

RELEASE OF LH IN EWES TREATED WITH PROGESTOGEN AND OESTROGEN DURING THE ANOESTROUS SEASON

A.W. Lishman, W.A. Botha* & B.P. Louw*

Receipt of MS 27.3.74.

Department of Animal Science, University of Natal, Pietermaritzburg

Asynchrony between oestrus and ovulation might contribute to the poor fertility which is observed commonly in ewes after the use of progestogens to synchronise oestrus or to induce out-of-season breeding (Cumming, Blockey, Brown, Catt, Goding & Kaltenbach, 1970; Mauer, Reneval, Johnson, Moyer, Hirata & White, 1972; Lintin & Lamming, 1973).

During the oestrous cycle the pre-ovulatory release of LH is triggered by oestrogen (McCracken, Baird & Goding, 1971; Obst, Seamark & Brown, 1971) and administration of this hormone during anoestrus can induce a release of LH (Goding, Catt, Brown, Kaltenbach, Cumming & Mole, 1969; Radford, Wallace & Wheatley, 1970). The experiment reported here was conducted to examine the effect of oestrogen following progestogen treatment on the interval between oestrus and the release of LH in "anoestrous" ewes. During the breeding season SC-9880 (intravaginally) resulted in a release of LH which approximated that observed in unsynchronised ewes except for a lower maximum LH level (Baumgartner, Lishman, Louw & Botha, 1974). Consequently, this progestogen was also tested during the anoestrous season. The anoestrous state was promoted by isolating the ewes from rams for some four months prior to the start of this experiment. A group of 20 Merino ewes was divided into three groups viz.:

- Group 1 – Intravaginal pessaries containing 40 mg SC-9880 were inserted for 10 days (five ewes).
- Group 2 – Eight ewes were injected (i.m.) daily with 10 mg progesterone in oil for 10 days.
- Group 3 – Seven ewes were treated the same as those in Group 2. In addition these ewes were injected (i.n.) with 25 µg oestradiol-17β in oil.

The progestational treatment was started on 24th August, 1973 (day 1) and the final injection of progesterone was given at 08h00 on day 12. Two hours later a blood sample was obtained (indwelling silastic cannula) from each ewe and sampling was repeated at four-hour intervals until a ewe stood for service by a vasectomized ram. Thereafter the samples were ob-

tained at two hour intervals for 24 hours. Blood was collected into heparinized syringes, centrifuged and the plasma stored at -15°C until assayed for LH by the double-antibody technique of Niswender, Reichert, Midgley & Nalbandov (1969). Analysis of variance was used to test for treatment differences.

Although all the ewes treated with SC-9880 exhibited oestrus and an LH surge with a mean peak value in excess of 100 ng/cm³ (NIH-LH-S16), a proportion of the animals which received progesterone exhibited neither oestrus nor an LH surge (Fig. 1). When an LH release occurred in those animals which received progesterone the maximum hormone level in the plasma was significantly lower ($P=0.05$) than that of ewes treated with SC-9880. Administration of oestrogen did not increase the incidence of LH release and in two animals oestrus was observed which was not associated with an LH surge. The two ewes which did respond showed evidence of hormone release which was abnormally small both as regards quantity and short duration (Fig. 1). According to the results obtained by Goding *et al.* (1969), Beck & Reeves (1973) and Beck, Nett & Reeves (1973) the oestrogen dose used should have been sufficient to induce a release of LH. However, the interval between termination of progestogen therapy and administration of oestrogen may have been too short (Radford *et al.*, 1970) or the fall in progesterone titre may not have been sufficiently rapid to mimic the events which occur during a normal oestrous cycle. Although Beck & Reeves (1973) concluded that the optimum dose of oestrogen for stimulation of LH release was about 50 µg oestradiol-17β, the effect of oestrogen on conception must be considered when selecting dose-levels.

Acknowledgements

This study was initiated following discussions with Dr J.F.W. Grosskopf and was performed with the assistance of senior students in the Department of Animal Science. The crystalline progesterone and Synchro-mate pessaries were generously donated by Messrs. Tuco (Pty) Ltd. and G.D. Searle (Pty) Ltd., respectively.

* College of Agriculture & Research Institute, Cedara.

Treatment	Ewe no.	Overt oestrus	LH release in relation to onset of oestrus				Maximum level of LH in plasma	
			-8	0	8	12	ng/cm ³	Mean
SC-9880	66-20	+	—				65,8	116,1 ±11,2
	66-49	+	—				143,3	
	67-2	+	—				129,6	
	67-26	+	—				130,0	
	68-293	+	—				112,0	
Progesterone	66-74	+	—				48,0	63,8 ±11,2
	66-97	+	—				84,4	
	66-120	+	—				51,0	
	67-10	+	—				91,2	
	67-77	+	—				44,5	
	71-122	-	—				—	
	66-50	-	—				—	
	68-49	-	—				—	
Progesterone + oestrogen	67-57	+	—				43,0	44,5 ±17,7
	67-91	+	—				46,0	
	66-41	+	—				—	
	68-132	+	—				—	
	66-39	-	—				—	
	66-136	-	—				—	
	67-49	-	—				—	

Fig. 1 Occurrence of oestrus and release of LH following progestogen and oestrogen treatment

References

- BAUMGARTNER, J.P., LISHMAN, A.W., LOUW, B.P. & BOTWA, W.A., 1974. Luteinizing hormone (LH) and prolactin levels at oestrus following synchronisation with progestogens in the ewe. *S. Afr. J. Anim. Sci.* 4, 137.
- BECK, T.W., NETT, T.N. & REEVES, J.J., 1973. Serum FSH and LH in anoestrous ewes treated with 17 β -oestradiol. *J. Anim. Sci.* 37, 300.
- BECK, T.W. & REEVES, J.J., 1973. Serum luteinizing hormone (LH) in ewes treated with various dosages of 17 β -oestradiol at three stages of the anoestrous season. *J. Anim. Sci.* 36, 566.
- CUMMING, I.A., BLOCKEY, M.A. de B., BROWN, J.M., CATT, K.J., GODING, J.R. & KALTENBACH, C.C., 1970. The release of luteinizing hormone in ewes following the withdrawal of intravaginal sponges containing progestagen. *Proc. Aust. Soc. Anim. Prod.* 8, 383.
- GODING, J.R., CATT, K.J., BROWN, J.M., KALTENBACH, C.C., CUMMING, I.A. & MOLE, B.J., 1969. Radioimmunoassay for ovine luteinizing hormone. Secretion of luteinizing hormone during oestrus and following oestrogen administration in the sheep. *Endocrinology*, 85, 133.
- LINTIN, K. & LAMMING, G.E., 1973. The effects of progestagens and PMSG on peripheral plasma LH levels in the Clun Forest ewe. *J. Reprod. Fert.* 35, 607.
- MCCRACKEN, J.A., BAIRD, D.T. & GODING, J.R., 1971. Factors affecting the secretion of steroids from the transplanted ovary in the sheep. *Recent Progr. Horm. Res.* 27, 537.
- MAUER, R.E., REVENAL, P., JOHNSON, E.S., MOYER, R.H., HIRATA, A., & WHITE, W.F., 1972. Levels of luteinizing hormone in sera of ewes near the time of oestrus as determined by radioimmunoassay. *J. Anim. Sci.* 34, 88.
- NISWENDER, G.D., REICHERT, L.E., MIDGLEY, A.R. & NALBANDOV, A.V., 1969. Radioimmunoassay for bovine and ovine luteinizing hormone. *Endocrinology*, 84, 1166.

- OBST, J.M., SEAMARK, R.F. & BROWN, J.M., 1971. Application of a competitive protein-binding assay for oestrogens to the study of ovarian function in sheep. *J. Reprod. Fert.* 24, 140.
- RADFORD, H.M., WALLACE, A.L. & WHEATLEY, I.S., 1970. LH release, ovulation and oestrus following the treatment of anoestrous ewes with ovarian steroids. *J. Reprod. Fert.* 21, 371.