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EFFECT ON THE FERTILITY OF "BARREN" OR EARLY POST-PARTUM KARAKUL EWES OF OESTRUS SYNCHRONIZATION AND VARIOUS LEVELS OF PMSG WITHIN AND OUTSIDE THE NORMAL BREEDING SEASON

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OPSOMMING: INVLOED VAN ESTRUSSINCHRONISASIE EN VERSKILLENDE VLAKKE VAN DMS OP DIE VRUGBAARHEID VAN GUS- OF VROEË *POST-PARTUM* KARAKOELOOIE BINNE EN BUITE DIE NORMALE TEELSEISOEN.

Agt-en-sewentig gus- of vroeë *post-partum* Karakoelooie is gebruik. Die tyd vanaf progestageen-sponsonttrekking tot estrus was korter binne as buite die teelseisoen en by albei seisoene het D.M.S. 'n hoogs betekenisvolle liniêre verkorting in die periode meegebring. Die estrusreaksie na sinchronisasie wat 100 % binne en omtrent 90 % buite die teelseisoen en D.M.S. het geen invloed gehad nie. D.M.S. het egter 'n neiging om die periode waarin estrus by 'n groep diere voorgekom het, in te kort. Die persentasie ooie wat gelam het is bevredigend indien gusooie gesinchroniseer word. Dit is egter laag wanneer sinchronisasie 20 dae *post-partum* begin het. Die rede is moontlik dat teen daardie tyd volledige involusie van die baarmoeder nog nie plaasgevind het nie en dit word voorgestel dat sinchronisasie nie voor 28 dae *post-partum* moet begin nie. D.M.S. het geen invloed op die parameter gehad nie. D.M.S. het die aantal meerlinggeboortes beide binne sowel as buite die teelseisoen verhoog. Vir maksimum tweelinge word voorgestel dat 250 I.E. D.M.S. binne en 500 I.E. D.M.S buite die teelseisoen 30 uur voor sponsonttrekking toegedien moet word. Binne-baarmoederbehandelings van òf estrogeen òf kortisol by *post-partum* ooie, het geen uitwerking op bostaande waarnemings gehad nie.

SUMMARY

Seventy eight "barren" (ewes which were not pregnant prior to treatment) or early *post-partum* Karakul ewes were used. The interval from progestagen sponge withdrawal to oestrus was shorter within than outside of the breeding season and in both seasons increasing levels of PMSG caused a highly significant linear decrease in this interval. The oestrus response after synchronization was 100 % within and not less than 88 % without the breeding season with PMSG having no apparent effect. However, PMSG had a tendency to decrease the range of time during which ewes in a group commenced oestrus. The percentage of ewes which lambed was satisfactory when ewes were "barren" prior to synchronization. It was, however, low when synchronization commenced 20 days *post-partum*, the reason probably being that uterine involution was not complete and it is suggested that it should not commence before at least 28 days *post-partum*. PMSG increased the number of multiple births both within and without the breeding season. For a maximum twinning rate it is suggested that 250 I.U. PMSG within and 500 I.U. PMSG without the breeding season should be administered 30 hours before sponge withdrawal. Intra-uterine treatments with oestrogen or cortisol in *post-partum* ewes had no effect on any of the above observations.

Increased lambing frequency and multiple births have definite advantages to the Karakul farmer. However, to increase lambing frequency the ewes must be mated as soon as possible after they have lambed which means that mating has to take place both within and outside of the normal breeding season (Hunter, 1968). On the other hand, although there is doubt that there is a lactation anoestrus (Hunter, 1971), the Karakul lamb is usually removed soon after birth which removes any lactational strain from the ewe.

Multiple births can be induced in the Karakul ewe by administration of PMSG (Boshoff, 1972). However, the optimum lambing rate appears to be twins, as larger numbers are associated with smaller, lower quality pels (Blom, 1967). It is necessary therefore to determine the amount of PMSG required to induce twinning.

In this experiment we examined the effects of synchronization, different levels of PMSG and various intra-uterine treatments on the fertility of "barren" (ewes which were not pregnant prior to the treatments) and early *post-partum* Karakul ewes both within and without the normal breeding season.

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Procedure

Ninety six Karakul ewes, 15 of which were two or four tooth, and the others adult animals, were divided by mass into four groups of 24 each. They were kept in small cement floored camps with available shade and water and were fed a maintenance ration with additional feed from four weeks before parturition until three weeks after the following insemination, as suggested by Klein (1972).

The experiment took the form of three consecutive periods of oestrus synchronization (two in and one outside of the breeding season) during which different levels of PMSG were used. In addition prior to two of the periods intra-uterine hormonal treatments were administered.

Synchronization Period 1 (P_1 = May i e. inside the breeding season).

For various reasons, the groups did not have their full complement of animals by the time the actual experiment commenced.

On day 0 intravaginal medroxy-progesterone acetate-impregnated sponges (MAP, Upjohn) were inserted into all the ewes after an intravaginal injection of 2 ml 5 % w/v dehydrostreptomycin (AGAVIN, Maybaker). On day 12 (30 hours before sponge withdrawal) the following international units of PMSG (Upjohn) were administered intramuscularly: 0; 250; 500 and 750 to groups 1; 2; 3 and 4 respectively. On day 13 the sponges were removed and immediately thereafter active raddled vasectomized rams were joined with the ewes to detect oestrus. Three rams were put with each pen of about 15 ewes and were changed periodically from pen to pen to ensure optimum activity. The time that each ewe came onto heat was recorded.

Twelve hours after the commencement of oestrus the animals were inseminated artificially and again 12 hours later. Only animals which were on heat after a further 12 hours were inseminated a third time. In addition all the animals were inseminated at 48 and again at 60 hours after sponge withdrawal in order to fertilize any animals with silent obulations (Van Niekerk & Belonje, 1970). The date of lambing was recorded as well as the number of lambs born per ewe. The lambs were allowed to suckle for 24 hours after which they were removed and the ewes entered synchronization Period 2.

Synchronization Period 2 (P_2 = November i.e. outside the breeding season)

Twenty four hours after lambing the ewes within each group were divided at random into three subgroups and treated intra-uterine as follows:

Subgroup A: 2 mg estradio cypionate (ECP, Upjohn)
Subgroup B: 1 mg flumethasone (FLUVET, Syntex)
Subgroup C: No hormonal treatment

In addition all ewes received an intra-uterine injection of 500 000 units penicillin and 500 mg streptomycin.

Twenty days *post-partum* an intravaginal progestagen sponge was once again inserted into each ewe. As lambing had spread over five days this treatment was also spread over the same period but, as all the sponges were removed on the same day, the ewes carried the sponges for between 10 and 14 days. Ewes which had not conceived during Period 1 ("barren" ewes) were not treated intra-uterine but intravaginal sponges were inserted into all of them on the first day of synchronization Period 2.

Thirty hours before sponge removal the animals in groups 1; 2; 3 and 4 once again received 0; 250; 500 and 750 I.U. PMSG intramuscularly as before After sponge removal the same oestrus detection, insemination and lambing procedure was used as in Period 1. After the ewes lambed down they entered synchronization Period 3.

Synchronization Period 3 (P_3 - May i.e. inside the breeding season).

The same procedure of intra-uterine treatments and synchronization was followed as described under Period 2.

The data were analysed using statistical methods described by Snedecor & Cochran (1967).

Results and discussion

Interval from sponge withdrawal to oestrus (Table 1).

Table 1.

Oestrus response after synchronization and treatment with different levels of PMSG

	PERIOD 1 (P1) May – Oct. 1969				PERIOD 2 (P2) Nov. 1969 – April 1970				PERIOD 3 (P3) May – Oct. 1970			
PMSG treatment I.U.	0	250	500	750	0	250	500	750	0	250	500	750
Number of ewes per group	19	22	20	17	19	18	19	19	19	19	19	19
Number of ewes in oestrus (%)	19 (100)	22 (100)	20 (100)	17 (100)	17 (89,5)	16 (88,9)	18 (94,7)	17 (89,5)	19 (100)	19 (100)	19 (100)	19 (100)
Mean time from sponge withdrawal to commencement of oestrus (range in hrs)	68,42 (39 - 113)	50,36 (29 - 111)	51,90 (18 - 88)	39,82 (21 - 74)	93,65 (73 - 145)	60,06 (30 - 76)	50,94 (23 - 110)	34,25 (23 - 62)	61,26 (37 - 157)	39,84 (19 - 82)	34,89 (21 - 86)	26,84 (17 - 45)

As neither the intra-uterine treatments, nor whether the ewes were "barren" or in the early *post-partum* period prior to synchronization, had any measurable effect on this interval, the data were pooled for further analyses.

The administration of PMSG shortened this interval ($P < 0,01$) as found also by Robinson (1961), Holst (1969) and Boshoff (1972). In fact, there was a highly significant linear correlation ($P < 0,01$) between increasing levels of PMSG and the shortening of this interval which agrees with work by Boshoff (1972). According to the regression coefficient each increase of 250 I.U. PMSG led to a decrease of 8,3 h and 10,8 h within the two breeding seasons (P_1 and P_3 respectively) and 20,1 h outside the breeding season (P_2).

Furthermore it was found that this interval was highly significantly shorter ($P < 0,01$) within than outside of the breeding season although there was a significant interaction ($P < 0,05$) between season and PMSG administration. This also agrees with similar work by Boshoff (1972).

As this interval is associated closely with the interval from sponge withdrawal to ovulation these findings demonstrate that factors such as season and level of PMSG must be taken into consideration particularly if inseminations are to be done without regard to individual oestrous observations as suggested by Van Niekerk & Belonje (1970).

Oestrus response (Table 1)

The intra-uterine treatments had no effect on this parameter. Within the two breeding seasons (P_1 and P_3) all the ewes came on heat while outside the breeding season (P_2) not less than 88 % came on heat and increasing doses of PMSG did not affect this percentage. It is evident that in this experiment at least synchronization with or without PMSG was effective in stimulating an oestrus response.

In all three periods there was a tendency for increasing levels of PMSG to decrease the range of time during which the groups of animals commenced oestrus. This is particularly noticeable in the 750 I.U. PMSG group.

Percentage of ewes which lambed (Table 2)

These percentages are calculated from ewes which lambed after being inseminated at only the first post-synchronization oestrus
The percentages during Period 1 are therefore considered satisfactory and no effect of PMSG was evident.

During the other two periods (P_2 and P_3) it is obvious that the low total percentage is due mainly to the ewes which were synchronized during the early *post-partum* period. The reason for this lowered fertility may be that synchronization commenced 20 days *post-partum* while it has been subsequently shown by Van Wyk, Van Niekerk & Belonje (1972) that uterine involution in the sheep is completed only by 28 days; a process which is not hastened by the same intra-uterine treatments as were used in this experiment (Van Wyk, Van Niekerk & Hunter, 1972), For these reasons, then, it is suggested that post-partum synchronization should commence no earlier than 28 days after the ewe has lambed.

Table 2.

The lambing results after synchronization and treatment with different levels of PMSG.

	PERIOD 1 (P1) May 1969 – Oct. 1969				PERIOD 2 (P2) Nov. 1969 – April 1970				PERIOD 3 (P3) April 1970 – Oct. 1970			
PMSG treatment (I.U.)	0	250	500	750	0	250	500	750	0	250	500	750
Number of ewes inseminated	19	22	20	17	B = 9 P = 10 T = 19	B = 4 P = 14 T = 18	B = 8 P = 11 T = 19	B = 7 P = 12 T = 19	B = 13 P = 6 T = 19	B = 13 P = 6 T = 19	B = 10 P = 9 T = 19	B = 12 P = 7 T = 19
Number of ewes which lambed (%)	12 (63)	17 (77)	12 (60)	12 (71)	B = 3 (33) P = 4 (40) T = 7 (37)	B = 4 (100) P = 2 (14) T = 6 (33)	B = 6 (75) P = 3 (27) T = 9 (47)	B = 4 (57) P = 3 (25) T = 7 (37)	B = 7 (54) P = 2 (33) T = 9 (47)	B = 8 (62) P = 1 (17) T = 9 (47)	B = 7 (70) P = 3 (33) T = 10 (53)	B = 9 (75) P = 5 (71) T = 14 (74)
Number of ewes with:												
Singles	10	9	5	3	7	6	5	2	8	4	3	4
Twins	2	7	5	5	-	–	3	1	1	5	7	7
Triplets	–	1	2	3	–	–	1	2	–	–	–	3
More (no of lambs)	–	–	–	1(5)		–	–	1(4)1(6)		–	–	–
Total number of lambs	14	26	21	27	7	6	14	20	10	14	17	27
Number of lambs as % of total ewes	74	118	105	159	37	33	74	105	53	74	89	142
Number of lambs as % of ewes which lambed	117	153	175	225	100	100	156	236	111	156	170	193

B = "Barren" ewes i.e. those ewes which were not pregnant during the previous period.
P = Early *post-partum* ewes.
T = Total number of ewes.

Lamb crop (Table 2)

Neither the intra-uterine treatments nor whether the ewe had been "barren" or in the early *post-partum* period, had any effect on the lamb crop

Increasing levels of PMSG resulted in a highly significant ($P<0,01$) linear increase in the number of lambs per ewe during all three periods. Furthermore, these was no significant seasonal difference between the number of lambs per ewe. However, there was a significant ($P<0,05$) interaction between season and the level of PMSG in this parameter, possibly as a result of the lack of multiple births in the 0 and 250 I.U. PMSG groups in P_2.

If one expresses the number of lambs as a percentage of the number of ewes inseminated the effect of season and lowered *post-partum* fertility (P_2 vs P_1 and P_3) and merely lowered *post-partum* fertility (P_3 vs P_1) is noticeable. However, if the number of lambs is expressed as a percentage of the number of ewes which actually lambed then there is little difference between the three periods.

From all these results it would appear that after the synchronization of oestrus, the oestrus response is slightly lower outside of the breeding season, but those animals which do conceive are as fertile as animals treated within the breeding season. The response to increasing levels of PMSG followed a similar trend.

For good pelt production there is a limit to the number of lambs born to each ewe and, in fact, the optimum would appear to be twins. For this reason it is inadvisable to use high levels of PMSG and although the number of animals in this experiment is limited and the results perhaps confounded by "barren" and *post-partum* ewes in the groups, it would appear that levels of 250 I.U. PMSG during the breeding season and 500 I.U. PMSG outside of the breeding season should not be exceeded.

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