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Reproductive Performance of Ewes Treated with Melatonin

A. L. Slyter
South Dakota State University

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Summary

The effectiveness of exogenous melatonin to stimulate conception during July-August was evaluated in two trials during 1989 (Trial 1) and 1990 (Trial 2). In 1989 ewes were exposed to one of three treatments: natural daylight (ND), ND + Regulin® implant (ND + RI) or ND + 3.5 mg melatonin per day in their feed (ND + Mel). In 1990, only the ND and ND + Mel treatments were studied. Treatments were initiated June 1 and fertile rams were joined with the ewes on July 1. Treatments ended August 25, 1989, and August 24, 1990, when rams were removed. A higher percentage of the ND + Mel ewes lambed and had more lambs per ewe lambing than control ewes in both years. Ewes receiving the Regulin® implant were intermediate in their percentage lambing to the other two groups in 1989. On the average, 73.4% of the control ewes lambed which is higher than normally expected in South Dakota at this time of year.

(Key Words: Out-of-season Breeding, Ewe, Melatonin.)

Introduction

Extending the breeding season in the ewe offers several potential benefits to the producer. In addition, this may result in a more constant supply of fresh lamb which could have a major beneficial impact on the slaughter and merchandising segment of the industry. By nature, the ewe is a short day breeder, normally conceiving in the fall-winter period. Physiologically, the breeding season in the ewe is triggered by an increase in the blood level of the natural hormone melatonin. This is in response to the increasing length of daily darkness. Administration of exogenous melatonin should mimic the secretion of endogenous melatonin. This study examined the effectiveness of exogenous administration of melatonin to induce cyclic reproductive activity and conception during July and August.

Experimental Procedure

Trial 1 (1989). One hundred nine Hampshire cross ewes 1 to 3 years old were randomly assigned within age and breed group to one of three treatments: natural daylight (ND) control, Regulin® implant (ND + RI) or 3.5 mg melatonin (ND + Mel) per head per day in their grain mixture. Treatments were initiated June 1 and terminated August 25. Fenceline ram contact was started June 1 and three fertile Hampshire rams were placed with the ewes July 1. All ewes were commingled as a single group during breeding except the melatonin-fed ewes were separated daily at 4 p.m. to receive their grain (.25 lb rolled corn) containing melatonin. The other ewes received an equal quantity of grain at the same time. All ewes were fed the balance (≈4 lb per head per day) of their diet (24.5% alfalfa:74.5% corn cob:1.0% molasses pellet) at the same time in a single group. Ewes were maintained outdoors in drylot during the treatment period. Ewe weights were recorded at 28-day intervals starting June 1 and ending August 25. Lambing date, birth type, sex and birth weights were recorded.

1 Regulin® furnished courtesy of Gene Link Australia, Inc.
Trial 2 (1990). One hundred six Hampshire cross ewes 1 to 4 years of age were randomly assigned within age and breed group to either natural daylight (ND) control or received 3.5 mg melatonin (ND + Mel) per head per day in their grain mixture. Treatments were initiated June 1 and terminated August 24. All other experimental procedures were similar to those described for Trial 1 except treatment groups were not commingled but maintained in separate pens. The nearest distance was 40 feet from the southeast corner of one pen to the northwest corner of the other pen. Rams were fed separately from the ewes and rotated daily between the experimental groups in an attempt to equalize ram differences.

Results and Discussion

Trial 1. Lambing results are shown in Table 1. No difference was noted in the mean lambing date. The average time of conception was mid July, approximately 2 weeks after the rams were joined with the ewes. One hundred percent of the ewes receiving melatonin in their feed lambed compared to 85.7% of the melatonin-implanted ewes and 78.9% of the control ewes. The lambing rate was 1.83, 1.43 and 1.53 lambs per ewe lambing for the ND + Mel, ND + RI and ND groups, respectively. The ND (control) ewes continue to do better than expected (78.7% lambing), especially when it is noted that two-thirds of the ewes in Trial 1 were lambing for their first time at approximately 18 months of age.

Trial 2. Results of Trial 2 are shown in Table 2. Ninety-two and one-half percent of the melatonin-treated ewes lambed in 1990 compared to 67.9% of the controls. The mean lambing dates were December 22 and December 16 for treated and control ewes, respectively. Lambs born per ewe lambing favored

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. ewes</th>
<th>Percentage lambing</th>
<th>Lambing date</th>
<th>No. lambs born per ewe lambing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>38</td>
<td>78.9</td>
<td>12-11</td>
<td>1.53</td>
</tr>
<tr>
<td>ND + RI</td>
<td>35</td>
<td>85.7</td>
<td>12-11</td>
<td>1.43</td>
</tr>
<tr>
<td>ND + Mel</td>
<td>36</td>
<td>100.0</td>
<td>12-12</td>
<td>1.83</td>
</tr>
</tbody>
</table>

*ND = natural daylight control, ND + RI = ND + Regulin® implant, ND + Mel = ND + 3.5 mg melatonin per head per day.

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</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>53</td>
<td>67.9</td>
<td>12-16</td>
<td>1.47</td>
</tr>
<tr>
<td>ND + Mel</td>
<td>53</td>
<td>92.5</td>
<td>12-22</td>
<td>1.84</td>
</tr>
</tbody>
</table>

*ND = natural daylight control and ND + Mel = ND + 3.5 mg melatonin per head per day.
ND + Mel treated ewes. Trial 2 contained 13 ewes lambing for their first time at approximately 18 months of age. The percentage lambing for these ewes was 50.0% for controls compared to 85.7% for treated ewes. A lower fall lambing performance for first time lambing ewes is in agreement with other data from this as well as other research stations. However, in 1989, the reproductive performance for maiden ewes was only slightly lower than for nonmaiden ewes.

The 1990 trial was designed to evaluate the effect that commingling of control and treated ewes may have had on reproductive performance in previous trials. Comparing Trial 1 with Trail 2 obviously is confounded by any year effect that might be present. In 1989, 100% of the ND + Mel-treated ewes lambed compared to 92.5% in 1990. Slightly fewer (67.9 vs 78.9%) of the control ewes lambed in 1990 compared to 1989. The difference between ND + Mel and ND treatments within year was very similar, 21.1% (1989) and 24.6% (1990). Thus, it would appear that the increased cyclic activity of treated ewes commingling with control ewes in 1989 was not responsible for the higher than expected response in control ewes. Final conclusions can not be drawn until statistical analyses of these data are completed.

If the data from the two trials are averaged together, 73.4% of the control ewes lambed compared to 92.2% of the ewes fed melatonin and 85.7% of the ewes that were implanted with Regulin®. Mean lambs born per ewe lambing were 1.50 and 1.83 for ND and ND + Mel ewes averaged across years. Results summarized in this paper are very similar to the results reported for similar treatments reported in the 1989 Sheep Day Proceedings.