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# EGG TRANSFER IN CATTLE: EFFECT OF HORMONAL TREATMENT ON SYNCHRONIZATION OF OESTRUS AND OVARIAN RESPONSE

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The technique of surgical egg transfer is being used commercially to multiply exotic breeds of cattle. The success of the technique depends, to a large extent, upon closely synchronizing the stage of the oestrous cycle of the donor and recipient animals.

To obtain sufficient synchronized animals, the commercial firms must either run a large herd of empty animals or utilize synchronization drugs (prostaglandins and progestagens). The latter method would be preferred because of the expense of maintaining a large herd.

This paper reports preliminary studies on the effectiveness of three hormonal regimes for synchronizing oestrus and inducing superovulation in egg transfer animals.

## MATERIALS AND METHODS

### ANIMALS

A total of 205 mixed breed cattle was utilized in the trial. Of these, 133 Friesian crossbreeds, were used in a contemporaneous comparison of the three treatments and the remainder, 72 Aberdeen Angus crossbreeds, were used in a subsequent examination of the effectiveness of the sponge treatment. The numbers of animals used in each treatment are shown in Table 1.

### SYNCHRONIZATION

The three techniques compared were:

- (1) Prostaglandin  $F_{2\alpha}$  (PGF; Upjohn Ltd) injected intramuscularly (i/m.) on two consecutive days (12.5 mg/day) between days 5 and 16 of the oestrous cycle.
- (2) Prostaglandin  $F_{2\alpha}$  analogue (PGFA; ICI 80996) injected i/m. on one day (500  $\mu$ g) between days 5 and 16 of the oestrous cycle.
- (3) Progestagen impregnated intravaginal sponges containing 500 mg "Cronolone" (Searle) inserted for 15 to 21 days.

### SUPEROVULATION

Potential donor cattle were injected i/m with 1500 to 2100 i.u. pregnant mares' serum gonadotrophin (PMSG) either one day before their first injection of prostaglandin or two days before removal of the intravaginal sponges. Eleven potential recipients treated with PGF received a low dose of PMSG (750 i.u. to 1000 i.u.) in an attempt to improve the synchronization of donor and recipient onset of oestrus.

Preliminary appraisal of a number of batches of PMSG was conducted. The most satisfactory was Paines and Byrnes batch 514126 and this was used routinely.

### OESTRUS DETECTION

All animals were fitted with "Matemaster" heat detectors and were inspected twice daily for oestrus.

### INSEMINATION

Donor animals were mated with an entire bull or inseminated with liquid semen ( $5$  or  $15 \times 10^6$  sperm/ml) three times during the 24 hours following onset of oestrus.

### OVARIAN RESPONSE, EGG RECOVERY AND EXAMINATION

Donor animals were laparotomized 3 to 7 days after onset of oestrus and the ovarian response recorded. Eggs were recovered at  $37^{\circ}\text{C}$  in Tissue Culture Medium 199 (C.S.L., Australia) and were examined for stage of cleavage and morphological abnormalities.

## RESULTS

### SYNCHRONIZATION OF OESTRUS

The results are shown in Table 1.

Examination of the distribution of onset of oestrus during the 5 days after each of the contemporaneous treatments showed that animals treated with PMSG displayed oestrus an average of 0.6 days earlier than animals not treated with PMSG. The animals treated with PGF and sponges showed oestrus up to  $1\frac{1}{2}$  days earlier than those treated with PGFA.

The most satisfactory synchronization of oestrus was achieved after donors and recipients were treated with sponges. However, all treatments gave satisfactory results after PMSG but unsatisfactory results were obtained after recipients were treated with PGF alone.

TABLE 1: DISTRIBUTION OF ONSET OF OESTRUS AFTER HORMONE TREATMENT (% OF COWS)

Treatment	No. cows	Interval from End of Treatment to Onset of Oestrus (days)									Not Synchron-ized (% of cows)	Significant Differences	
		1	1½	2	2½	3	3½	4	4½	5		Distribution of Onset Oestrus	Synchron-ization <sup>4</sup>
PGF + PMSG <sup>1</sup>	15	20	0	67	0	7	0	0	0	0	7		} a b
PGF + PMSG <sup>2</sup>	11	0	18	36	9	0	9	0	9	0	18		
PGF <sup>3</sup>	24	0	0	29	4	4	0	0	4	0	58	a	
PGFA + PMSG <sup>1</sup>	6	0	0	33	17	33	0	0	0	0	17		b
PGFA <sup>3</sup>	22	0	0	0	0	41	9	14	0	5	32	b	
Sponges + PMSG <sup>1</sup>	12	17	42	33	0	0	8	0	0	0	0	c	c
Sponges <sup>3</sup>	43	0	5	47	16	12	0	2	0	0	19	d	
Sponges + PMSG <sup>1</sup>	22	0	5	45	9	18	0	5	0	0	18	e	d
Sponges <sup>3</sup>	50	0	0	14	20	10	2	4	0	0	50		e

<sup>1</sup> Potential donors  
<sup>2</sup> Potential recipients—low dose PMSG  
<sup>3</sup> Potential recipients—no PMSG  
<sup>4</sup> Greatest proportion of animals exhibiting oestrus over a 1½-day period.

a v. b  $P < 0.01$   
b v. d  $P < 0.001$   
c v. d  $P < 0.01$   
c v. e  $P < 0.05$

a v. b  $P < 0.05$   
b v. c  $P < 0.01$   
c v. e  $P < 0.01$   
d v. e  $P < 0.05$

On the basis of these results further animals were treated with sponges. The results of this subsequent treatment are also shown in Table 1. These subsequent sponge donors and recipients showed oestrus an average of 0.6 and 0.5 days, respectively, later than the original sponge donors and recipients. Also, compared with the original sponges, fewer of the donors and recipients were closely synchronized.

#### OVARIAN RESPONSE

The donor ovarian response and egg recovery data are presented in Table 2. These data are only from the donors superovulated with Paines and Byrnes PMSG, batch no. 514126, that were satisfactorily synchronized. Also, as there were no differences between donors treated with PGF and PGFA their results have been combined.

TABLE 2: DONOR OVARIAN RESPONSE AND EGG RECOVERY DATA

	Treatment		
	Prostaglandin	Sponges (Initial)	Sponges (Subsequent)
No. of donors .....	11	8	16
No. of ovulations:			
Mean .....	7.7 <sup>b</sup>	14.9 <sup>a</sup>	9.8
Range .....	1-13	1-28	1-35
No. of large follicles:			
Mean .....	2.6	10.8	2.2
Range .....	1-11	1-60	1-5
No. of eggs recovered:			
Mean .....	5.0	9.9 <sup>c</sup>	4.3 <sup>d</sup>
Range .....	1-10	1-20	1-10
% of total ovulations .....	65	66	43
No. of fertilised eggs recovered:			
Mean .....	4.6	6.3 <sup>e</sup>	3.1 <sup>f</sup>
Range .....	1-10	1-18	1-9
% of eggs recovered .....	93 <sup>e</sup>	63 <sup>h</sup>	72

a v. b, c v. d, g v. h  $P < 0.05$ ; e v. f  $P < 0.10$

A feature of the results is the differing response of the initial and subsequent sponge-treated animals. However, overall, the sponge-treated donors produced more ovulations than those treated with prostaglandins. More eggs and more fertilised eggs were recovered from the initial sponge donors than from the subsequent

donors. The proportion of recovered eggs fertilized was, however, lower in the sponge donors than in the prostaglandin donors.

#### DISCUSSION

It is of little consequence when donors and recipients show oestrus at different times after a fixed treatment provided that, within the donor and recipient groups, the onset of oestrus is satisfactorily synchronized. Under these conditions, adjustment of the time of donor and recipient commencement of treatment will enable maximum numbers of synchronized donors and recipients to be obtained.

The results from the contemporaneous comparison of PGF, PGFA and sponges suggested that the sponges offered most potential as a technique for the routine synchronization of donor and recipient onset of oestrus. The most satisfactory donor and recipient synchronization was achieved with the sponges and, although the eggs from donors were less often fertilized than when prostaglandins were used, the higher ovulation rate of the sponge animals resulted in more fertilized eggs being recovered.

A disturbing aspect of the sponge treatment was the failure of the subsequent sponge-treated animals to respond as satisfactorily as the initial animals. They were less satisfactorily synchronized and the donors did not ovulate quite as readily. These differences could be associated with the treatment of a new herd of cattle which contained animals of a different breed from that used in the initial trials. Also seasonal effects could perhaps have some influence on the response. Because of these differences, further experiments must be conducted before any recommendations can be made on the most suitable synchronization treatment for use in conjunction with the ovum transfers.

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