Continuous presence of rams hastens the onset of estrus in ewes synchronized during the breeding season

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Abstract

The objective of the study was to investigate whether ram exposure would affect the onset of estrus in synchronized ewes, during the breeding season. Ninety pluriparous ewes (30 White Face, 30 Suffolk and 30 Hampshire) were divided by breed and estrous synchronized with intravaginal sponges. These sponges were impregnated with medroxyprogesterone acetate and inserted for 12 days at unknown stages of the estrous cycle. Half of the females in each breed were exposed to a ram immediately following sponge removal and throughout an 120-h period (group IMM) while the other half was subjected to ram exposure at 48 h after sponge removal (group LAT). The same ram was used for both groups. In the LAT group the male was housed in a pen adjacent to the female pen. Estrus onset for group IMM occurred (mean ± S.D.) 32.9 ± 12.3 h after sponge removal while in group LAT estrus occurred at 53.1 ± 19.6 h, respectively (P < 0.0001). The number of females in estrus at 48 h was 43/45 (95.6%) for the IMM group and 26/41 (63.4%) for the LAT group (P < 0.001). At 60 h 43/45 (95.6%) and 31/41 (75.6%) of the ewes of the IMM and LAT groups showed estrus, respectively (P < 0.01). At 120 h after sponge removal, all the females from IMM group showed estrus (45/45) while 41/44 (93.2%) from the LAT group did (P > 0.05). These results show that immediate exposure to a ram at sponge removal hastens estrus onset in ewes estrous synchronized during the breeding season. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Sexual behavior; Estrus synchronization; Sheep reproduction; Teaser

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1. Introduction

The use of intravaginal sponges impregnated with progesterone or synthetic progestins is a well established practice in controlled breeding programs (Robinson, 1979). One of the main problems associated with artificial breeding is estimating the time of estrus initiation and extent of estrous synchronization. If one can predetermine this time, the need of estrus detection could be reduced or even eliminated (Britt, 1987). In small ruminants, many factors affect the estrous synchronization response of a group of females. These include breed, nutrition, lactation, post-partum interval, season, age, use of equine chorionic gonadotrophin, the kind of progestagen employed, etc. (Colas, 1979; Robinson, 1979; Romano, 1996). In sheep, the ram acts as an exteroceptive stimulus to initiate ovarian activity in ewes during the transition from non-breeding to breeding season (male effect; Chemineau, 1987; Cunshwa et al., 1992). The minimum time required for anestrus ewes to respond with ovulation to the presence of the male was two weeks (Martin et al., 1986). It has been observed in goats that during the breeding season, the continuous presence of a male hastens estrus onset in estrous synchronized does whether progestagen sponges or prostaglandin F-2alpha analogs are used (Romano, 1998). In ewes, LH surge occurs at the beginning of estrus (Ainsworth et al., 1982/1983;
Robinson et al., 1987) and the interval from preovulatory LH discharge to ovulation is relatively constant (21–26 h; Cumming et al., 1973). Therefore, a possible male influence in ewes on synchronization efficiency during the breeding season may improve the success of AI at a fixed time.

The objective of this study was to determine the effect of the continuous presence of a ram introduced to the ewes immediately after removal of progestagen sponges on estrus response, estrus onset and number of ewes in estrus at 48, 60 and 120 h after sponge removal.

2. Materials and methods

This experiment was performed in September and October at the University of Minnesota’s St. Paul Sheep Teaching and Research Unit. The animals used were 90 pluriparous ewes (30 White Face, 30 Suffolk and 30 Hampshire). Most of the White face ewes were purebred Polypay and Polypay crosses. All the females were subjected to a breeding soundness examination which included a vaginal examination before insertion of the sponges. Each ewe was considered in estrus when she was observed to have a crayon mark on her rump or when she was directly observed to accept a mount from a ram equipped with a marking harness. Estrus detection was observed two times per day (0700 and 1800 h) for a 45-min period. An ewe was considered to have responded to the treatment when she showed estrus within 120 h after sponge removal. Estrus onset was defined as the time elapsed between sponge removal and the middle of the time interval between the last rejection to be mounted and the first tolerance. The ewes were synchronized with intravaginal sponges impregnated with 60 mg of medroxyprogesterone acetate. The sponges were inserted sequentially at unknown stages of the estrous cycle and left for 12 days. The sequential insertion allowed us to use the same

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of ewes</th>
<th>Treatment</th>
<th>Presence of ram at</th>
<th>Estrus onset (h) (Mean ± S.D.)</th>
<th>No. of ewes in estrus at 48 h (%)</th>
<th>Estrus response at 120 h N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hampshire</td>
<td>15</td>
<td>0</td>
<td>34.0 ± 11.7*</td>
<td>14/15* (93.3)</td>
<td>15* (100.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>48</td>
<td>54.0 ± 20.2*</td>
<td>7/13* (53.8)</td>
<td>13* (92.8)</td>
<td></td>
</tr>
<tr>
<td>Suffolk</td>
<td>15</td>
<td>0</td>
<td>29.2 ± 10.6*</td>
<td>15/15* (100.0)</td>
<td>15* (100.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>48</td>
<td>51.4 ± 20.1*</td>
<td>10/14* (71.4)</td>
<td>14* (93.3)</td>
<td></td>
</tr>
<tr>
<td>White Face</td>
<td>15</td>
<td>0</td>
<td>35.6 ± 14.3*</td>
<td>14/15* (93.3)</td>
<td>15* (100.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>48</td>
<td>54.0 ± 19.9*</td>
<td>9/14* (64.3)</td>
<td>14* (93.3)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>0</td>
<td>32.9 ± 12.3*</td>
<td>43/45* (95.6)</td>
<td>45* (100.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>48</td>
<td>53.1 ± 19.6*</td>
<td>26/41* (63.4)</td>
<td>41* (93.2)</td>
<td></td>
</tr>
</tbody>
</table>

Different superscripts in the same column are significantly different: *P < 0.05; **P < 0.01; ***P < 0.001; ****P < 0.0001.
ram in both IMM or LAT groups. Half of the females in each breed were exposed immediately and were left continuously with a ram following sponge removal for 120 h (group IMM). The other half was exposed to the same ram 48 h after sponge removal (group LAT). The male was housed in a pen adjacent to the female pen in the LAT group. All ewes had the opportunity to see, smell, and hear the male. The ram could place his head through the fence. Three rams equipped with a marking harness were used (1 Texel, 1 Suffolk, 1 Hampshire).

Total estrus response and estrus response at 48 and 60 h were analyzed by Chi-square analysis. Estrus onset was analyzed by Student’s t-test. A difference was considered significant at $P < 0.05$ (Snedecor and Cochran, 1967).

3. Results

The results indicating estrus response, estrus onset and number of ewes in estrus at 48 h are shown in Table 1. One ewe from group LAT lost her sponge 3 days after the pessary was inserted. This ewe was not included in the analysis. Estrus onset for group IMM was $32.9 \pm 12.3$ h while group LAT was $53.1 \pm 19.6$ h, respectively ($P < 0.0001$). The number of females in estrus at 48 h was 43/45 (95.6%) for the IMM group vs. 26/41 (63.4%) for the LAT group ($P < 0.001$) (see Fig. 1). The number of females in estrus at 60 h was 43/45 (95.6%) and 31/41 (75.6%) for the same groups, respectively ($P < 0.01$). At 120 h, all the females exposed from IMM group showed estrus (45/45) while 41/44 (93.2%) of the females in the LAT group did ($P > 0.05$) (see Fig. 1).

4. Discussion

From the present study, it is apparent that continuous exposure of ewes to rams beginning at sponge removal hastens estrus onset. These results are in agreement with previous findings, that exposure to rams after sponge removal increased the number of ewes that showed LH surges between 24 and 48 h (Romano et al., 1996).

Successful fertilization depends on the time of insemination relative to ovulation, and this is related to the estrus onset (Robinson et al., 1987). Presently, it is recommended that fixed time artificial insemination is to be performed between 48 and 58 h after sponge removal (Evans and Maxwell, 1987). If those recommendations had been followed in the present study, 95.6% of the ewes from group IMM would have been inseminated during estrus, but less than 70% of the ewes in the LAT group (Fig. 1). Females artificially inseminated between 42 and 52 h after to sponge removal which were not in estrus did not become pregnant (Husein et al., 1998). This situation is even more important if frozen semen is used. Frozen semen has reduced fertilizing capacity in comparison to fresh semen (Hawk, 1983; Lighfoot and Salamon, 1970). Furthermore, the presence of the male could be responsible for the variation found among different experiments using the same drugs in estrous synchronization protocols (Walker et al., 1989; Eppleston et al., 1991; Romano et al., 1997). Therefore, with adequate management of the teaser ram we can obtain more ewes in the optimal period of estrus when artificial insemination is performed.
In the present study, the ram effect not only reduced the time between sponge removal and estrus onset but also reduced variation in estrus onset (see Table 1). Thus, most of the ewes were in the optimal stage of estrus during the recommended time for artificial insemination (42–52 h) following immediate ram exposure.

The mechanism by which the male hastens estrus in ewes is unknown. The male teasing behavior was probably an important factor. In the IMM group, the ram had the opportunity to exhibit all of its sexual behavior: vocalization, fore-leg striking, mount and close contact. An interesting point about this study, is that the ram waiting to be used in the LAT group was in an adjoining pen. Therefore, the females had the opportunity to see, smell and hear the ram continuously for 48 h, before he was introduced into the pen with females. From the present study, a reduction between sponge removal and estrus onset was noted when males were in close contact with females. This is in agreement with previous information obtained by Shelton (1980) working with non-synchronized goats during the transitional breeding period. He found that the male effect was completely effective when the male was in physical presence with the females, but the response was reduced when the male was far away from the females.

In conclusion, the present results indicate that the continuous exposure of the ram immediately after sponge removal hastens estrus onset and reduces the variation in estrous synchronization programs during the breeding season.

References


