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DIFFERENCES IN PROGESTERONE SYNCHRONIZED OESTRUS AND OVULATION IN THREE CATTLE BREEDS

J.M. van der Westhuysen*

Research Institute for Animal and Dairy Science, Irene

In a previous study of ovarian function and reproduction, (van der Westhuysen, unpublished), Hereford and Africander cows were treated with a series of progesterone injections to synchronize their ovarian cycles and some breed differences in response to the progesterone treatment were apparent. It has furthermore been suggested by previous work that low breeding efficiency in the normal cow (van Rensburg & de Vos, 1962), and after synchronization (Hansel, 1967) may be due to abnormal oestrus-ovulation time relationships. The present study was therefore planned to compare breeds in their response to progesterone synchronization of the ovarian cycle, and to examine the oestrus-ovulation time relationships of the synchronized cattle.

Table 1

Grading system for oestrus behaviour

Grade	*Description of cow behaviour*
1.	Bull locates cow easily and mounts; cow stands firm when mounted.
2.	Bull locates cow easily; little movement by cow when mounted.
3.	Bull locates cow easily; teases cow for a few minutes before mounting is possible; cow moves a few steps, but mating is accomplished
4.	Bull locates cow easily; cow turns away or runs and bull is unable to copulate. Exterior signs of oestrus usually obvious.
5.	Cow arouses only brief interest by the bull.
6.	No signs of oestrus.

Only cows graded 1, 2 or 3 were regarded as in oestrus.

Synchronization of oestrus in 26 Africander, 18 Sussex and 20 Hereford cows, all mature and dry, was accomplished by suppressing ovarian function with a series of 50 mg progesterone injections at 48 hour intervals. Forty-eight hours after the final progesterone injection, testing for oestrus with a vasectomised bull was commenced and repeated at four hour intervals until the end of oestrus. As soon as a cow no longer permitted mating at two successive tests, she was regarded as off oestrus. The time of onset of oestrus was taken as 2 hours before the first positive teasing, while the end of oestrus was taken as 2 hours after the last positive test for oestrus. The intensity of oestrus was graded at each test according to a modification of a system for sheep used by Parsons & Hunter (1967) (Table 1).

In order to determine time of ovulation in ten of the cows, rectal palpations were performed at four hour intervals following the first negative test for oestrus. On the ninth day following the final progesterone injection, all the cows were rectally palpated to assess the ovulation rate and silent ovulations.

From the results of the study, (Table 2) it is evident that although no breed differences were found in the number of cows ovulating, significantly less Africanders ($P < 0,01$) displayed overt oestrus during the nine days of observation and that 42% of the Africanders had silent ovulations.

Furthermore, the onset of oestrus after the final progesterone injection was approximately 20 hours later in the Africanders than in the other breeds. The low oestrus response of this breed may, however, partly account for this delay.

Both Sussex and Africander cows displayed significantly shorter heat periods than the Herefords. These figures are somewhat misleading due to the difference in oestrus

Table 2

Duration, distribution and oestrus response of Hereford, Sussex and Africander cows synchronized with progesterone injection

	Breed		
	Hereford	Sussex	Africander
Number observed	20	18	26
Number of oestrus within 216 hr after cessation of progesterone treatment	19 (95,0%)$^{\underline{a}}$	16 (88,9%)$^{\underline{a}}$	12 (46,2%)$^{\underline{b}}$
Number ovulating within 216 hr after cessation of progesterone treatment	19 (95,0%)	17 (94,4%)	23 (88,5%)
Onset of oestrus after cessation of treatment (hrs)	105,4 ± 26,4$^{\underline{a}}$	104, ± 19,1$^{\underline{a}}$	124, ± 32,9$^{\underline{b}}$
Range (hrs)	76 - 172	76 - 132	88 - 176
Duration of oestrus (hrs)	19,4 ±5,4$^{\underline{a}}$	14,1 ±2,7$^{\underline{b}}$	12,4 ±1,8$^{\underline{b}}$
Range (hrs)	12 - 24	12 - 20	4 - 16

$\underline{a}$ $\underline{b}$: Figures having the same superscript are not significantly different from each other.

Present address: Department of Physiology, University of Rhodesia, Mount Pleasant, Salisbury.

behaviour between the British and Africander breeds. In contrast to the British breeds, which aroused interest in the bull (grade 4) for a short time (less than four hours) prior to first standing oestrus, Africanders tended to have a long pro-oestrus which usually terminated in a short, low-intensity oestrus (grade 3 or 2 and sometimes 1). In the Sussex, however, cows were either not in oestrus (grades 4, 5 or 6) or showed intense oestrus (grade 1). Thus at least part of what was recorded as oestrus in the Africander was of a lower intensity than was the case with the British breeds whereas, part of what was not recorded as oestrus in the Africander (viz. the prolonged pro-oestrus) was "included" in the longer heat periods of the Herefords. In addition, while heats of four to eight hours duration were not uncommon in this breed, ten Africander cows (39%) exhibited the pro-oestral signs (grade 4) but never allowed the bull to mate.

The low oestrus response and the general low intensity and duration of oestrus in the Africander suggest that the physiological and endocrinological factors involved in the manifestation of oestrus fluctuate marginally around the threshold for stimulation of oestrus and is therefore easily interfered with. This is confirmed by the 39% Africander cows showing all the pro-oestral signs and ovulation yet they never came into standing oestrus. In contrast to the Africander, the British breeds invariably had a very well defined and intense heat.

The observations on time of ovulation in a sample of ten cows showed that ovulation occurred within 33 ± 3,1 hours after the onset of heat. Although it is suggested that progesterone treatment may reduce the duration of oestrus slightly (Wiltbank, 1965), the recorded time of ovulation fell within the normal limits (Asdell, 1967).

The conclusion to be drawn from the present work is that by using progesterone injections ovulation can be controlled with success in cattle. In the case of the Africander, the physiological mechanisms involved in overt oestrus function slightly above the critical level and this breed is therefore much more labile and easily interfered with than in the British breeds where these mechanisms seem to be more stable. It therefore seems that as in the case of sheep (Robinson, 1967; van der Westhuysen, van Niekerk & Hunter, 1971), reproductive failure following synchronization can be due to factors other than the time and event of ovulation. More knowledge of the control of the ovarian cycle is needed for successful practical application without upsetting the delicate endocrinological balance.

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References

ASDELL, S.A., 1964. Patterns of Mammalian Reproduction, 2nd. edn. London: Constable.

HANSEL, W., 1967. Aust. vet. J. 43, 441.

PARSONS, S.D. & HUNTER, G.L., 1967. J. Reprod. Fert. 14, 71.

ROBINSON, T.J., 1967. The control of the ovarian cycle in sheep. Sydney University Press.

VAN DER WESTHUYSEN, J.M., VAN NIEKERK, C.H. & HUNTER, G.L., 1970. Agroanimalia, 2, 131.

VAN RENSBURG, S.W.J. & DE VOS, H.W., 1962. Onderstepoort J. vet. Res. 29, 55.

WILTBANK, J.N., 1965. Proc. Conf. Estrus Cycle Control in Domestic Animals. Agric. Misc. Publ. No. 1005, p. 58.