

The effectiveness of medroxyprogesterone acetate (MAP) in synchronizing oestrus and its influence on lambing rate and litter size in crossbred ewes

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SUMMARY

Oestrus was synchronized in crossbred ewes (Djallonke × Sahel F₂ generation) on the Ghana Government /UNDP/FAO Sheep and Goat Project Farm at Ejura. Medroxyprogesterone acetate (MAP), 60 mg, was applied in an antibiotic-treated intravaginal sponge and allowed to remain for 14 days. Pregnant mare serum gonadotropin (PMSG; 500 I.U.) was injected intramuscularly in one group of ewes on the day of sponge withdrawal. A control group (D) had no treatment. The progestagen was effective in synchronizing oestrus and resulted in a compact batch lambing interval. PMSG shortened the interval between sponge withdrawal and the onset of oestrus. It also increased the incidence of multiple births. About 80 per cent of animals in MAP treated groups exhibited oestrus within a three-day period as compared to 33 per cent in the control group and the difference was significant ($P < 0.01$). About 90 per cent of animals in the treated groups lambed within a 6-day period as opposed to 45 per cent in the control group. The difference was significant ($P < 0.01$). Fertility was 100 per cent for all the animals.

RÉSUMÉ

TUAH, A. K., OPPONG-ANANE, K. & ARTHUR, S. K. B. A.: L'efficacité de l'acétate de medroxyprogestérone (MAP) en synchronisant l'oestrus et sa influence sur le taux de l'agnelage et la taille de la portée dans des brebis méritis. L'oestrus a été synchronisé dans des brebis méritis (Djallonke × Sahel de la génération F₂) dans la ferme du projet Ghana/UNDP/FAO à Ejura. Soixante milligramme (60 mg) d'acétate de medroxyprogestérone (MAP) a été appliqué dans une éponge intravaginale traitée avec un antibiotique et laissé pour quatorze jours. Une groupe de brebis a été injecté intramusculairement avec un sérum gonadotrophine (500 I.U.) prélevé d'une jument plein un jour après le retrait de l'éponge. Une groupe témoin (D) n'a pas été traité. Le progestérone était efficace en synchronisant l'oestrus et il a résulté en un petit intervalle d'agnelage par lots. L'intervalle entre le retrait de l'éponge et le commencement de l'oestrus a été raccourci par le serum gonadotrophine. La progestérone a aussi augmentée la fréquence d'accouchement multiple. Environ 80 % d'élevage dans des groupes traité avec l'acétate de medroxyprogestérone (MAP) a eu l'oestrus dans trois jours par rapport à 33 % dans des groupes témoins et la différence est très bien importante ($P < 0.01$). Environ 90 % d'élevage dans des groupes traité a agnelé dans un délai de six jours par rapport à 45 % dans des groupes témoins. La différence était significative ($P < 0.01$). La fertilité était 100 % pour toutes des élevages.

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Introduction

Sheep production in Ghana has a number of constraints. One of these is high neonatal mortality rate (Tuah, Owusu-Aduomi & Oppong-Anane, 1987). Neonatal lamb mortality rate is high because there is no proper lambing management as a result of irregular distribution of lambing throughout the

whole year. It will be advantageous if batch lambing could be achieved so as to make it possible to make efficient use of labour and supplementary feed. Synchronization of oestrus using synthetic progesterone has been used to achieve batch lambing in some countries (Lamond, 1964; Botha van Niekerk & Pagel, 1975; Oppong-Anane, 1975).

Adam (1972), however, reported that in the Ashanti forest belt of Ghana synchronization of oestrus could not be achieved using synthetic progesterone. The main objective of this present trial was, therefore, to assess the effectiveness of Medroxyprogesterone acetate (MAP) in synchronizing oestrus and hence batch lambing in ewes in the savanna belt of Ghana. Treatment of oestrus synchronized ewes with pregnant mare serum gonadotropin (PMSG) is also known to affect the incidence of multiple births and the shortening of the interval between withdrawal of progesterone and the onset of oestrus. One group of animals was, therefore, treated with PMSG after the progesterone treatment. The effects of the dates of treatment on oestrus synchronization were also tested by having two groups of animals treated with only MAP on different dates.

Materials and methods

Location, climate and vegetation

The experiment was conducted at the Ghana Government/UNDP/FAO Sheep and Goat Project Farm at Ejura.

Ejura is about 104 km from Kumasi and lies on latitude 7° 23' N and longitude 1° 22' N. It is in the derived Savanna Zone. The vegetation is made up of tall trees, shrubs and grasses.

Maximum temperatures occur in February and March with minimum temperatures occurring in April and July. Mean monthly temperatures range from 26.1 to 28.9°C.

The area experiences a two-peak annual rainfall distribution with a mean of about 1500 mm. The major rainy season starts from April to July. There is a short break in August followed by the minor rainy season which starts in September and ends in October. The dry season lasts from November to March (Batrop-Sackey, 1979).

Animals

The stock used consisted of a total of 289 ewes belonging to the Ghana Government/UNDP/FAO Sheep and Goat Project Farm at Ejura. The animals were hybrids from the second filial generation of

crosses between West African Dwarf Sheep (Djallonke) and the Sahel Sheep.

Management

Each animal was tagged to ensure proper identification and record keeping. The animals were fed on grass and legume pastures in paddocks during the day and housed in sheds at night, throughout the year. They were grazed on pastures made up of giant star grass (*Cynodon plectostachyus*) and stylosanthes (*Stylosanthes gracilia*). Patches of spear grass (*Imperata cylindrica*) and *Aspiria africana* were found in some paddocks. Supplementary feed (dried brewers' spent grains, 200 g/head/day) was given twice a day (morning and evening) in the dry season (from November to March) and in the last trimester of gestation.

The animals were inspected every morning and medical attention was given where necessary. Weighing and counting of animals were done every month. All deaths were recorded. In all cases, post-mortem examinations were carried out to find the cause of death. The animals were dipped and drenched regularly against external and internal parasites respectively. Overgrown hooves were also trimmed.

Hormone treatment

On 15 Jul 82, the animals were divided into four groups, A, B, C and D. Groups A and B consisted of 100 animals each and C and D, 37 and 52 ewes respectively.

Polyurethane sponges, each impregnated with 60 mg Medroxyprogesterone acetate (MAP), a synthetic progestagen were used for all animals given hormone treatment. Each sponge was coated liberally with an antibiotic cream (veramix antiseptic cream) to prevent infection. The sponges were loaded into applicators. Each ewe was restrained in the standing position, the applicator gently inserted into the vagina and then withdrawn over the plunger thus ejecting the treated sponge into the vagina. The sponges had two drawing strings (about 8 cm long) protruding from the vulva for

easy withdrawal at the end of the treatment. Sponges were allowed to remain in the vagina for 14 days. Ewes in each group were treated the same day. Ewes in Group A were treated on 15 Jul 82, Group E on 1 Aug 82 and those in Group C on 3 Sep 82. Ewes in Group D were used as control and they had no progestagen treatment.

The sponges were withdrawn from ewes in Group A on 29 Jul 82 and on 14 Aug 82 for those in Group B. In the case of Group C, each ewe was injected with 500 I.U. PMSG immediately after sponge withdrawal on 17 Sep 82.

Mating procedure

In the morning of 31 Jul 82 (2 days after sponge withdrawal for Group A), the ewes were divided into five groups of 20 each. Each group was confined to a pen in the sheep yard and two rams of proven ability, marked with crayon at the briskets were introduced into the group. Ewes in respective groups were confined to minimize the chance of an ewe being missed by the ram and to reduce the energy expended by the ram in searching for an ewe on heat. Mating was observed as an ewe was marked on the rump. Raddling on the rump was taken as indicating service. Marked rams were alternated every 6 h. At 18 h, all unraddled ewes were put to new rams overnight. Hourly mating observation starting from 6.00 h to 18.00 h was continued for 4 days after which the whole flock in the group was run with marked rams for 4 weeks. Similar mating procedure was applied for ewes in Group B on 16 Aug 82 and ewes in Group C on 18 Sep 82. The ewes in Group D were allowed to mix freely with marked rams from 2 Aug 82. Daily records of raddlings were taken.

Lambing data

Lambing dates for all animals were taken. Lambing occurred between 24 Dec 82 and 20 Feb 83.

Expected lambing intervals were calculated for animals in each group using 147-153 days gestation length.

Other parameters on lambing were computed as follows:

Percent fertility of animals in group that lambed

$$= \frac{\text{No. of animals lambing in a group}}{\text{No. of animals in the group at the end of experiment}} \times 100$$

Percent lambing within the 6-day interval

$$= \frac{\text{No. of animals in a group lambing within the 6-day lambing interval}}{\text{No. of animals in the group at the end of experiment}} \times 100$$

Lambing percentage

$$= \frac{\text{No. of lambs born to ewes in a group}}{\text{No. of animals in the group at the end of experiment}} \times 100$$

Statistical analysis

A series of chi-squared tests were performed to find differences between groups (Steel & Torrie, 1960).

Results and discussion

Success of sponge treatment

The success of the veramix sheep sponge treatment was shown by the high retention rate of the intravaginal sponge (100 per cent) for all the treated groups. There was no difficulty in the insertion and removal of sponges.

Oestrus synchronization

The synchronization of oestrus was successful and precise as very high proportions of animals in treated groups were served within 3 days of sponge removal.

Table 1 shows the proportion of animals in the various groups that exhibited oestrus within specific periods of observed mating. As shown in Table 1, 86 per cent of treated animals in Group A were mated within the first 4 days of sponge withdrawal. Corresponding figures for Groups B, C and D are

TABLE 1

Proportion of Animals in Various Groups Exhibiting Oestrus within Specific Periods after MAP Treatment*

	Group A	Group B	Group C	Group D
Total no. of animals	100	100	37	52
% observed mated by Day 1	0	0	24.3	11.5
% observed mated by Day 2	44	44	54	19.2
% observed mated by Day 3	80	71	89.1	32.7
% observed mated by Day 4	86	79	89.1	40.4

* Medroxyprogesterone acetate

79, 89 and 40 per cent. Lamond (1964) estimated that 80 - 90 per cent of progestagen treated animals would exhibit oestrus within a period of 36 to 48 h if synchronization was satisfactory.

A few animals in Group C (24 per cent) exhibited oestrus a day after sponge withdrawal (Table 1). This agrees with observations by Botha, Van Niekerk & Pagel (1975) that the use of PMSG at progestagen withdrawal would shorten the interval to onset of oestrus.

Contingency Table 2 shows the effect of progesterone on the number of animals that exhibited oestrus within the first 3 and 4 days. Results of chi-squared tests (Table 2) showed a significant difference ($P < 0.01$) between the number of animals coming on heat within the first 3 and 4 days in treated Groups A, B and C as compared to the control Group D. There was no effect of date of treatment on oestrus synchronization. Lamond & Lambourne (1961) and Oppong-Anane (1975) reported the successful synchronization of oestrus with synthetic progestagen. Adam (1972), however, reported that synthetic progestagen was not effective at the University of Science and Technology farm in Kumasi. This may be due to the fact that Adam (1972) made no direct observation of oestrus but used variability in lambing dates to

TABLE 2

Contingency Table Showing the Effect of Progesterone on the Number of Animals that Exhibited Oestrus within the First Three Days in the Various Groups (figures in parentheses indicate the first four days)

Group	No. of animals expected to exhibit oestrus within the first 3 days	No. of animals that exhibited oestrus within the first 3 days	χ^2
A	100 (100)	80 (86)	4 ^a (1.96 ^a)
B	100 (100)	71 (79)	8.41 ^a (4.11 ^a)
C	37 (37)	33 (33)	0.43 ^a (0.43 ^a)
D	52 (52)	17 (21)	23.56 ^b (12.02 ^b)

Values bearing different letters (a, b) in the same row (χ^2) are significantly ($P < 0.01$) different. Critical χ^2 value ($P < 0.01$) = 11.3.

indicate degree of synchronization. Each of his treatment groups also had a maximum of 10 animals.

Lambing rate within an expected 6-day interval

Table 3 shows the distribution of lambing and the lambing percentage in the various groups. There was a synchronized lambing pattern in group A, B and C. Eighty-seven per cent and 82 per cent of animals in Groups A and B respectively lambled within the 6-day interval. Only 45 per cent lambled within the same interval for the control group. Sixty-eight per cent of the animals in Group C died of suffocation before the end of the experiment but all the remaining animals lambled within the expected period of 6 days. Oppong-Anane (1975) had reported that 83.7 per cent of sheep treated intravaginally with MAP (60 mg) lambled within a period of 10 days.

Contingency Table 3 shows the effect of progesterone on the number of animals that lambled within the first 6 days lambing interval. The highly significant differences observed between treated Groups A and B and the untreated Group D within the first 6 days (Table 3) is expected. This is because mating for the treated Groups was

TABLE 3

Contingency Table Showing the Effect of Progesterone Treatment on the Number of Animals that Lambed within the 6-day Lambing Interval

Group	No. of animals expected to lamb within the first 6-day interval	No. of animals that lambled within the first 6-day interval	χ^2
A	100	87	1.69 ^a
B	100	82	3.24 ^a
C	52	24	15.08 ^b

Group C was not used because of high mortality. Values with different letters (a, b) in the same column (χ^2) are significantly ($P < 0.01$) different. Critical χ^2 value ($P < 0.01$) = 9.21.

completed within 4 days whilst it took 2 weeks (14 days) to complete in the untreated. The more compact lambing in treated groups could only have resulted from the effect of progesterone since all other factors were relatively uniform for all experimental animals.

Lambing outside the expected interval

Some lambings were recorded in both Groups A and B before and after the expected interval (Table 4). This could be attributed to differences in the gestation lengths of the sheep concerned. For those animals which lambled before the expected lambing dates, it is also probable that they exhibited oestrus though they were pregnant. Occurrence of heat during pregnancy has been reported by Jollans (1960) and Williams *et al.* (1956). As much as 55 per cent of animals in Group D lambled after the 6-day interval. This is a reflection of the mating spread experienced in the group.

Lambing percentage

As shown in Table 4, Group C recorded the highest lambing percentage (133 per cent) followed by Groups B (110 per cent), D (106 per cent) and A (104 per cent).

TABLE 4

Distribution of Lambing and Lambing Percentages in Various Groups

	Group A	Group B	Group C	Group D
Total no. of animals	100	100	37(12)*	52
% of animals in the group that lambled (fertility)	100	100	100	100
% lambing within the expected 6-day interval	87	82	100	45
% lambing before interval	6	1.1	-	-
% lambing after interval	-	-	-	55
Lambing percentage	104	110	133	106

* 68 per cent of animals in Group C died of suffocation before the end of the experiment. Figure in parentheses indicates the number of ewes which survived.

Fertility

The percentage of ewes that lambled in each group was used as the index of fertility. There was a 100 per cent fertility rate (Table 4) for all the groups. There was, therefore, no significant difference in fertility rate between treated and untreated groups. This confirms the work of Oppong-Anane (1975). He observed that a high fertility, indicated by conception and lambing, could be obtained if sexually-experienced rams were introduced 48 h after sponge withdrawal.

Conclusion

Intravaginal application of MAP (60 mg) was effective in synchronizing oestrus in crossbred West African ewes. It also resulted in batch lambing within a 6-day lambing interval. MAP treatment in conjunction with PMSG treatment resulted in the incidence of high multiple births and the shortening of the interval between the withdrawal of progesterone and the onset of oestrus.

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