Synchronization of oestrus in the Boer goat doe: The response to the use of intravaginal progestagen and PMSG

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The effect of different periods (12, 14, 16 or 18 days) of intravaginal progestagen treatment (MAP) and PMSG (300 IU) on synchronization of oestrus in Boer goat does was investigated. No significant difference in oestrous response, follicular activity, ovulation rate, and time of ovulation was observed between the different periods of intravaginal progestagen treatment. The interval from sponge withdrawal to oestrus was significantly longer in the 14-day ($P<0,01$) and 16-day ($P<0,05$) treatment groups, when compared to the 18-day treatment group. Ovulation occurred in all treatment groups on average 31,0 hours after the onset of oestrus. The mean ovulation rate for all the treatment groups was 1,4 ovulations/doe.
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Die effek van verskillende periodes (12, 14, 16, of 18 dae) van intravaginale progesteroontoediening (MAP) en DMSG (300 IE) op sinkronisasie van die estrussiklus van Boerbokooie, is ondersoek. Met verandering in die periode van progesteroontoediening is geen betekenisvolle verskil gevind in die persentasie ooie wat estrus toon of in follikulêre aktiwiteit, ovulasie tempo en tyd van ovulasie nie. Die interval vanaf sponsonttrekking tot estrus was betekenisvol langer in die 14-dae ($P<0,01$)-en 16-dae ($P<0,05$)-groepe, vergeleke met die 18-dae-groep. Ovulasie het gemiddeld 31,0 uur na die aanvang van estrus plaasgevind. Die gemiddelde aantal ovulasies per ooi, vir al die behandelingsgroepe was 1,4.
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Introduction

Owing to the ever-increasing demand for protein in the world, there has been renewed interest in the contribution of the goat as a source of meat to help alleviate this need. With reproduction as a major contributing factor to the efficiency of meat production, it is of the utmost importance that this facet be exploited to the full, even in the goat. The use of exogenous progestagens in the synchronization of the oestrous cycles in sheep has been extensively investigated (Robinson, 1967; Van der Westhuysen, 1969; Boshoff, 1972; Quirke, 1979; and Botha, 1980). Formal studies on the hormonal control of ovulation in the doe with progestagen are rather limited (Corteel, Mauléon, Thimonier & Ortavant, 1967; Skinner & Hofmeyr, 1969; Van der Westhuysen, 1976; and Bosu, Serna & Barker, 1978).

The object of this investigation was to examine the degree of synchronization, time of ovulation, and ovulation rate in the Boer goat doe following intravaginal progestagen and pregnant mare serum gonadotrophin (PMSG) administration with the aim of achieving optimal conception rates at the synchronized oestrus. In addition the serum progesterone concentrations in the does following hormonal treatments were quantitated to monitor their responses to the exogenous hormones.

Procedure

During May 1981, 32 cycling Boer goat does were randomly allotted to the following four treatment groups. The period of progestagen (medroxy progesterone acetate, 60 mg: Repromap. Upjohn) administration was varied and consisted of therapy for either 12 days (Treatment 1); 14 days (Treatment 2); 16 days (Treatment 3); or 18 days (Treatment 4). Furthermore, all does were injected subcutaneously with 300 IU PMSG (pregnant mare serum — 'Fostim', Upjohn) after sponge withdrawal.

Following sponge withdrawal, all does were tested at 8-hourly intervals for oestrous response with the aid of vasectomized rams. Venous blood (10 ml) was collected at 8-hourly intervals, starting at the time of sponge withdrawal until the end of the subsequent oestrous period or for an observation period of 104 hours. Serum was recovered and stored at $-20°C$ until assayed for serum progesterone concentration by radioimmunoassay (Biodata — code 1884). The procedure followed involved diethyl ether extraction (95,4% recovery), use of a tritiated tracer and polyethyleneglycol precipitation for the separation of bound and free tracer. The anti-sera used had a relative cross reactivity of <0,1% for pregnenolone and <0,001% for cortisol and 17 β-oestradiol.

Inter- and intra-assay coefficients of variation for the assay were 5,8% and 9,0% respectively. To determine the time of ovulation, laparotomies were performed under local anaesthesia ('Planocaine' — Maybaker) on all does exhibiting oestrus, 24 hours after the onset of oestrus and again at 8-hourly intervals until the doe had ovulated. Follicular activity was measured in terms of the number and size of follicles larger than 0,2 cm in diameter at the time of the laparotomy in each doe. The time of ovulation was determined by the age of the ovulation point, relative to the time of laparotomy.

The interval from sponge withdrawal to onset of oestrus, the time of ovulation relative to the onset of oestrus, follicular activity, and the accompanying serum progesterone concentration were determined following progestagen and PMSG treatment for the different treatment groups.
All data were analysed statistically.

Results

The oestrous response (percentage does showing oestrus), ovarian response (as estimated by the follicular activity), and serum progesterone concentration, following the different intervals of intravaginal progestagen treatment are presented in Tables 1 and 2. Figure 1 shows the oestrous response of the different treatment groups.

The oestrous response in the different treatment groups did not differ significantly. There was however a significant difference in the time from cessation of treatment to the onset of oestrus in the four treatment groups, with the 18-day progestagen group's time to respond significantly shorter than the 16-day ($P<0,05$) and the 14-day ($P<0,01$) progestagen treatment groups.

No significant differences in the time of ovulation and ovulation rate were found between the different treatment groups. The mean time of ovulation relative to the onset of oestrus for the different subgroups was 31,0 hours (range 26,0 – 48,5 hours), with the mean duration of the oestrous period in the Boer goat being 37,5 hours (Greyling, unpublished data). This implies that ovulation occurred approximately 6,5 hours prior to the end of oestrus in this experiment. No significant difference in the follicular activity was found for the different treatment groups. When data on follicular activity for the four treatment groups were pooled for does exhibiting oestrus only or does in oestrus and ovulating, the correlation coefficient (r) between bodymass and follicular activity (number of follicles > 0,2cm) was 0,09 and 0,23 respectively and was not significant. The mean serum progesterone concentration remained low from sponge withdrawal to the end of the observation period (0,31 – 0,85 ng/ml) and no significant changes relative to oestrus were observed between the different periods of progestagen treatment.

Discussion

The effective synchronization of oestrus by means of progestagen has been employed mainly in the dairy goat

Table 1 The effect of a 12, 14, 16, or 18-day intravaginal progestagen followed by 300 IU PMSG treatment on the oestrous response in Boer goat does.

	Duration of progestagen treatment (days)			
Item	12	14	16	18
No does	8	8	8	8
No does exhibiting oestrus	7	8	7	5
Oestrous response, %	87,5[a]	100,0[a]	87,5[a]	62,5[a]
Interval (hours) from cessation of treatment to onset of oestrus (mean ± S.D.)	63 ± 19[a]	81 ± 17[b]	74 ± 18[b]	52 ± 15[a]
Range, hours	46 – 101	54 – 101	54 – 101	30 – 70

[a,b]Figures having the same superscript in the body of the table are not significantly different from each other.

Table 2 The time of ovulation, ovulation rate, follicular activity, and mean serum progesterone concentration at the onset of oestrus, following treatment with progestagen for 12, 14, 16, or 18 days and 300 IU PMSG at sponge withdrawal.

	Duration of progestagen treatment (days)			
Item	12	14	16	18
Time of ovulation relative to onset of oestrus, hours	30,8 ± 2,8	29,6 ± 7,2	33,6 ± 10,4	29,8 ± 3,4
Range, hours	26,0 – 32,8	26,0 – 42,5	26,0 – 48,5	25,5 – 32,5
Mean ovulation rate (No of ovulations/doe ovulating)	1,4 ± 0,9	1,5 ± 0,6	1,4 ± 0,6	1,25 ± 0,5
No. follicles > 0,2cm at time of ovulation	5,7 ± 1,4	5,1 ± 2,0	4,9 ± 1,7	5,8 ± 1,6
Mean serum progesterone concentration at onset of oestrus, ng/ml	0,37 ± 0,11	0,34 ± 0,07	0,32 ± 0,01	0,34 ± 0,19
Range of mean serum progesterone concentrations for the observation period, ng/ml	0,36 – 0,6	0,32 – 0,72	0,31 – 0,52	0,34 – 0,85
Does ovulating per does showing oestrus, %	71,4	62,5	57,1	80,0

Values in the body of the table are mean ± SD

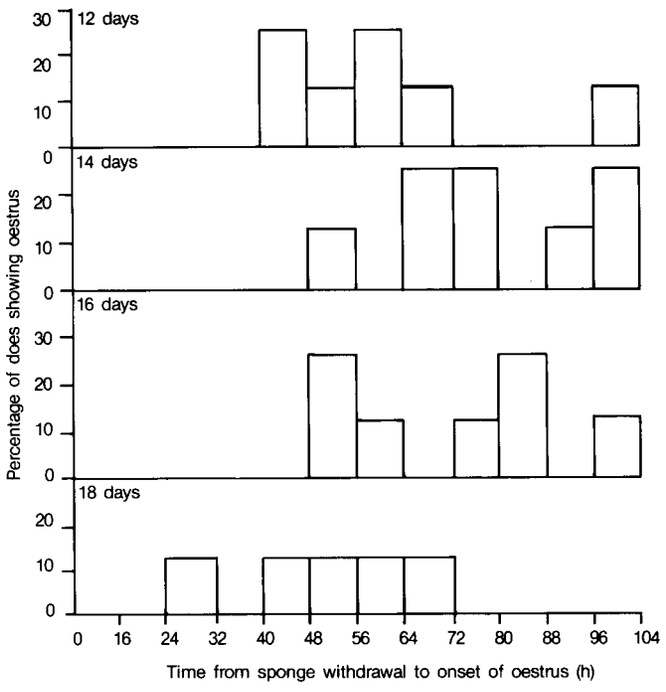

Figure 1 The oestrous response in Boer goat does to a 12, 14, 16 or 18-day progestagen treatment with 300 IU PMSG at sponge withdrawal.

(Barker, 1966; Corteel, 1975). The results of the present study in which intravaginal sponges impregnated with medroxy progesterone acetate were used in the synchronization of oestrus in the Boer goat, indicate that it is a highly efficient synchronizing agent. Although sheep have shorter oestrous cycles (van Rensburg, 1974) than the Boer goat (Hofmeyr, Joubert, Badenhorst & Steyn, 1966), an increase in the treatment period from 12 to 18 days had no significant effect on oestrous response, follicular activity, ovulation rate, or serum progesterone concentration at the subsequent oestrous period and thus the effectiveness of the intravaginal sponge. There was however a significant difference in the time from sponge withdrawal to the onset of oestrus for the different treatment groups, with no definite trend being observed. The 14- and 16-day intravaginal progestagen treatment resulted in a significant ($P < 0,01$ and $P < 0,05$ respectively) delayed incidence of oestrus when compared to the 18-day treatment group. The mean interval from cessation of treatment to the onset of oestrus experienced in this experiment (67,6 hours) was much longer than the expected peak period of oestrus of between 16 to 48 hours (Bongso, Fatimah & Dass, 1982). According to Corteel (1977), fertility levels following intravaginal progestagen sponges (FGA) in goats favour a longer rather than a shorter treatment period. For example, in does treated shortly after ovulation, longer treatments might be needed to avoid overlapping of the long luteal phase (Thorburn & Schneider, 1972) beyond the duration of treatment. The shorter treatment with progestagen would lead to a delayed onset of oestrus in the post treatment period. Further the administration of 400 IU PMSG at sponge withdrawal, proved to be necessary to enhance fertility following AI at a fixed time by inducing a tighter synchronization of oestrus (Corteel, 1977).

Nalbandov (1964) suggested that ovulation in the goat occurs between 9 and 19 hours after the onset of oestrus, while Salama (1972) reported ovulation to occur at about 27 hours following the onset of oestrus. In the Boer goat, ovulation occurred approximately 31,0 hours after the onset of oestrus in the synchronized oestrus and 6,5 hours prior to the end of the oestrous period. The mean ovulation rate in this study on the Boer goat averaged 1,4 ovulations per doe ovulating, with a correlation coefficient of 0,43 (non-significant) between the bodymass and the ovulation rate for does exhibiting oestrus and ovulating. Rao & Bhattacharyya (1980) reported an ovulation rate of 4,0 in the Black Bengal nanny goat, compared to 1,2 in the Angora (Shelton, 1960), 1,28 in the Norwegian goat (Lyngset, 1968), and 1,4 in Barbari goats (Bhattacharyya & Prasad, 1974). An ovulation rate of 4,8 has been reported in the Boer goat, using 750 IU PMSG (Van Rensburg, 1964).

The mean serum progesterone concentration during the observation period following intravaginal progestagen treatment for different periods (12 – 18 days) remained relatively low, varying between 0,31 and 0,85 ng/ml with a mean serum progesterone concentration of 0,34 ng/ml at the onset of oestrus for all the treatment groups. This compare well with the value of 0,2 ng/ml at oestrus published by Thorburn & Schneider (1972). These low progesterone levels following sponge withdrawal demonstrate the efficiency of the progestagen, after different intervals of administration for controlling oestrus in the goat.

It would thus seem that period of intravaginal progestagen administration in the synchronization of oestrus in the Boer goat is effective from 12 – 18 days and the conventional practice of a 14-day intravaginal treatment, as in sheep, is applicable here.

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