

SYNCHRONISATION OF OESTRUS IN SHEEP EARLY IN THE BREEDING SEASON: THE VAGINAL ENVIRONMENT AND FERTILITY

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OPSOMMING: SINKRONISASIE VAN OESTRUS BY SKAPE VROEG IN DIE TEELSEISOEN: DIE VAGINALE OMGEWING EN VRUGBAARHEID

'n Ondersoek na die effek van dihidrostreptomysien setpille saam met fluorogestoon-asetaat geïmpregneerde intravaginale (FGA) sponse op sinkronisasie van oestrus en ovulasie is vroeg in die teelseisoen op tweehonderd-en-agt Dormer ooie uitgevoer. Hierbenewens is die vaginale omgewing en flora ondersoek. Alhoewel die sinkronisasie van oestrus goed was, het slegs 70% van die ooie oestrus getoon, waarvan 42% nie beset geraak het nie. Maagdelike ooie het baie swakker gereageer op die behandeling as volwasse ooie (Tabel 2) en slegs 50% het oestrus getoon vs. 81% vir volwasse ooie. Die vaginale pH van ooie met FGA sponsies behandel was normaal en die bakteriese kontaminasie van die cervikale slym was oorheersend van 'n nie-heemolitiese, nie-patogene, coliform oorsprong. Alhoewel die gebruik van antibiotiese setpille nie die voorkoms van oestrus of die persentasie ooie beset verhoog het nie, het die hoër persentasie tweeling, as gevolg van hierdie behandeling, tot gevolg gehad dat meer lammers gebore is per ooi wat lam (1,41 vs 1,26; $P < 0,05$) (Tabel 1). Dit word vermoed dat die antibiotikum voordelig was vir sperm oorlewing in die genitale gang van die ooi. Toetsing vir bronstige ooie twee maal per dag in plaas van een maal het tot gevolg gehad dat 13% meer bronstige ooie gevind is, terwyl dekking twee maal gedurende oestrus in plaas van een maal die persentasie ooie beset en lampersentasie met 6% en 20% respektiewelik verhoog het.

SUMMARY

Two hundred and eight Dormer ewes were included in an investigation into the effect on ewe fertility of dihydrostreptomycin antibiotic pessaries used with fluorogestone acetate-impregnated intravaginal (FGA) sponges for the synchronisation of oestrus and ovulation early in the breeding season. In addition, the vaginal environment and flora were investigated. Although synchronisation was good, only 70% of the ewes exhibited oestrus and of these 42% failed to conceive. Maiden ewes had a lower oestrous response (50% cf. 81%), but conceived as well as mature ewes. Although the use of antibiotic pessaries did not improve oestrous response or conception rate, as a result of a higher twinning rate following this treatment, more lambs were born per ewe lambing (1,41 cf. 1,26; $P < 0,05$). It is suggested that the antibiotic pessaries were beneficial to sperm survival in the genital tract of the ewe.

During the first successful oestrus synchronisation trial using fluorogestone acetate-impregnated (FGA) sponges (Synchro-mate: G.D. Searle & Co.), Robinson (1964) noticed the accumulation of mucus in the vagina due to the physical presence of these sponges. This finding has been generally confirmed and the mucus has been shown to be a good medium for bacterial growth (Robinson, 1964; Moore & Robinson, 1967; Wishart, 1967; Barker, 1968). Although fertility is low following other methods of application of progestagen, changes in the vaginal environment as a result of the insertion of sponges may be a factor specific to this method of progestagen administration. This experiment was therefore designed to explore this aspect and also the practicability of handling large numbers of synchronised ewes.

Procedure

Two hundred and eight healthy Dormer Stud ewes, ranging from maidens to old multiparous ewes, were available. At the beginning of the breeding season, the ewes were randomly allotted to two treatment groups, balanced with respect to age. On October 27 (group I) and October 30 (group II), FGA sponges were introduced intravaginally into all ewes, half of which (groups IA and IIA) also carried a dihydrostreptomycin pessary (Solcon, Maybaker)

cranial to the sponge. Immediately prior to the insertion of these sponges, bacterial swabs were taken from the vaginas of eight randomly selected ewes from each of groups IA and IB. This was done by opening the vulva to avoid contamination and introducing sterile swabs about six inches into the vagina. The staggering of the two groups was intended to preclude "overwork" of the rams following sponge withdrawal 15 days later (i.e. at 1400h on November 11 and 14 respectively). Immediately after sponge removal, and also two days later, bacterial swabs were again taken from the vaginas of the same 16 ewes. The cultured both aerobically and anaerobically on blood agar and later identified according to Breed, Murray & Smith (1957). The approximate vaginal pH of all ewes in groups IIA and IIB was measured immediately after sponge withdrawal by dabbing the removed sponges on wide range pH paper.

From a large proportion of virgin ewes the sponges had to be removed by means of forceps. Physical trauma to the hymenal region during insertion may have resulted in cicatrix formation and partial occlusion of the vagina. Both insertion and removal of the sponges in these ewes must have been painful and their use seems to be contraindicated in the maiden ewe.

Commencing the morning after the sponges had been

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Table 1

The oestrous response and lambing performance of ewes treated with fluorogestone acetate-impregnated (FGA) sponges for 15 days early in the breeding season
(Groups IA & IIA: Treated with antibiotics. Groups IB & IIB: No antibiotic treatment)

(a) Oestrous response

Treatment group	1-6 Days after sponge removal			16-24 Days after sponge removal				Overall Response	
	No. of ewes	No. of ewes served	% of Total	No. ewes served	First Service	Return to service	% of Total served	Total ewes Served	% of Total
IA & IIA	103	69	66,99	36	16	20	28,99	89	86,40
IB & IIB	104	78	75,00	30	88	22	28,21	89	85,58
	207	147	70,53	66	24	42	28,57	178	85,99

(b) Lambing data

Treatment group	Ewes conceiving 1-6 days after sponge removal					Ewes conceiving 16-24 days after sponge removal					Overall data		
	Ewes served	Ewes lambled	C.R. %	Lambs born	Lambs/ewes Lambing	Ewes served	Ewes lambled	C.R. %	Lambs born	Lambs/ewes	Total ewes served	Total lambled	C.R. %
IA & IIA	69	39	56,52	55	1,41*	36	28	77,78	41	1,46	89	69	77,53
IB & IIB	78	46	58,97	58	1,26*	30	19	63,33	22	1,16	89	68	76,40
	147	85	57,82	113	1,33	66	47	71,21	63	1,32	178	137	76,97

* P < 0.05

C.R. = Conception rate

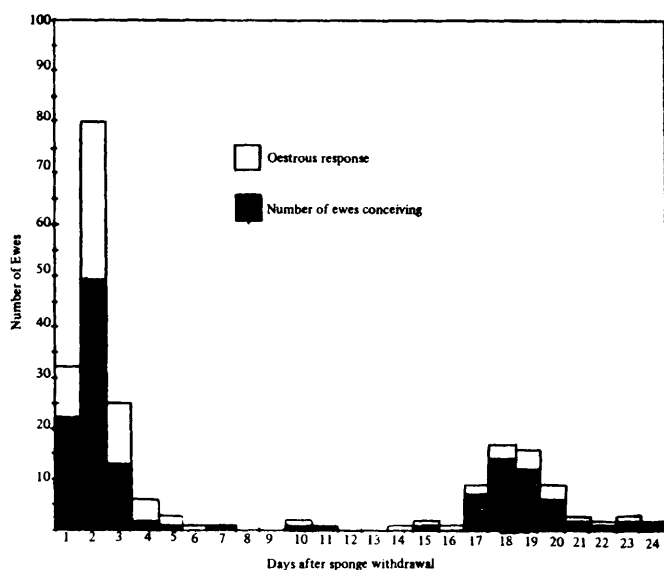


Fig. 1. — Oestrus response and conception of ewes after fluorogestone acetate (FGA) treatment for 15 days early in the breeding season

removed, the ewes in group I were teased once daily with five vasectomised rams. The rams of proven fertility were used each morning to serve the ewes on heat. Due to some short oestrous periods observed during the teasing and mating of group I, it was decided to tease the second group twice daily (0800h and 1600h). Ewes were mated as soon as they were found on heat and again each morning as long as they remained on heat. For the second post-treatment cycle all ewes, pooled into a single group, were teased and served once daily in order to mate those ewes which had not conceived at the first cycle. After mating and until two weeks prior to lambing, the ewes were kept on a lupin and oats stubblefield after which they were transferred to lucerne lands until they had all lambled. The Chi-square test was used for statistical analyses of the data of this experiment.

Results

Of the 208 ewes, one lost its sponge during the treatment period and was withdrawn. The oestrous response and lambing performance are presented in Figure 1 and Table 1. From these results it is apparent that the antibiotic treatment had no significant effect on oestrous response or conception rate. The antibiotic treated ewes, however, had a significantly higher lambing rate than the ewes with FGA sponges only (P < 0,05). Although the conception rate of maiden ewes was a little higher than multiparous ewes (P < 0,25) the latter group had a greater

Table 2

A comparison between the breeding performance of maiden and multiparous ewes treated with fluorogestone acetate-impregnated (FGA) sponges early in the breeding season.

	First Cycle					Overall response					
	No. of ewes	Ewes served	% of Total	Ewes lambed	C.R. %	No. ewes served	% of total	No. ewes lambed	C.R. %	No. of lambs	Lambs/ewe lambing
Multiparous ewes	141	114	81,43**	64	56,14	135	94,74**	103	76,29	152	1,46**
Maiden ewes	66	33	50,00**	21	63,64	43	65,15**	34	79,07	36	1,06**
	207	147	70,53	85	57,82	178	86,00	137	76,97	188	1,36

** P<0,01

C.R. = Conception rate

oestrous response and lambing rate (P<0,01) Table 2). Attention should be drawn to the fact that between one and four days after sponge withdrawal, conception rate tended to decrease (Table 3). However, no relationship could be found between body weight and the onset of oestrus. The effects of teasing and mating frequencies on the number of ewes in oestrus and on conception and lambing rates, are presented in Table 4.

Table 3

The conception rate of ewes coming on heat from day 1 to day 4 after FGA sponge withdrawal

	Days after sponge withdrawal			
	1	2	3	4
Number of ewes on heat	32	80	25	6
Number of ewes conceiving	22	49	13	2
Conception rate (%)	68,8	61,3	52,0	33,3

Table 4

The oestrous response, conception rate and lambing rate of ewes teased once or twice daily and mated once or twice during oestrus treatment

	Frequency	
	Once (%)	Twice (%)
1. Oestrous response – teased once or twice daily	65,69	78,64*
2. Conception rate – mated once or twice during oestrus	56,12	62,00
3. Lambing rate – mated once or twice during oestrus	74,43	92,00**

* P<0,05

** P<0,01

Teasing twice instead of once daily in a significant increase in the number of ewes found in oestrus (P<0,05) while lambing rates, but not conception rates, were improved by mating twice. Sponge removed from ewes not carrying antibiotic pessaries were accompanied by 3–5 ml of a greyish, highly odiferous fluid, while those with antibiotic pessaries had a similar quantity of viscous somewhat cloudy, sweetsmelling mucus. The pH of the cervical mucus of antibiotic-treated ewes was higher than the mucus of untreated ewes (P<0,01) (Table 5), but had no effect on conception rate.

Table 5

The vaginal pH of ewes treated with progestagen impregnated sponges with an antibiotic (Group A), or without an antibiotic (Group B)

	Groups	
	A	B
Mean vaginal pH	7,15 ± 0,19**	6,90 ± 0,23**
Range	6,4 – 7,6	6,4 – 7,6

(**P < 0,01)

Although no bacterial counts were made, the types of bacterial which were isolated from the cultures of the vaginal swabs showed only random variation between treatment groups and between the three sampling periods. The non-specific, non-pathogenic and non-haemolytic coliform bacterial were found in all cultures, followed by *corynebacterium spp.* (mainly *Corynebacterium pyogenes*). The vaginas of these ewes never appeared infected and were clinically normal two days after sponge removal.

Discussion

The use of FGA sponges early in the breeding season provided somewhat disappointing results. Seventy per cent of the ewes exhibited oestrus at the first post-

treatment cycle and of these 42% failed to conceive. The low oestrous response, especially amongst maiden ewes (Table 2) probably resulted from the high incidence of silent ovulations and short heat periods early in the breeding season (Radford & Watson, 1955; Glimp, 1967; Healey & Eastoe, 1967; Moore & Robinson, 1967; Shelton & Moore, 1967). The previous lambing history of this stud also indicated that the maiden ewes had a shorter active breeding season and invariably showed their first fertile oestrus later in the breeding season. The decrease in fertility from day 1 to day 4 after sponge removal (Table 3), and the low oestrous response, suggest that a degree of endocrine imbalance had occurred between progesterone and oestrogens, both of which are involved in the manifestation of oestrous behaviour. The dosage of progestagen may have been inadequate considering the annual rhythmic change of the sensitivity of the ewe to progesterone (Lamond, 1964). Robinson (1967) states that a progesterone-oestrogen regime adequate for the production of oestrous behaviour in autumn, (the normal breeding season) is inadequate in spring. This and the seasonal decline in gonadotropin content and secretion of the anterior pituitary (Lamond, 1960) can possibly account for the low oestrous response and conception rate. During the second post-treatment cycle, however, conception rate was about 13% higher ($P < 0.07$).

The fact that teasing twice daily increased the number of ewes found in oestrus by 13%, suggests that at this stage in the breeding season a significant number of ewes have short heat periods. Two services during oestrus gave a 21% higher lambing rate compared with ewes mated once, due to a higher twinning rate.

Both in this experiment and in that of Moore & Robinson (1967) the use of antibiotics had no effect on oestrous response, conception rate (Table 1) or vaginal flora. On the other hand it increased lambing rate by 15%, due to a higher twinning rate. This finding may be due to increased fertilization of the second (twinning) ovulation as a result of a more favourable vaginal environment for increased survival, longevity and fertilizing capacity of the spermatozoa. Bush, Ludwick, Ferguson & Ely (1950) showed a correlation between the bacterial count (*Corynebacterium pyogenes*) of semen diluted for artificial insemination and fertility in cattle, while the beneficial effects on fertility of the inclusion of antibiotics in such semen has been shown by various workers (Foote & Bratton, 1950; Almquist, 1951; Steward, Melrose & Wilson, 1951). Thus, although Moore, Quinlivan, Robinson & Smith (1967) found that the accumulated mucus present after sponge removal had no effect on the motility of the spermatozoa, the possible effect of bacterial contamination on the fertility and sperm survival cannot be totally excluded. It is of interest that the presence of antibiotic pessaries changed the pH of the vagina and cervical mucus, but this had no effect on conception rate as the range fell within the normal buffering power of the seminal plasma (Asdell, 1946). The vaginal pH (6.9) of ewes treated with FGA sponges only, was normal (Asdell, 1946).

It is concluded that the major cause for lowered fertility after the use of FGA sponges must be the result of some endocrine disturbance, possibly affecting semen transport (Quinlivan & Robinson, 1967), the oestrous-ovulation relationship of fertilization. Nevertheless, some benefit can be derived from the use of antibiotic pessaries with FGA sponges. They appear to increase fecundity, perhaps through improved sperm survival and/or fertilization rate resulting from a more favourable vaginal environment.

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