

THE SYNCHRONIZATION OF OESTRUS IN SHEEP IN ARTIFICIAL INSEMINATION PROGRAMMES

Effect of dose, single or double injection regime, of three prostaglandin analogues on oestrus response and conception rate.

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SUMMARY

During the last two breeding seasons, i.e. 1979/80 and 1980/81, more than 6800 ewes -mainly Corriedale- were synchronized with PG analogues. ICI 80996, ONO 1052 and Tiaprost. Ten graded doses of the three analogues were administered i.m. in 4600 ewes, as well as the effect of a single vs. double injection in oestrus response was evaluated using ICI 80996.

Conception rate after one AI at induced oestrus or at the first "natural" oestrus was measured as the number of ewes non-returned after 21 days.

A dosage of 40 µg of ONO 1052; 50 µg of ICI 80996; and 60 µg of Tiaprost proved adequate to induce regression of the CL. When ONO 1052 was diluted and administered at four dose levels of 0, 25, 30 and 35 µg, differences due to dose were significant with the 35 µg dose being more effective ($P < 0.01$)

The percentage of ewes synchronized and marked by raddled vasectomized rams between one and five days after treatment, were from 70,1 to 80,4% in the single dose, vs. 90,5 to 96,6% in the double injection.

The conception rate after one AI at the induced oestrus of the single and the double injection were between 26,2 to 44,9% for the single and the double regime (x 12 or x 14 days), being lower than the control groups ($P < 0.01$). CR after one AI at the first natural oestrus were between 58,7 and 73,2 with no statistical differences with the control groups.

The results of these trials confirm that controlled breeding in sheep using low dose of PG and worked with an AI at the first natural oestrus is possible under Uruguayan conditions.

INTRODUCTION

Successful control of oestrus and ovulation in sheep combined with A. I. would provide a number of practical and economic advantages, allowing also the exploitation of genetically superior sires. The corpus luteum (CL) of the ewe is responsive to prostaglandins (PG), during nine to ten days period of the midluteal phase of the oestrus cycle (1) (6) (12). Administration of PGF₂ alpha or its analogues at various doses has been used to induce oestrus in cyclic ewes, but the fertility found was variable. (2) (3) (4) (10) (8). The determination of the minimal effective dosage in larger studies would obviously be desirable for economic reasons.

The following experiments were designed to determine the effect of graded dosages of three PG analogues administration, on oestrus synchronization and conception rate. This study was also undertaken to evaluate the practical advantages of different set-time A. I. following PG treatment under field conditions during the last three breeding seasons.

MATERIALS AND METHODS

Trials were conducted in nine flocks during the 1979/80 breeding season in 3.587 ewes (2.442 Corriedale and 1.145 Polwarth) and in seven flocks during the 1980/81 breeding season in 3.265 ewes (1.511 Corriedale and 1.754 Polwarth). Ewes were observed for oestrus markings by raddled vasectomized rams.

a) Dose Response.

Three PG analogues were used in 4.674 ewes.

1. **ICI 80996** Five groups (1.028 ewes) were injected i.m. with either 100 (0, 4 ml), 75 (0, 3 ml) or 50 ug (0,2 ml), or 40 ug (0,1 ml) on ewes at unknown stage of the oestrus cycle.
2. **ONO 1052** Four groups (381 ewes) were injected i.m. with either 160 (0, 4 ml), 120 (0, 3 ml), 80 (0,2 ml), or 40 ug (0,1 ml) on ewes at unknown stage of the oestrus cycle. Five groups (591 ewes): two groups (396 ewes) were injected i.m. with a single dose of diluted PG ONO 1052 with 50 ug (2 ml) and three with either 35 (1,4 ml), 30 (1,2 ml) or 25 ug (1,0 ml). (195 ewes).
3. **TIAPROST** Four groups (2.674 ewes) were injected i.m. (several times) with either 105 (0, 7 ml), 75 (0,5 ml), 80 (0,4 ml) or 45 ug (0,3 ml) on ewes at unknown stage of the oestrus cycle.

b) Number or doses (single or double injection)

1. **ICI 80996** Only with experimental purpose during the 1979/80 breeding seasons a trial was carried out with two injections of PG administered at intervals of either 12 (336 ewes) or 14 days. (169 ewes).
2. **ONO 1052** Working with a diluted dose i.e. 35, 30 and 25 ug at an interval of 12 days was given to 195 ewes.

c) Conception Rate

CR after one insemination at induced oestrus or at the first "natural" oestrus was measured as the number of ewes non-returned after 21 days.

RESULTS AND DISCUSSION

a) Dose Response

Tables 1 and 2 show the response of ICI 80996, ONO 1052, and TIAPROST: i.e. ewes marked within one to five days after treatment during the breeding seasons 1979/80 and 1980/81.

TABLE 1

The effect of different dosages of PG F2 alpha (analogues) on the percentage of ewes exhibiting oestrus, from day 1 to day 5.

Analogue PG F2 α	N° ewes	Breed Month	0,1 cc	0,2 cc	0,3 cc	0,4 cc	X ²
ICI 80996	284	Corriedale	-	50ug	75 ug	100 uq	-
		Dec.	-	61,2	71,3	78,7	7*,31
ICI 80996	744	Corriedale Mar.	-	79,3	73,9	-	NS 3,00
ONO 1052	381	Corriedale	40 ug	80 ug	120 ug	160 ug	NS2,15
		Apr.	72,7	73,5	71,4	65,0	

Single Dose
*p<0.05

Breeding Season 1979/80

TABLE 2

The effect of different dosages of PGF2 alpha (analogues) on the percentage of ewes exhibiting oestrus, from day 1 to day 5.

Analogue PGF 2 α	N°	Breed	Month	45 ug 0,3cc	60 ug 0,4cc	75 ug 0,5cc	105 ug 0,7cc	X ²
TIAPROST (Iliren)	100	Corriedale	Feb-March	54,5	-	78,8	72,2	NS 4,88
"	100	Corriedale	Mar	66,7	-	72,7	72,8	NS 0,68
"	600	Corriedale	Mar-Apr	-	72,0	85,0	-	* 25,16
"	120	Corriedale	Mar-Apr	-	69,5	77,6	-	NS 1,09
"	1754	Polwarth	Apr	59,3 61,8	76,6 82,1	89,0	-	* * 69,97

* P<0,05

** P<0,01

Breeding Season 1980/81

The results of Table 2 and 3 showed no statistical differences in dose when working with PG over a dose of 40 to 60 ug unless ewes were at the beginning of the breeding season (Table 1, first trial ICI 80996). These figures are in agreement to what was published (11) (14).

The body mass of Corriedale and Polwarth ewes were in the range of 40 to 45 kg. According to this, an approximate dose of PG would be one ug per kg. body weight in ewes. Because the dilution of the PG analogue could give better precision in the administration. Table 3 shows the results when ONO 1052 was diluted and injected at low doses.

TABLE 3

Oestrus response following the treatment with PG Analogue diluted.

Analogue PGF2 alpha	ug Dose R e g i m e	N ^o	Breed Month	% Oestrus	X ²
ONO 1052	Single 50	160	Corriedale Apr-May	72,5	NS 0,01
"	"	236	Corriedale Apr-May	72,9	
ONO 1052	Double x 12 days	35 65	Corriedale Apr-May	93,8	** 31,6
"	Double x 12 days	30 65	Corriedale Apr-May	70,8	
"	Double x 12 days	25 65	Corriedale Apr-May	49,2	

** P 0,01

Breeding Season 1980/81.

Dose of 35 ug shows that dilution could improve precision of treatment when administered i.m. (Table 3)

During the last two breeding season it was found that smaller dose than previous, administered intravaginal -near cervix- gave promising results

b) Number of doses

The results on oestrus synchronization when using one or two injection regime are set out in Table 4.

TABLE 4

The effect of number of doses (PG) and set-time A.I. on oestrus response (%)

Dose	I. A.	N° ewes	Breed Month	% Oestrus
Single	Induced	284	Corriedale Dec.	70,1
	"	744	Corriedale Mar.	76,6
	1 ^{est} Natural estrus	531	Corriedale Mar.	80,4
	"	640	Corriedale Mar.	70,9
	"	502	Corriedale Apr.	67,2
	"	381	Corriedale Apr.	70,6
Double	Induced x 12 days	59	Polwarth Dec.	96,6
	Induced x 14 days	169	Polwarth Dec.	90,5
	Induced x 12 days	277	Polwarth Mar.	92,1

From the results in Table 4 it is evident that two dose injection either for 12 or for 14 days interval-gave better response in the synchronization of oestrus in sheep than one dose regime.

c) Set-time A.I. and Conception Rate

The results of PG synchronization using A.I. at induced oestrus or first natural oestrus (second cycle) on conception rate are shown in Table 5.

TABLE 5

The effect of number of doses (PG) and set-time A.I. on Conception Rate (%)

Dose	I. A;	N° ewes		Breed Month	Conception Rate		X ²
		Treated	Control		Treated	Control	
Single	Induced	404	649	Corriedale Dec.	26,2	41,5	** 25,1
	"	137	812	Polwarth Dec.	32,1	52,9	** 20,4
	"	579	596	Corriedale Feb.	44,9	55,0	** 12,1
	1 ^{est} natural oestrus	155	812	Polwarth Dec.	58,7	52,9	NS 1,7
	"	473	646	Polwarth Mar.	59,4	53,3	* 4,2
	"	269	108	Corriedale Apr.	73,2	71,3	NS 0,2
Double	Induced x 12 days	59	812	Polwarth Dec.	38,9	52,9	* 4,3
	x 14 days	153	812	Polwarth Dec.	32,7	52,9	** 21,2
	x 12 days	255	646	Polwarth Mar.	27,5	53,3	** 49,0

** P<0, 01; * P<0, 05

The CR after one A.I. at the induced oestrus in the groups that received single or double injection of PG gave lower conception than the control group (Table 5). When ewes were inseminated at the first natural oestrus CR were between 73,2 to 58,7 and did not differ significantly with the control group.

The results of these large scale field trials confirm that the use of low dose of PG analogues in double dose regime is more effective than in the single, although the conception rate was reduced

by an average of 17%. It was found (13) (7) (9) that PG treatment reduced the life span of the CL and thus limited the exposure of the uterus to progesterone priming prior to A.I.. Dose interval in the double injection regime, i.e. for 12 or 14 days should reduce this effect, nevertheless present results (Table 5) demonstrated that CR have not been improved.

Later work of Dieleman and Kruij (5) pointed out the low activity of 3 β -45D in preovulatory follicles and steroids present in heifers and cows treated with PMS-C/PGF2 - induced oestrus. On the other hand, another study (14) shows that PG treatment reduce the concentration of protein and activities of acid and alkaline phosphates and peroxidase in cervical mucus of buffalos after induction of oestrus. These changes in some biochemical constituents of the cervical- mucus could alter the passage of spermatozoa.

Thus, from our work we may conclude that after one dose PG analogue A.I. aE first natural oestrus did not affect CR in ewes and, could be used in 70-80% heat synchronization in ewes during a period of 5-7 days. This obviously will shorten the length of the A.I., make more efficient use of labour and lately grouping lambings to facilitate handling and reducing lamb mortality.

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