Release of LH in anoestrous and cyclic ewes

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Reports from this and other laboratories indicate that LH may be released episodically in the intact ewe, the frequency varying according to the reproductive state of the animal (Palmer, Howland & Ibrahim, 1972; Akbar, Nett & Niswender, 1974; Foster, Lemons, Jaffe & Niswender, 1975; Yuthasastrakosol, Palmer & Howland, 1975). The purpose of the present study was to examine therefore the profile of LH secretion in ewes during anoestrus and the oestrous cycle.

Methods

Blood was obtained from two mature cross-bred (Ewes 1 and 4) and 2 Finnish Landrace (Ewes 2 and 3) ewes by jugular venepuncture at 20-min intervals over a 24-h period, beginning at 20.00 h, on 21 June, 24 July, 28 August and 16 November. The ewes were penned together with a raddled vasectomized ram and were checked daily for oestrus. Ewes 1, 2, 3 and 4 exhibited their first overt oestrus on 28 September, 6 September, 22 October and 15 September, respectively, and by 16 November had had 3, 5, 2 and 4 periods of oestrus, respectively. The blood samples were allowed to clot overnight at 4°C, and the serum was separated by centrifugation and stored at –20°C until assay. Serum LH concentrations were determined by a validated double-antibody radioimmunoassay (Niswender, Reichert, Midgley & Nalbandov, 1969) using procedures previously described (Howland, 1972). Anti-ovine LH serum (GDN-No. 15) was used at an initial dilution of 1:100,000. The LH concentrations were expressed in terms of the NIH-LH-S14 standard. The sensitivity of this method in our laboratory is 0.15 ng/ml, which corresponds to approximately 95% binding of labelled hormone when binding in tubes containing no labelled hormone is expressed as 100%. Serum progesterone was measured by the radioimmunoassay as described by Abraham, Swerdloff, Tulchinsky & Odell (1971) and modified by Yuthasastrakosol, Howland, Simarakas & Palmer (1974). The method had a coefficient of variation of 7.5% and the lower limit of sensitivity was determined to be 0.05 ng. Mean recovery was 77.4% and results were corrected for procedural losses.

Results and discussion

During anoestrus, episodic releases of LH were observed in all four ewes (Table 1). LH peaks, defined as obvious elevations followed by 2 or more declining values, varied in height from 0.6 to 10.0 ng/ml. With the exception of Ewe 2, in which there was a decrease in the number of peaks, there did not appear to be a major change in the pattern of LH release with the approach of the first overt oestrus of the breeding season. Similarly, there were no great differences in the mean LH concentrations or average peak levels during anoestrus (Table 1). The progesterone concentrations of Ewes 1, 3 and 4 were <0.5 ng/ml at all times during anoestrus but the level of 0.38 ng/ml in the first sample collected from Ewe 2 on Day –9 had increased to 1.32 ng/ml by the end of the 24-h collection period, perhaps indicating that luteinization had begun. These data lend further support to previous findings that episodic releases of LH occur in the anoestrous ewe (Cicmanec & Niswender, 1973; Akbar *et al.*, 1974; Yuthasastrakosol *et al.*, 1975). Foster *et al.* (1975) also observed pulsatile releases of LH in ewe lambs as they approach sexual maturity, but like us, they were unable to detect any marked change in the release pattern or peak amplitude before the first ovulation at puberty. It is possible therefore that the first ovulatory burst of LH that occurs at the beginning of the breeding season is due to a change in the sensitivity of the hypothalamus to the positive feed-back effect of oestradiol-17 β without a change in the negative feed-back action of ovarian hormones, as was suggested by Foster *et al.* (1975) to occur when the ewe lamb reaches puberty.

Table 1. The pattern of LH secretion in 4 ewes during anoestrus and the oestrous cycle

Reproductive stage*	Ewe	Peaks/24 h	Peak conc. (ng/ml)	Mean of all samples (ng/ml)
Mid-anoestrus				
Day -123	3	5	2.2 ± 0.2	0.6 ± 0.1
Day -99	1	4	7.9 ± 1.0	1.0 ± 0.2
Day -90	3	5	3.4 ± 0.6	0.8 ± 0.1
Day -86	4	3	5.9 ± 0.9	0.7 ± 0.1
Day -77	2	6	2.7 ± 0.4	0.6 ± 0.1
Day -66	1	3	8.0 ± 0.8	0.9 ± 0.2
	Mean	4.3	5.0 ± 1.0	0.8 ± 0.1
Late anoestrus				
Day -55	3	2	4.1 ± 0.9	0.6 ± 0.1
Day -53	4	3	4.0 ± 0.9	0.6 ± 0.1
Day -44	2	9	1.6 ± 0.2	0.6 ± 0.1
Day -31	1	2	7.7 ± 0.7	0.6 ± 0.2
Day -18	4	3	3.8 ± 1.6	0.6 ± 0.1
Day -9	2	2	2.6 ± 1.1	0.3 ± 0.1
	Mean	3.5	4.0 ± 0.8	0.6 ± 0.1
Oestrous cycle				
Day 3	2	19	1.3 ± 0.1	0.8 ± 0.1
Day 14	1	14	2.6 ± 0.2	1.0 ± 0.1
	Mean	16.5	1.9	0.9
Day 9	3	1	3.0	0.5 ± 0.1
Day 10	4	1	6.4	0.6 ± 0.1
	Mean	1	4.7	0.6

Values are mean ± S.E.M.

* Days before the first oestrus of the breeding season are indicated for the anoestrous ewes.

During the oestrous cycle there were many LH peaks/24 h on Days 3 and 14 compared to the single peak observed on Days 9 or 10 (Table 1). The progesterone level decreased from 2.08 to 0.46 ng/ml during the 24-h sampling period in Ewe 1 on Day 14, and increased from 0.68 to 4.88 ng/ml in Ewe 2 on Day 3. In Ewes 3 and 4, the progesterone levels changed from 2.10 to 3.52 ng/ml on Day 9 and from 1.46 to 4.52 ng/ml on Day 10, respectively. Although the number of animals sampled does not allow definitive conclusions to be made, it would appear that the pattern of episodic release of LH in anoestrous ewes is different from that in cyclic ewes and that the release pattern may be affected by the stage of the cycle in the cyclic animal. Foster *et al.* (1975) and Akbar *et al.* (1974) also have observed minor episodic releases of LH throughout the oestrous cycle of the ewe. Our findings confirm those of Foster *et al.* (1975) that the number of small LH spikes was much greater during the early and later part of the cycle than during the mid-luteal phase. It therefore appears that progesterone may have an important effect in the regulation of tonic LH secretion in the cyclic female by altering the frequency of the pulsatile LH release. This hypothesis is also supported by the findings of Hauger, Karsch & Foster (1975) who reported that chronic progesterone treatment of ovariectomized ewes caused a reduction in LH secretion.

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