CONCEPTION RATES IN EARLY POSTPARTUM EWES BRED NATURALLY OR BY INTRAUTERINE INSEMINATION

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ABSTRACT

Ewes were treated with a medroxyprogesterone acetate (MAP) sponge for 8 d followed, at sponge removal, with 500 IU pregnant mare serum gonadotropin (PMSG) at d 30, 40 or 50 (d 0 = lambing) to induce estrus. Dry and lactating ewes were divided into equal numbers at each postpartum day and bred at estrus. Conception rates and number of accessory sperm were determined by flushing the oviducts 3 d after mating and examining the recovered ova. There was no effect (P > .05) of lactational status on conception rates. Conception rates increased (P < .05) from d 30 (10%) to d 40 (45%) and from d 40 to d 50 (80%). There were fewer (P < .05) ova with accessory sperm (5/26) in d-30 ewes compared with d-40 (10/27) or d-50 (12/24) ewes. In Exp. 2, ewes were assigned to two groups after receiving PMSG on d 30: 1) mated naturally or 2) inseminated during laparotomy near the uterotubal junction (UTJ). Dry and lactating ewes were divided evenly within each of the two treatments. Oviducts were flushed and ova were examined for cleavage. The conception rate was 60% in ewes that were inseminated in the UTJ vs 10% in ewes mated to rams (P < .05). Lactational status had no effect on results. In conclusion, conception rates in postpartum ewes treated with MAP sponge and PMSG increased from postpartum d 30 to d 50 with natural breeding, and d-30 conception rates were increased over natural mating by insemination into the uterine horn near the UTJ.

(Key Words: Postpartum Interval, Fertility, Ewes, PMSG, Progestogen.)


Introduction

Sub-optimal fertility in postpartum ewes is due, in part, to lack of estrous activity. Progestogen-impregnated vaginal sponges followed by pregnant mare serum gonadotropin (PMSG) injection (Christenson, 1976) or low doses of GnRH (McLeod and Haresign, 1984) induce estrus and ovulation during the anestrous season. Conception rates, however, are low when ewes are mated if the induced estrus is within 35 d of lambing (Foote, 1971). This low conception rate during the early postpartum period could be due to several factors, including a detrimental effect of progestogen on sperm transport (Hawk et al., 1981), presence of uterine debris (Foote, 1971), and(or) a detrimental effect of lactation (Cognie et al., 1975; Dawe and Fletcher, 1976).

The following experiments were conducted to 1) more precisely define conception rates following treatment with PMSG at d 30, 40 and 50, 2) determine whether conception rates could be increased after administration of PMSG to d-30 postpartum ewes by insemination, at estrus, into the uterine horn near the uterotubal junction (UTJ) and 3) determine the effect of lactation on postpartum fertility in ewes that received medroxyprogesterone acetate (MAP) vaginal sponge plus PMSG.

Materials and Methods

Experiment 1. Sixty Suffolk × Hampshire ewes, 3 to 6 yr of age, lambed between

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February and May. On the appropriate postpartum day, all ewes received an intravaginal sponge containing 40 mg MAP for 8 d. At sponge removal, 500 IU PMSG were injected on d 30, d 40 or d 50. Lactating and dry ewes were divided equally within each treatment day. Lambs remained with lactating ewes throughout the experiment. Dry ewes either had lost their lambs at birth or lambs had been weaned at 10 d of age.

Following PMSG treatment, ewes were penned individually with a brisket-painted ram of known fertility, checked for mounting marks twice daily (0800 and 1600) and bred by a second ram at estrus to assure that mating occurred. All ewes showed estrus between 36 and 48 h after injection of PMSG. Three days after estrus was first observed, marked ewes were laparotomized and oviducts ipsilateral to the corpora lutea (CL) were flushed with .9% NaCl. Recovered ova were examined for cleavage and accessory sperm were counted under a phase contrast microscope.

Tests for differences in proportions of fertilized to unfertilized ova were made between dry and lactating ewes within each postpartum group using Fisher's exact test for 2 x 2 contingency tables (Snedecor and Cochran, 1967). The number of CL among groups was compared by one-way analysis of variance. The number of accessory sperm in fertilized and unfertilized ova among and within groups (d 30, 40 and 50) was compared by analysis of categorical data by linear models (Grizzle et al., 1969).

Experiment 2. Twenty ewes, lambing between November and January, were induced to show estrus on d 31 or 32, as described in Exp. 1, and were either bred naturally by two rams or artificially inseminated during laparotomy. Lactating and dry ewes, as defined for Exp. 1, were divided evenly within each of the two groups.

Using a blunt 18-gauge needle attached to a tuberculin syringe, laparotomized ewes were inseminated into the uterine lumen adjacent to the UTJ with .2 ml of semen mixed from two rams, and containing between 550 and 600 million progressively motile spermatozoa. On the 3rd d following estrus, the oviduct(s) ipsilateral to the CL were flushed, and recovered ova were examined for cleavage. Differences in proportion of fertilized to unfertilized ova among groups were compared using Fisher's exact test for 2 x 2 contingency tables (Snedecor and Cochran, 1967).

Results and Discussion

Experiment 1. There was no effect (P > .05) of lactational status on any of the variables tested; therefore, the data from dry and lactating ewes were combined. Results are summarized in Table 1. Neither the number of CL nor the ovary recovery rate differed among groups (P > .05). However, both the fertilization rate and conception rate increased progressively with the time interval postpartum (P < .05). Thus, when ewes were bred naturally at d 30 following lambing, conception rates were low, but as the postpartum interval increased to d 40 or d 50, conception rates increased. This is in agreement with Dawe and Fletcher (1976), who studied Merino ewes and did not

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of ewes</th>
<th>No. of CL</th>
<th>Ova recovered (%)</th>
<th>No. of ova with accessory sperm</th>
<th>No. of fertilized ova</th>
<th>Fertilization rate, %</th>
<th>Conception rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 30</td>
<td>20</td>
<td>34c</td>
<td>26 (76)c</td>
<td>5c</td>
<td>3</td>
<td>12c</td>
<td>10c</td>
</tr>
<tr>
<td>D 40</td>
<td>20</td>
<td>31d</td>
<td>27 (87)d</td>
<td>10d</td>
<td>11</td>
<td>41d</td>
<td>45d</td>
</tr>
<tr>
<td>D 50</td>
<td>20</td>
<td>27e</td>
<td>24 (89)e</td>
<td>12e</td>
<td>19</td>
<td>79e</td>
<td>80e</td>
</tr>
</tbody>
</table>

aPostpartum dry and postpartum lactating ewes within groups did not differ (P > .05) in number of fertilized ova, so they were combined for analysis.

bConception rate was determined by taking the total number of ewes with fertilized ova divided by total number of ewes in each group.

c,d,ePercentages within columns without common superscript letters differ (P < .05).
TABLE 2. NUMBER OF CORPORA LUTEA (CL), CHARACTERISTICS OF OVA COLLECTED AND CONCEPTION RATE OF D-30 POSTPARTUM EWES INDUCED TO ESTRUS WITH MEDROXYPROGESTERONE ACETATE AND PREGNANT MARE SERUM GONADOTROPIN, AND INSEMINATED NATURALLY OR THROUGH LAPAROTOMY NEAR THE UTERO-TUBAL JUNCTION

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of ewes</th>
<th>No. of CL</th>
<th>Ova recovered (%)</th>
<th>No. of fertilized ova</th>
<th>Fertilization rate, %</th>
<th>Conception rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrauterine Insemination</td>
<td>10</td>
<td>15</td>
<td>12 (80)</td>
<td>7</td>
<td>58</td>
<td>60</td>
</tr>
<tr>
<td>Natural Mating</td>
<td>10</td>
<td>15</td>
<td>13 (87)</td>
<td>1</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

aPostpartum dry and postpartum lactating ewes within groups did not differ (P > .05) so they were combined for analysis.

bConception rate = number of ewes with fertilized ova divided by total number of ewes in each group.

c,dWithin columns, values with differing superscript letters differ (P < .05).

define so closely the postpartum day at which the increase in conception rate occurred.

Both number of lambs suckled and level of lactation affected conception rate in ewes that lambed during the spring (Cognie et al., 1975; Hulet and Stormshak, 1972). However, in the present study, there was no difference in conception or fertilization rates between lactating and dry ewes. Because the oviducts were flushed and ova were collected 3 d after mating in this study, ewes did not have the opportunity to carry lambs to term, so any potentially adverse effects of lactation on embryo survival could not be assessed. Hence, the adverse effect of lactation on lambing rate reported in previous studies (Cognie et al., 1975; Hulet and Stormshak, 1972) may have been caused by an adverse uterine environment in lactating compared with dry ewes.

Foote (1971) found that estrus and ovulation could be induced successfully before d 35 following lambing, but the number of ewes lambing was between 5 and 10%. It was not known whether the problem in the d-30 ewe was lack of fertilization or decreased embryonic survival. In the present study the number of ova with accessory sperm was less (P < .05) in the d-30 group than in the d-40 or d-50 group (Table 1). Thus, the low conception rate at d 30 likely was due to lack of fertilization as a result of inadequate numbers of viable sperm reaching the oviducts following mating (Quinnivan and Robinson, 1969; Hawk and Conley, 1975). However, physiological factors associated with the ova could not be ruled out in this experiment.

Experiment 2. There was no effect of lactational status on any of the variables tested; therefore, data for dry and lactating ewes were combined for further analysis. Neither the number of CL nor the number or percentage of ova recovered were different (P > .05) between d-30 naturally mated ewes and d-30 artificially inseminated ewes (Table 2). But conception and fertilization rates were much greater (P < .05) for ewes that were inseminated at the UTJ than for ewes that were mated naturally (Table 2). Thus, ova of d-30 postpartum ewes can be fertilized if large numbers of sperm are deposited near the site of fertilization.

Uterine motility is a major contributing factor to sperm transport (Brinsfield and Hawk, 1969; Warren and Hawk, 1971; Hawk and Echternkamp, 1973; Hawk, 1983). Uterine contractions in ewes that have not lambed within the previous 90 d originate near the cervix and move toward the oviducts, whereas most contractions in d-30 postpartum ewes originate near the oviducts and move toward the cervix (Warren and Kiesling, 1982, 1983, 1984). This observed reversal of uterine contractions in d-30 postpartum ewes could be responsible for poor sperm transport to the oviducts and consequently for lowered fertility. There also is the possibility that uterine debris could affect sperm transport in a small percentage of ewes (Foote and Call, 1969; Call et al., 1976) or that the early postpartum uterine environment renders spermatozoa incapable of penetrating ova.

Conclusion

Fertilization rates increased as postpartum interval increased in ewes mated naturally. Insemination at the UTJ increased fertilization rates at d 30 after parturition compared with naturally mated ewes. This provides evidence
that ova of d-30 postpartum ewes are capable of being fertilized and that low fertility is due to insufficient numbers of sperm reaching the oviducts, or to a reduced ability of transported sperm to fertilize ova. Lactational status had no effect on conception or fertilization rate of ewes mated during an induced estrus.

Literature Cited
