

## The effect of progestogen and oestradiol priming on luteal function in seasonally anoestrus GnRH-treated ewes

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Seasonally anoestrus Corriedale ewes receiving 1 ml GnRH (0,0042 mg buserelin-acetate) IM, were pretreated as follows: (i) 5 Days with intravaginal progesterone-impregnated sponges removed 24 h prior to GnRH (P-group); (ii) 6 h with subcutaneous oestradiol silicone rubber implants removed 6 h prior to GnRH (E-group); or (iii) no pre-GnRH treatment (O-group). The mean  $E_2$  levels of ewes in the P-group ( $8,18 \pm 1,52$  pg/ml) and the E-group ( $8,03 \pm 1,74$  pg/ml) were elevated by 6 h prior to GnRH injection. Plasma progesterone output of GnRH-induced CL's in sheep primed with progesterone (P-group) were higher ( $p < 0,01$ ) than mean values for the control ewes (O-group). The E-group was intermediate. The life-span of corpora lutea was not affected. It appears that the trophic effect of progesterone is not mediated via  $E_2$  release, but rather as a direct effect on the ovary or hypothalamo-pituitary axis.

Corriedale-ooie is gedurende seisoenale anestrus óf vir 5 dae behandel met intravaginale progesteron geïmpregneerde sponsies (P-groep), óf vir 6 uur met  $E_2$ -silikoonrubberstafies onderhuids geïmplanteer (E-groep), óf het as kontrole (O-groep) gedien. Die ooie het onderskeidelik 24 h na sponsonttrekking (P-groep) en 6 h na einde van die  $E_2$ -behandeling (E-groep), 'n 1 ml intramuskulêre GnRH (0,0042 mg buserelin-asetaat)-in-spuiting ontvang. Die O-groep ooie is terselfdertyd met GnRH behandel. Vir die P- en E-groep ooie is plasma- $E_2$ -vlakke van  $8,18 \pm 1,52$  pg/ml en  $8,03 \pm 1,74$  pg/ml onderskeidelik geregistreer 6 h voor GnRH-toediening. Progesteronsekresie (area onder sekresiekurwe) was hoër ( $p < 0,01$ ) vir die P-groep ooie as vir die O-groep. Waardes vir die E-groep was intermediêr. Lewensduur van corpora lutea is nie beïnvloed nie. Die luteotrofiese effek van progesteron blyk eerder 'n direkte effek te wees, as via  $E_2$ .

Robinson (1950) has demonstrated that progesterone plays an important role in hormonally induced ovulations, but that progesterone alone, administered during anoestrus, does not necessarily lead to ovulation. If progesterone is combined with PMSG during postpartum anoestrus, an oestrous cycle of normal duration is experienced (Oldham & Martin, 1979). Available evidence suggests that GnRH treatment combined with progesterone, more often than not, increases luteal activity (Webb, Lamming, Haynes, Hafs & Mann, 1977;

McLeod, Haresign & Lamming, 1982). A progestational phase also prevents the premature regression of ram-induced CL (Oldham & Martin, 1979). Poor luteal function was reported by Hamilton, Lishman & Lamb (1979) after an IM injection of oestrogen followed by GnRH, but pretreatment with E<sub>2</sub> implants eliminated the problem (Walters, Short, Convey, Staigmillar, Dunn & Kaltenbach, 1982). The object of this study was to determine whether the effect of progesterone pretreatment on luteal function was direct or mediated via E<sub>2</sub> release prior to LH release.

Corriedale ewes, checked with vasectomized rams to be in seasonal anoestrus, were randomly allocated to three groups (P, E, and O) of six ewes each. The P-group was pretreated with intravaginal progesterone-impregnated sponges (Repromap, Tuco 60 mg) for 5 days, with sponge removal 24 h prior to a 1 ml GnRH IM injection (0,0042 mg buserelinacetate, Receptal Hoechst). The E-Group was subcutaneously implanted with 8,5 mm-long E<sub>2</sub> silicone rubber rods (Compudose, Elanco) for 6 h (12 h to 6 h prior to GnRH). The implants were previously found to produce blood levels of 12 pg E<sub>2</sub>/ml (Liebenberg, 1983). The O-group served as a control, receiving only GnRH. Blood samples to be assayed for E<sub>2</sub> were drawn every 6 h, with the last sample being obtained immediately prior to GnRH. Commencing on the day following GnRH administration, blood samples for progesterone assay were drawn at 48 h intervals over a period of 15 days.

By 6 h prior to GnRH injection the mean E<sub>2</sub> plasma concentration in the ewes of the P-group (in response to progesterone withdrawal) and the E-group had risen to 8,18 ± 1,52 pg/ml and 8,03 ± 1,74 pg/ml respectively (Figure 1). Progesterone pretreatment enhanced luteal function significantly (*p* < 0,01 Table 1), with E<sub>2</sub> pretreatment resulting only in a small (NS) effect (Figure 2).

The results of this study are consistent with those of McLeod *et al.* (1982) where seasonally anoestrus ewes were studied. These workers recorded a highly significant luteotrophic effect of progestogen priming followed by a multiple injection regime of GnRH. The life-span of corpora lutea induced by HCG was prolonged during postpartum anoestrus in cows pretreated with progesterone implants, but not in cows primed with oestradiol (Pratt, Berardinelli, Stevens & Inskeep, 1982). The results pertaining to progesterone priming are similar to those obtained by Sheffel, Pratt, Ferrel & Inskeep

(1982), who concluded that the mechanism by which progesterone increased the subsequent level of luteal function remained unknown.

In this study, the near perfect mimicking of the oestrogen surge in the P and E groups indicates that E<sub>2</sub> implants were

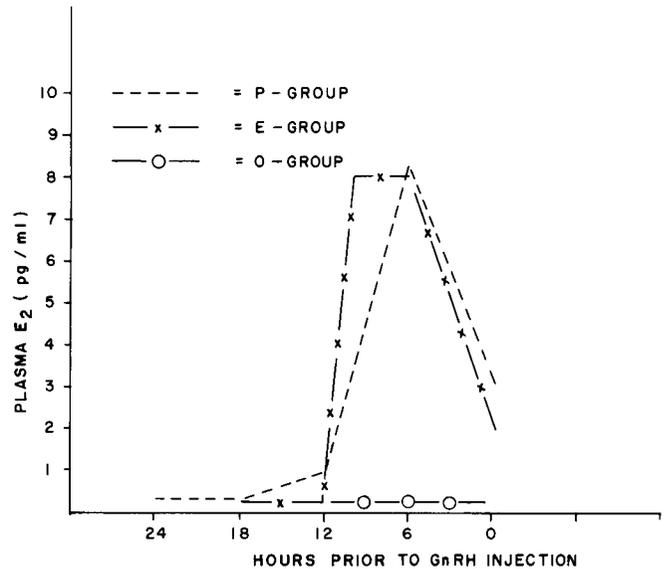


Figure 1 The mean plasma E<sub>2</sub> concentration (pg/ml) of anoestrus ewes treated with intravaginal progestogen sponges for 5 days (P-group), E<sub>2</sub> silicone rubber implants for 6 h (E-group) and control ewes (O-group).

Table 1 Areas under the progesterone curve of anoestrus ewes injected with GnRH after priming for 5 days with intravaginal progestogen sponges (P), for 6 h with E<sub>2</sub> silicone rubber implants (E) and control (O) ewes

Group	n	Treatment mean ± SEM	As % of control
P	6	11,07 ± 0,77	194,2
E	6	7,16 ± 1,98	125,6
O	6	5,7 ± 0,41	100,0

$\bar{x} = 7,98 \pm 0,85; P > O (p < 0,01).$

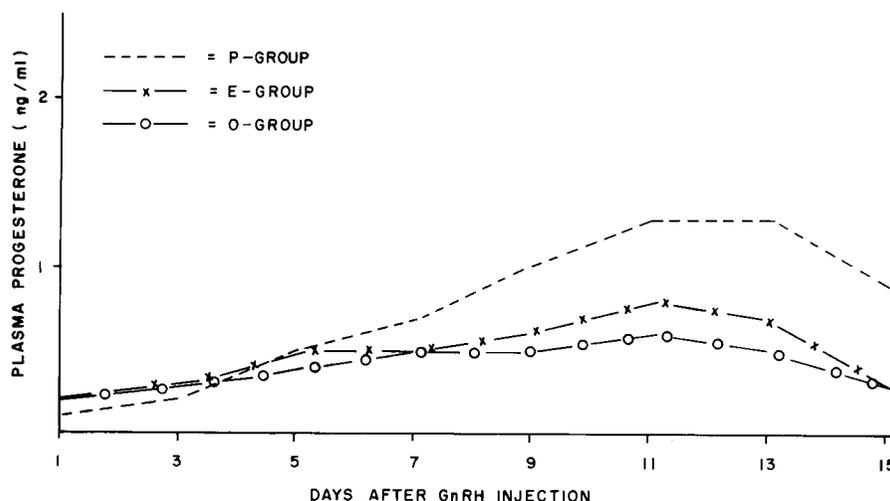


Figure 2 The mean plasma progesterone concentration (ng/ml) of anoestrus ewes injected with GnRH after priming for 5 days with intravaginal progestogen sponges (P), for 6 h with E<sub>2</sub> silicone rubber implants (E) and control (O) ewes.

not responsible for the luteotrophic effect.

In conclusion, the results seem to indicate that the action of progesterone is direct, rather than mediated through  $E_2$ . The direct effect can be at ovarian level or on the hypothalamo-pituitary axis to alter the pattern of LH and or FSH secretion. This alteration could be more beneficial in priming the pre-ovulatory follicle to become a better secretor of progesterone.

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