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# Effects of melatonin on early breeding of F+ and ++ Booroola x Perendale and Romney ewes

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## ABSTRACT

The effects of Regulin melatonin implants and type G progesterone impregnated controlled internal drug releasers (CIDR) on the early breeding of F+ and ++ Booroola x Perendale and Waihora Romney ewes were compared in a 2 x 2 factorial trial, melatonin v no melatonin x progesterone v no progesterone. The melatonin plus progesterone and melatonin only groups were implanted with melatonin on 12 December and 23 December respectively. While CIDRs were inserted on 7 January and removed on 19 January, when fertile rams were joined with all treatments.

Progesterone alone induced oestrus and ovulations 2 to 9 d after ram introduction in 39%, 50% and 11% of F+, ++, and Romney ewes, whereas progesterone plus melatonin induced oestrus and ovulations in 68%, 76% and 44% of the ewes respectively. There was no response to treatment in terms of percentage ewes lambing. The response to treatment in terms of the percentage of lambing ewes with multiples was different in the 3 genotypes. There was no response to either melatonin or progesterone by the F+ ewes, whereas the ++ ewes responded to both additively, leading to a difference of 50% between melatonin plus progesterone and the control groups. The Romney ewes responded only to melatonin leading to an overall melatonin response of 21%.

**Keywords** Ewes; F+; ++; Romney; melatonin; progesterone; ram effect; fertility; prolificacy.

## INTRODUCTION

Trials have been carried out in Australia showing that continuous treatment with subcutaneous melatonin implants (Regulin Ltd) make Merino cross ewes more responsive to the ram effect in spring joinings and also increase the number of lambs born (Williams *et al.*, 1987), but the responses of Romney ewes to melatonin implants have been inconsistent (Staples *et al.*, 1986; McPhee *et al.*, 1986). The effect of melatonin implants on ewes with the F gene has not been reported.

In the present trial melatonin implants were compared with another aid to early breeding, type G progesterone impregnated controlled internal drug releasers (CIDR), in effects on onset of oestrus, fertility and prolificacy of Waihora Romney ewes, and F+ and ++ Booroola x Perendale ewes.

## MATERIALS AND METHODS

The trial design was a 2 x 2 factorial, with 2 melatonin levels (melatonin implant v no implant)

and 2 progesterone levels (CIDR v no CIDR). The melatonin plus progesterone and melatonin only groups were implanted with melatonin on 12 December and 23 December respectively. CIDRs were inserted on 7 January and removed on 19 January. Melatonin treated ewes were grazed separately from untreated ewes. Ewes were joined with fertile rams fitted with a mating harness on 19 January after a period of at least 5 weeks isolation from rams. The ewes were joined in 4 mating groups F+ and Romney ewes were mated to FF Booroola x Romney rams in melatonin treated and untreated groups, and ++ ewes were mated to ++ Booroola x Romney rams in treated and untreated groups. All ewes were laparoscoped and ovulations counted 3 to 9 d after tup marks were recorded.

## RESULTS AND DISCUSSION

The proportions of ewes which responded to the ram, showed oestrus and ovulated within the periods 2 to 9 or 18 to 25 d after ram introduction are shown for the 3 genotypes in Table 1. Progesterone alone

**TABLE 1** Effect of melatonin implant and progesterone CIDR on onset of oestrus and ovulation.

Treatment	No. ewes joined			Ewes having first oestrus and ovulation(%)					
				2 to 9 d after ram introduction			18 to 25 d after ram introduction		
	F+	++	Romney	F+	++	Romney	F+	++	Romney
Melatonin + progesterone	44	21	34	68	76	44	11	10	29
Melatonin only	56	20	35	4	5	0	36	35	6
Progesterone only	41	22	35	39	50	11	32	18	26
Untreated	50	21	38	4	5	0	36	10	8

induced a marked oestrous response 2 to 9 d after ram introduction for the F+ and ++ ewes and a smaller response in the Romney ewes, because progesterone pre-treatment produces oestrus at the first ram-induced ovulation (Cognie *et al.*, 1982). A greater percentage of ewes in all genotypes showed oestrus in this period when progesterone was combined with melatonin treatment. This synergistic effect was most marked with the Romney ewes.

The total response of the ewes to the ram can be found by adding the responses in the 2 to 9 and 18 to 25 d periods, when progesterone doubled the proportion of F+ and ++ ewes responding to the ram, and there was no effect of melatonin. In the Romneys there was no response to the ram in the ewes without progesterone supplementation, while melatonin doubled the response to the ram in the ewes supplemented with progesterone.

**TABLE 2** Effect of melatonin implant and progesterone CIDR on ovulation rate.

Treatment	No. of ovulations Ewes ovulating		
	F+	++	Romney
Melatonin + progesterone	2.9	1.5	1.3
Melatonin only	2.3	1.2	1.4
Progesterone only	2.3	1.5	1.3
Untreated	2.6	1.1	1.0

**TABLE 3** Effect of melatonin implant and progesterone CIDR on lambing performance.

Treatment	<sup>1</sup> EL/EP(%)			<sup>1</sup> ELM/EL(%)			<sup>1</sup> LB/EJ		
	F+	++	Romney	F+	++	Romney	F+	++	Romney
Melatonin + progesterone	84	67	76	59	57	24	1.52	1.14	0.94
Melatonin only	69	84	81	91	19	32	1.42	1.00	1.06
Progesterone only	80	62	74	78	23	8	1.59	0.73	0.79
Untreated	76	75	57	75	7	6	1.41	0.80	0.56

<sup>1</sup> EL Ewes lambing; EP Ewes present lambing; ELM Ewes lambing multiples; LB Lambs born; EJ Ewes joined.

As would be expected the ovulation rate of the F+ ewes was markedly higher than the ++ or Romney ewes (Table 2). There were no significant effects of progesterone or melatonin on ovulation rate.

There were no significant effects of melatonin or progesterone on the percentage of ewes lambing in the 3 genotypes (Table 3). The F+ ewes also did not respond in terms of the percentage of ewes lambing multiples. The ++ ewes responded additively to melatonin and progesterone in the percentage of ewes lambing multiples, generating a difference of 0.34 lambs born per ewe mated between the melatonin plus progesterone treatment and the control. In the Romney ewes there were significant differences due to melatonin in the percentage of ewes lambing multiples, progesterone had no effect on prolificacy. The overall melatonin effect was an increase of 0.38 lambs born per ewe mated.

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