SYNCHRONIZATION OF OESTRUS IN CATTLE USING A PROSTAGLANDIN $F_{2\alpha}$ ANALOGUE (ICI 79939)

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Prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) placed, non-surgically, into the uterine horn ipsilateral to the CL has been shown to cause luteolysis in cattle (Liehr, Marion & Olson, 1972; Louis, Hafs & Morrow, 1972) provided it is administered after Day 4 of the oestrous cycle (Rowson, Tervit & Brand, 1972). For routine use as a synchronizing agent, it would be desirable to administer the prostaglandin intramuscularly. This paper reports the successful induction and synchronization of oestrus in cattle treated with a potent $PGF_{2\alpha}$ analogue by either the intrauterine or the intramuscular route.

A total of 251 heifers was treated with the $PGF_{2\alpha}$ analogue, ICI 79939, between Days 5 and 16 of the oestrous cycle (oestrus = Day 0). These cattle were used either as donors or as recipients for egg transfer experiments. The donor cattle were pretreated with an intramuscular injection of approximately 2000 i.u. PMSG 1 or 2 days before administration of the analogue. The analogue, in an aqueous solution containing 200 $\mu\text{g}/\text{ml}$, was either deposited in the ipsilateral uterine horn (through a fine wire pipette) or injected intramuscularly into the gluteal region. The treated animals were run with raddled vasectomized bulls and the onset of oestrus was recorded.

The effect of the analogue on the onset of oestrus is shown in Table 1. Satisfactory synchronization of oestrus was considered to have been achieved when most of the treated animals exhibited oestrus within a 3-day period and approximately 50% of these animals showed oestrus on one of the 3 days. Such synchronization is satisfactory for egg transfer experiments where it is desirable that the donor and recipient animals exhibit oestrus either on the same day or within 1 day of each other (Rowson, Lawson, Moor & Baker, 1972).

The intrauterine administration of 300 μg analogue/day on each of 2 consecutive days gave precise synchronization of oestrus. Since it was thought that this dose might have been excessive, animals were similarly treated with 200 $\mu\text{g}/\text{day}$ and this treatment gave satisfactory synchronization of oestrus whether or not the animals had been pretreated with PMSG. Animals pretreated with PMSG tended to show oestrus 1 day earlier than those that were not treated. The total dose of 400 μg analogue may still have been excessive and so, coincident with a simplification of the treatment to a single intrauterine administration, the dose was reduced to 350 μg . This treatment gave satisfactory synchronization of oestrus when the animals were pretreated with PMSG

Table 1. Effect of prostaglandin analogue on onset of oestrus in cattle

Route of administration	Dose of prostaglandin (μg)	Day of PMSG injection†	No. of animals												Total no. of animals	
			Showing oestrus at intervals after first prostaglandin treatment (days)†										S‡	NR§		
			1	1½	2	2½	3	3½	4	4½	5	>5				
Intrauterine	300, 300* 200, 200* 200, 200* 200, 200* 350 350 350	-1 -2 -1 -2			2 15 5 2 6 10	1 3 1 5 2	5 5 8 2 11 4 3	2 3 1	1 7 1				1 3 1	1 1 2 1 1	5 10 30 8 39 13 18 123	
Total																
Intramuscular	600 800 600, 200* 750, 200* 750, 200* 750, 200* 800, 200* 800, 200*	-2 -1 -2 -2	2		1 2 3 3 1 47	7 1 1 1 5 2	1 10 3 1 8 7		1 3					1 2 1 2 2	1 2 3 1	3 4 2 24 7 6 21 61 128
Total																

* Prostaglandin administered on 2 consecutive days.

† Day of first prostaglandin administration = Day 0.

‡ S = Silent oestrus.

§ NR = No response.

but was less satisfactory when the pretreatment was omitted. Animals injected with PMSG tended to show oestrus 1 day earlier than animals that were not injected.

Preliminary intramuscular treatment of nine animals with either a single injection of analogue (600 or 800 μg) or, after PMSG pretreatment, an injection of analogue on 2 consecutive days (600 μg on 1st day; 200 μg on 2nd day) did not give particularly satisfactory induction or synchronization of oestrus. The total dose of analogue was therefore increased to 950 or 1000 μg , the animals being injected on 2 consecutive days (750 or 800 μg on 1st day; 200 μg on 2nd day). These injection regimens gave precise synchronization of oestrus when in combination with PMSG pretreatment but when the PMSG was not given, the synchronization was less satisfactory. There was a tendency for animals receiving PMSG pretreatment to exhibit oestrus earlier than those not receiving PMSG.

The earlier and more precise onset of oestrus in animals pretreated with PMSG is probably due to these animals having, relative to untreated animals, a considerably larger population of maturing follicles at the time of analogue-induced luteolysis. Examination of the donor ovulation rate data suggested that the PMSG injection was most effective in inducing superovulation when administered after Day 5 of the oestrous cycle. Similar ovulation rates were obtained whether the PMSG was injected 1 or 2 days before the first prostaglandin analogue treatment.

The use of the potent $\text{PGF}_{2\alpha}$ analogue, ICI 79939, has enabled the intrauterine treatment of cattle to be reduced to a single administration of 350 μg . Because synchronization was more precise when animals were pretreated with PMSG, this would suggest that, without PMSG treatment, the dosage of 350 μg analogue was inadequate since satisfactory synchronization of oestrus has been achieved (without PMSG pretreatment) after high single doses of $\text{PGF}_{2\alpha}$ were placed into the ipsilateral uterine horn (Liehr, Marion & Olson, 1972; Louis, Hafs & Morrow, 1972). The intramuscular injection of animals on 2 consecutive days (750 or 800 μg on 1st day; 200 μg on 2nd day) also gave precise synchronization of oestrus in PMSG-pretreated cattle. In cattle not treated with PMSG, more precise synchronization may have been achieved by increasing the total dose of intramuscularly administered analogue.

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