Seasonal variation in luteinising hormone secretion and sensitivity to oestradiol feedback in red deer (*Cervus elaphus*) hinds

G.K. Barrell and J.A. Duckworth

Animal & Veterinary Sciences Group, P O Box 84, Lincoln University, New Zealand

Luteinising Hormone (LH) secretion was monitored in entire red deer (*Cervus elaphus*) hinds to determine the mechanisms underlying seasonal breeding in this species. Four red deer hinds were ovariectomized (Ovx) three months prior to the commencement of the breeding season and were run with four entire hinds. Over the next eleven months the hinds were blood sampled once to three times per week and on seven occasions underwent a 4-hour period of 20-minute samples followed by an injection of gonadotrophic-releasing hormone (GnRH, 2 µg i.v.) with samples collected over 4 h to determine pituitary responsiveness. The ovariectomized hinds each received a subcutaneous implant containing 12 mg oestradiol (E2) which was left in place for twelve weeks on two occasions, encompassing the onset and end of the natural breeding season, respectively. Plasma LH concentration was measured by radioimmunoassay using ovine LH standards and tracer. LH pulses were defined as elevations in LH concentration which exceeded the previous nadir by three standard deviations. The response to GnRH was determined as the difference between LH concentration at 0 and 10 minutes following injection.

Implantation of Ovx hinds with E2 prior to the breeding season reduced mean plasma LH concentration ($P<0.001$) but levels increased ($P<0.01$) in mid-April, coincident with the onset of seasonal breeding activity in untreated entire hinds. There was a trend for a corresponding fall in plasma LH concentration associated with the end of the breeding season. LH results from acute sampling on four dates are shown in Table 1.

Table 1. LH pulsatility and LH response to 2 µg GnRH i.v. in Ovx red deer hinds. Means in rows with different superscripts are significantly different ($p<0.05$).

		Prior to the breeding season		During the breeding season	
		without E_2	with E_2	with E_2	without E_2
Frequency of pulses	Mean	3.25^{b}	1.25^{a}	2.75^{b}	3.00^{b}
(no. of pulses/4h)	s.e.m.	0.25	0.25	0.63	0.71
Response to GnRH	Mean	3.13^{a}	2.71^{a}	6.37^{b}	2.29^{a}
(ng/ml)	s.e.m.	0.72	0.29	0.76	0.37

E_2 reduced the frequency of LH pulses during anoestrum but not during the breeding season. The increased LH response to GnRH in E_2-treated hinds during the breeding season showed that E_2 had enhanced pituitary responsiveness at this time. These results indicate that seasonal changes in LH secretion in red deer hinds reflect major changes in sensitivity to the feedback effects of E_2.