf experiments may be due to a lack of numbers relative to between animal variation. The coefficient of variation for liveweight gain was 13 and 16% in Experiments 8 and 9 respectively.

Repeat implantation

Response to repeat zeranol treatment by 18 to 20 month old steers is given in Table 5.

During the single zeranol treatment period the responses of between 0.060 and 0.130 kg/hd/day ($P<0.05$) were within the range of responses by steers in Experiments 1 to 4 inclusive.

In Experiment 5, repeat treatment gave a response over the control group (0.025 kg/hd/day $P<0.05$) and over the single zeranol group (0.023 kg/hd/day $P<0.05$) during the period 10 December 1981 to 21 February 1983. However, over the whole experimental period of 606 days, there was no advantage to repeat treatment over single treatment. In

this experiment the advantage accruing to the single zeranol treatment during the first 168 days of the trial was maintained during the following 438 days.

Table 5. Effect of repeat zeranol treatment

Experiment and treatment	Observation period and daily liveweight gain (kg/hd/day) for each period				
Experiment 5 Commenced 25 Jun 81 Initial liveweight 311 kg					
Period	25 Jun 81 to 10 Dec 81	10 Dec 81 to 21 Feb 83	25 Jun 81 to 21 Feb 83		
(No. days)	(168)	(438)	(606)		
Control	0.319*b*	0.330*b*	0.327*b*		
Single zeranol	0.379*a*	0.332*b*	0.361*a*		
Repeat zeranol		0.355*a*	0.356*a*		
Experiment 6 Commenced 10 Feb 81 Initial liveweight 246 kg					
Period	10 Feb 81 to 5 May 81	5 May 81 to 22 Sep 81	22 Sep 81 to 11 Aug 82	10 Feb 81 to 22 Sep 81	10 Feb 81 to 11 Aug 82
(No. days)	(84)	(140)	(323)	(224)	(547)
Control	0.863*a*	0.446*a*	0.215	0.611*a*	0.377
Late zeranol		0.518*b*	0.208		0.381
Early zeranol	0.993*b*	0.455*a*	0.188	0.666*bc*	0.384
Repeat zeranol		0.521*b*	0.193	0.694*c*	0.398

* Values within columns within experiments followed by different letters differ significantly ($P<0.05$).

In Experiment 6, response to a repeat zeranol treatment 84 days after the initial implant was similar to that of an initial implant; late zeranol initial implant 0.072 kg/hd/day ($P<0.05$) over control group and repeat zeranol second implant 0.075 kg/hd/day ($P<0.05$) over control group. This response is different to the work by Mason *et al.* (1984) and Lowman *et al.* (1982) who found the responses to a second implant tended to be smaller and less consistent than responses to the initial implant.

By day 224 of Experiment 6 there was little difference between early zeranol and repeat zeranol, giving the same trend as reported from Experiment 5 and agreeing with Mason *et al.* (1984). However, the early treatment gave slightly better results than the late treatment. This is probably caused by the higher liveweight gains made during the active period of the early zeranol than were made during the active period of the late zeranol.

In contrast to Experiment 5 the advantages to zeranol treatment in Experiment 6 were eroded during the last 323 days.

Commercial implications

Experience from these experiments suggests that response to zeranol treatment of cattle grazing pastures commonly found in central-western Queensland will be similar to those in other regions. The most effective way to use zeranol to increase liveweight gains is less clear due to the variability of the experimental results. Probably the best use of zeranol will be made if treatment is immediately following rainfall that will produce high pasture productivity and hence high liveweight gains. Due to the possibility of advantages being eroded during periods of relatively low liveweight gain it seems preferable to use zeranol only in cattle that are likely to be sold within six to eight months after the start of high pasture productivity.

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