OVULATION IN EWES SELECTED FOR FECUNDITY: EFFECT OF SYNTHETIC Gn-RH INJECTED ON THE DAY OF OESTRUS

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When ewes are injected with synthetic Gn-RH on the day of oestrus, the magnitude of the LH release is greater than that following injection at other stages of the oestrous cycle (Reeves, Arimura & Schally, 1971; Hooley, Baxter, Chamley, Cumming & Findlay, 1974; Thimonier, Terqui & Pelletier, 1974). It is not known, however, whether additional LH on the day of oestrus has any effect on the number of ovulations, especially in ewes with the genetic potential for high ovulation rates. This question was investigated in four flocks of Merino sheep, designated 'C', 'O', 'T' and 'B', which are, respectively, an unselected group and groups selected since 1954, for low, medium and high litter size. The genetic history of these flocks has been described by Turner (1969).

In May 1973, eighty-nine ewes (aged 4 to 7 years) from these flocks, were kept with vasectomized rams and observed daily for evidence of oestrus. After experiencing one oestrous cycle of normal length, ewes in sub-groups from each flock were injected intramuscularly with either 100 µg synthetic Gn-RH (Hoechst) in 2.0 ml saline or 2.0 ml saline only. The injections were given at 09.00 hours on the morning of the day of oestrus. In a proportion of the ewes from each group, jugular plasma samples were collected immediately before, and 60 min after, injection. These were assayed for LH by the method of Goding & co-authors (1969).

Laparotomy was performed under thiopentone sodium anaesthesia 96 to 120 hr after the day of oestrus, and the corpora lutea were counted to assess the number of ovulations.

After a delay of approximately two oestrous cycles, the ewes from each flock were randomly re-allocated to two groups and were injected as before with either saline or 500 µg Gn-RH at 09.00 hours on the morning of the day of oestrus. Ovulation was assessed as in the first test. Blood samples were not taken for LH estimation.

The results of the two tests are summarized in Table 1. It is clear that injections of either 100 µg or 500 µg synthetic Gn-RH did not significantly alter the number of ovulations in any of the flocks. The between-flock differences in ovulation rate were similar in the two tests.

The LH data in Table 2 confirm that Gn-RH injections consistently induced LH release at a time when the LH levels of control ewes were either

Table 1. Ovulation rate of ewes following injection of synthetic Gn-RH at 09.00 hours on the day of oestrus

<i>Flock</i>	<i>Test</i>	<i>Treatment</i>	<i>No. of ewes</i>	<i>Mean no. of ovulations ± S.E.</i>
'C'	1	Saline	10	1.2 ± 0.14
		Gn-RH (100 µg)	10	1.3 ± 0.14
	2	Saline	11	1.0 ± 0
		Gn-RH (500 µg)	9	1.0 ± 0
'O'	1	Saline	13	1.3 ± 0.16
		Gn-RH (100 µg)	14	1.2 ± 0.13
	2	Saline	11	1.0 ± 0
		Gn-RH (500 µg)	12	1.1 ± 0.12
'T'	1	Saline	11	1.9 ± 0.09
		Gn-RH (100 µg)	9	1.7 ± 0.15
	2	Saline	9	1.6 ± 0.24
		Gn-RH (500 µg)	11	1.8 ± 0.12
'B'	1	Saline	11	2.9 ± 0.48
		Gn-RH (100 µg)	11	2.9 ± 0.48
	2	Saline	10	3.0 ± 0.45
		Gn-RH (500 µg)	11	2.9 ± 0.48

Table 2. Changes in plasma LH of ewes after injection of 100 µg synthetic Gn-RH at 09.00 hours on the day of oestrus

<i>Flock</i>	<i>Treatment</i>	<i>No. of ewes</i>	<i>Mean* LH (ng/ml)</i>		
			<i>Before injection</i>	<i>60 min after injection</i>	<i>Mean change</i>
'C'	Saline	4	7.2 (2.8–14.7)	4.5 (2.0–10.9)	– 2.7
	Gn-RH	4	32.1 (2.0–109.8)	60.0 (22.6–148.8)	+ 27.9
'O'	Saline	8	67.9 (1.9–260.0)	63.7 (3.2–266.0)	– 4.2
	Gn-RH	6	30.0 (3.1–88.9)	52.6 (8.6–120.8)	+ 22.6
'T'	Saline	4	45.1 (5.3–159.2)	40.5 (3.9–137.8)	– 4.6
	Gn-RH	4	66.4 (4.5–107.0)	155.4 (38.9–247.0)	+ 89.0
'B'	Saline	6	19.1 (2.8–76.9)	31.6 (1.8–160.4)	+ 12.5
	Gn-RH	5	25.2 (3.4–88.5)	48.2 (8.8–128.4)	+ 23.0

* Values in parentheses are the ranges of LH levels within each group.

stable or declining. The magnitude of the LH response in each group was quite variable since the ewes were not all at precisely the same stage, in relation to the normal preovulatory LH peak, at the time of injection.

Previous observations of ovarian activity of these genetic groups (Bindon, Ch'ang & Turner, 1971) revealed greater follicular development in the 'T' flock during the oestrous cycle. It appears that additional LH on the day of oestrus is unable to cause ovulation of these follicles. The present results may also be interpreted as an indication that the low ovulation rate of the 'O' flock is not the result of a deficiency of LH on the day of oestrus. This would support the results of Land, Pelletier, Thimonier & Mauléon (1973) which showed that the magnitude of the preovulatory LH release was unrelated to the number of ovulations in ewes genetically different in fecundity.

The work reported here does not add greatly to our understanding of the hormonal differences that have accompanied the genetic divergence in fecundity of the 'O', 'T' and 'B' flocks. It does, however, provide the opportunity to examine the repeatability of ovulation rate since the same animals were observed in both tests. This is especially interesting in the 'B' flock which has a range of natural ovulation rates (1 to 6) much wider than is normally found. Since Gn-RH was without effect on ovulation rate, all Flock 'B' ewes have been included in Text-fig. 1 which demonstrates the relation between the number of

TEXT-FIG. 1. The relationship between the number of ovulations for individual ewes in flock 'B' in two tests approximately 6 weeks apart.

eggs shed by a ewe in the two tests. There was a good correlation ($r = +0.89$) between the two sets of observations, which was not accounted for by differences in the age of the ewes.

Whatever the ovarian or hormonal mechanisms involved in ovulation rate of the sheep, the present data demonstrate a remarkable consistency in the differences in this character between flocks (Table 1) and between ewes within one flock (Text-fig. 1).

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