A COMPARISON OF CLOPROSTENOL AND DINOPROST TROMETHAMINE FOR THE CONTROL OF ESTRUS IN BOVINE EMBRYO TRANSFER

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ABSTRACT

Cloprostenol (500 ug) and dinoprost tromethamine (65 mg in three doses) were similarly effective in controlling estrus during superovulation with FSH-P. Estrous response was 97.3% and 99.5%, respectively. Embryo production was the same measured in terms of the number transferable, total, percent transferable and number of ova cleaved. The percent cleaved was higher in the dinoprost group (75.5%) than the cloprostenol group (67.4%, P=0.019). The number (P=0.04) and proportions (P=0.009) of degenerate embryos were higher in the dinoprost group as compared to the cloprostenol group (2.9 and 27.9% vs 2.2 and 20.5%).

Key words: Dinoprost tromethamine, cloprostenol, embryo transfer, superovulation, cattle.

INTRODUCTION

Early experiments investigating the mode of action of dinoprost involved inducing luteolysis by infusing large doses of dinoprost (1). It now has been shown that about five pulses of dinoprost over 25 hours is necessary to cause corpus luteum regression in the sheep: this dose is only 1/40 of the dose of dinoprost that previously had been needed (1). These findings may illustrate the principle that the number of times a donor cow was treated with dinoprost during superovulation (2) was more important in the control of estrus than was the dose of dinoprost. Increasing the number of treatments of dinoprost from one to three per day increased estrous response and the number of ova cleaved, thereby increasing the number of transferable embryos. When cloprostenol became available in the USA, it was necessary to test this drug in the superovulation regimen to see if the longer acting properties of this prostaglandin analogue would be of benefit.

MATERIALS AND METHODS

Estrous response and embryo production was measured in 455 experimental donor cows treated with either one dose of 500 ug cloprostenol (Estrumate, Haver-Lockhart, Shawnee, KS) or three doses of 35, 15 and 15 mg dinoprost (Lutalyse, The Upjohn Co., Kalamazoo, MI). The cloprostenol was given in the morning of the third day of superovulation and the dinoprost on the morning, noon and night of the same day. The cows were superovulated with FSH-P (Burns Biotec, Omaha, NE) given in doses of 6, 4, 2 and 2 mg twice a day over four days. Cows were allocated to treatments at random in groups of 8 to 15 cows. Each group was treated over five days, representing one week's work. Groups were treated with dinoprost or cloprostenol on alternate weeks. Cows were checked for estrus three times a day, and any cow not seen in estrus but which produced embryos was classified as a positive estrous response. Cows were inseminated two or three times with good semen, at the time of detection, at 12, or a 24 hours after the detection of estrus. Two straws of semen were used at the 12-hour and one straw at the other inseminations.

Embryos were collected nonsurgically (3) 6.5 to 7.5 days after estrus. The embryos were classified on the basis of their morphological characteristics. Transferable embryos were symmetrical and approximately round. Up to three defects were allowed including some debris surrounding the cell mass, dark color, ragged zona pellucida or embryo stage out of phase with its chronological age. If there were more than three defects, the embryos was classified as degenerate. Clear evidence of cleavage of the cells of the embryonic mass distinguished fertilized embryos. Nontransferable embryos were classified as degenerate or unfertilized. Features of embryos which were diagnostic of nontransferable included shrunken cells, dark cells, fuzzy membranes, grainy appearance, cracked or broken zona pellucida (including empty zona), and flattened embryos. Unfertilized eggs appeared as a single spherical ball of cytoplasm without evidence of cleavage. The data were analysed using a microcomputer statistical package (4). The percentages for transferable, cleaved and degenerate embryos were calculated for each collection and then analysed.

RESULTS AND DISCUSSION

The estrous response in superovulated donor cows treated with cloprostenol and dinoprost was 97.3% and 99.5%. This difference was not significant (By Chi Square P = 0.129). There was no effect of insemination regimen on embryo production, so the results are presented for all regimens

TABLE 1 - THE EFFECTS OF CLOPROSTENOL AND DINOPROST ON EMBRYO PRODUCTION PER COLLECTION

EMBRYOS	CLOPROSTENOL No.	S.D.	DINOPROST No.	S.D.	
No.TRANS-FERABLE	4.6	5.6	4.4	4.9	0.644
No. RECOVERED	10.3	9.7	9.9	8.6	0.673
% TRANSFERABLE	44	34	46	33	0.553
No. CLEAVED	7.6	7.6	7.9	7.4	0.710
% CLEAVED	67	36	75	35	0.019
No. DEGENERATE	2.2	3.4	2.9	4.0	0.040
% DEGENERATE	20	27	28	30	0.009
No. COWS	223		222		

(a) By ANOVA P =

combined. In the cows treated with cloprostenol or dinoprost, there was no difference in the number of embryos transferable, the total embryos and ova collected, the percent transferable or the number of embryos cleaved (Table 1). However, the percent of cleaved ova was significantly higher and the number and percent of degenerate embryos was higher in the dinoprost-treated cows. An increase in the percent of cleaved ova with three doses dinoprost had been previously described (2), but no satisfactory explanation was given for this occurrence. In this experiment, the increase in cleavage rate was offset by the increased rate of degeneration of embryos. These results suggested that the dinoprost portion of the superovulation treatment can affect embryo quality as well as quantity. A single dose of cloprostenol, with its longer acting properties, achieved similar results to the three injections of dinoprost. Cloprostenol has the advantage that it costs less at these dose rates and as a single injection requires only a single handling of the donor cow.

REFERENCES

1. Schramm, W., Bovaird, L., Glew, M. E., Schramm, G. and McCracken, J. A. Corpus luteum regression induced by ultra low pulses of prostaglandin F_2 alpha. Prostaglandins 26: 347-364 (1983).

2. Donaldson, L. E. The effect of prostaglandin F_2 alpha treatments in superovulated cattle on estrus response and embryo production. Theriogenology 20: 279-285 (1983).

3. Elsden, R. P., Hasler, J. F. and Seidel, G. E., Jr. Non-surgical recovery of bovine eggs. Theriogenology 6: 523-529 (1976).

4. Walonick, D. Stat Pac, Walonick Associates, Minneapolis, MN. 1983, pp. 1-124.