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Summary

Induction of fertile mating during summer anestrous in the ewe would aid in spreading the peak supply of lambs over a longer period of time. This should aid many facets of the industry. The effects of alteration of the natural light and dark ratios during the summer months on breeding results were evaluated. Extending day length to 16 hours starting July 4 appeared somewhat beneficial. Results of several light:dark regimes alone or in combination with hormone treatments are reported.

Introduction

One of the major problems of the sheep industry is the seasonal breeding characteristics of the ewe. This causes a concentration of lamb numbers at market time and the related price trends. Also, this seasonal fluctuation makes it difficult for the lamb packing industry to be efficient and causes peaks and valleys in labor demands for the industry. Various exogenous hormonal treatments have been used attempting to stimulate out-of-season breeding, but they have resulted in varying success. However, most of these compounds are no longer available commercially.

The ewe normally expresses estrus as day length decreases. Maximum ovulation rates occur near or slightly after the shortest day of the year. This appears to be related to a decreased level of circulating prolactin in the blood stream. This project was initiated to study the effect of decreased daylight and/or prolactin inhibition on the occurrence of estrus and pregnancy in the ewe during July and August in South Dakota.

Experimental Procedure

Fifty Targhee ewes, 6 years of age, were randomly allotted to one of the following five groups: (1) natural daylight, maintained outdoors at the Sheep Unit, (2) same as group 1 plus 2-bromo-α-ergocryptine (CB154) and melatonin, (3) extended darkness, 16 hours of darkness (D) and 8 hours of light (L), (4) same as group 3 plus CB154, (5) extended light for 28 days (16 hours light:8 hours dark) followed by extended dark (16 hours dark:8 hours light) for the remaining 24 days. Groups 3 through 5 were housed in the Animal Science Complex laboratory in light-controlled rooms. Average temperature was 70 F during this period. CB154, a prolactin inhibitor, was administered intramuscularly in a .5-mg. dose twice daily to the respective groups. Melatonin injections provided 12 µg per day and were divided into hourly injections starting at 6 p.m. and continuing until 9 p.m. or were given in a single 12 µg injection at 6 p.m. These levels were calculated to

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mimic natural levels associated with the dark phase of the day. Treatment commenced July 4 and ended August 29, 1980. Ewes were bled weekly for serum and plasma samples. Ewes were exposed continuously to intact Suffolk rams. Breeding marks were recorded daily. Date of birth, birth weight, type of birth and sex of lamb were recorded at lambing. Hormone analyses have not been completed on blood samples to date.

Results and Discussion

The results of this trial are presented in table 1. In view of the small number of ewes per group, little difference was noted among treatments in the percentage of ewes that lambed. However, the largest percentage lambing (89%) was found in the natural daylight group receiving CB154 plus malatonin followed by those in the 16 hours dark:8 hours light group (80%). Both of these treatments were designed to simulate natural short-day hormonal conditions. The addition of CB154 to the 16 D:8 L treatment did not improve the percentage lambing. The reversal light treatment, 16 L:8 D to 16 D:8 L, resulted in the lowest percentage lambing. It is possible that for this treatment to be effective it should be initiated earlier, since there appears to be a time lag between light changes and resulting hormonal changes.

The length of the lambing period was shortest (9 days) for ewes in the 16 D:8 L group. The average lambing date was earlier for those under 16 D:8 L plus CB154, although only 4 and 6 days earlier than the natural daylight plus CB154 and melatonin and 16 D:8 L groups, respectively. Considering the combination of percentage lambing, average lambing date and length of the lambing period, the most effective treatment was the extended dark group, 16 D:8 L.

The response obtained in the natural daylight group was considerably better than anticipated. This indicates this group of ewes was apparently nearing the end of their anestrous period by early August. Differences may have been larger if this study had been initiated earlier in the anestrous period. Additional work is also needed to determine the time lag between initiation of treatment and observed response. Further work is necessary before alteration of light can be recommended for practical application by the producer.

Table 1. Alteration of Lambing Season With Environmental and Hormonal Stimuli

Treatment[a]	No. ewe	No. lambing	Average lambing date	Length lambing period (days)
Natural daylight	10	7 (70)[b]	1/16/81	26
Natural daylight plus CB154 and melatonin	9	8 (89)	1/7/81	29
Controlled light 16 D:8 L	10	8 (80)	1/9/81	9
Controlled light 16 D:8 L plus CB154	9	6 (67)	1/3/81	34
Controlled light 16 L:8 D for 28 days followed by 8 L:16 D for 24 days	10	5 (50)	1/30/81	23

[a] Experiment conducted July 4 through August 24, 1980, at Brookings, South Dakota. See experimental procedure for specific treatment detail.
[b] Numbers in parenthesis are percentages.