

Ram effect: Adult rams induce a greater reproductive response in anestrus ewes than yearling rams

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Abstract

The introduction of rams to previously isolated anestrus ewes ensures induction of ovulation and estrus in part of the flock, and allows for the potential to conceive. However, there is little known about the desirable characteristics of the rams used to induce these behavioral and physiological responses. Adult rams may be more effective than young rams in induction of these responses. The primary aim of the present study was to compare the response in ewes stimulated by adult or yearling rams. During the non-breeding season, two groups of 121 ewes were stimulated with adult (AR) or yearling (YR) rams. When adult rams were used, significantly more ewes had ovulations (78.5 compared with 61.1%) and came into estrus (47.9 compared with 35.5%). There were more corpora lutea per ewe exposed to rams (0.95 ± 0.59 compared with 0.65 ± 0.51) and per ewe that had ovulations (1.18 ± 0.41 compared with 1.06 ± 0.25) and a greater conception rate (58.6 compared with 20.9%) as a result. Subsequently, to determine what signals led to the greater response to adult rams, the courtship behavior of adult and yearling rams toward anestrus ewes was compared in 46 pen tests. There were no significant differences in the frequency of any of the recorded courtship behaviors (anogenital sniffing: 21.9 ± 3.4 versus 25.7 ± 3.2 ; lateral approaches: 7.1 ± 1.5 compared with 9.9 ± 2.9 ; flehmen: 2.1 ± 0.4 compared with 2.2 ± 0.4 ; mount attempts: 0.1 ± 0.1 compared with 0.1 ± 0.1 , for AR and YR, respectively), latency to the onset of courtship behavior (13.1 ± 7.0 compared with 17.3 ± 6.2 s) or the time engaged in courtship behavior (173.1 ± 24.6 compared with 199.0 ± 26.5 s). The difference in the signals produced by adult and yearling rams skin glands was assessed by stimulating ewes with masks containing wool from adult ($n=45$) or yearling ($n=48$) rams. More ewes had ovulations (24/45 compared with 11/48) and came into estrus (21/45 compared with 10/48) when wool from adult rams was used. As in Experiment 1, pregnancy and conception rates were greater when adult rams were used, another trial was designed to determine if there were differences in mating and mounting frequency between adult and yearling rams. Seven adult and six yearling rams were subjected to three pen tests each with three estrual ewes. Adult rams mounted more (21.7 ± 4.5 compared with 9.8 ± 0.7) and tended to ejaculate more frequently (2.9 ± 0.5 compared with 1.8 ± 0.4) than yearling rams. It is concluded that adult rams induce a greater reproductive

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response in anestrus ewes than yearling rams, inducing a greater ovulation percentage and estrous response in ewes, resulting in greater ovulation numbers, pregnancy and conception rates. This greater stimulation is, in part, explained by differences in the signals provided in the wool (presumably odors) produced by adult rams. The lesser percentage of pregnancies obtained when yearling rams are used may be explained by differences in mounting behaviors and ejaculation frequency.

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1. Introduction

The introduction of rams to previously isolated ewes during the non-breeding season is used to induce estrus and ovulation (“ram effect”; review: Ungerfeld, *in press*). Sexual behavior (courtship: Signoret et al., 1982; reproductive serving capacity: Perkins and Fitzgerald, 1994) as well as substances contained in the wool, and wax secreted by sebaceous and sweat glands (Knight and Lynch, 1980) are the major stimulus provided by the presence of the ram. As androgen-treated wethers and ewes provoke similar responses as intact rams, the ability of rams to stimulate reproductive activity in sheep is linked to the concentration of androgens (Fulkerson et al., 1981; Croker et al., 1982; Signoret et al., 1982). Ungerfeld and Silva (2004) observed after the introduction of rams into a test flock an increase in testosterone concentration, which remained greater for several days.

Haynes and Haresign (1987) recommended the use of adult, rather than young rams, for induction of reproductive responses. Moreover, Rosa and Bryant (2002) suggested that the advantage of adult rams might be related to the more frequent sexual behavior and greater pheromone production. However, in none of those reviews experimental data been provided to substantiate this hypothesis. In fallow deer, an earlier onset of the breeding season was observed in females, which were in contact with adult stags compared to hinds joined with young males (Komers et al., 1999). However, in postpartum cows, stimulation by adult or yearling bulls resulted in similar responses (Cupp et al., 1993).

Therefore, the first hypothesis tested was that adult rams induce a greater reproductive response in anestrus ewes than yearling rams. As adult rams induce a greater reproductive response than yearling teasers, there may be differences in the intensity of sexual signals. Therefore, courtship behavior of adult and yearling rams toward anestrus ewes, and the percentage of anestrus ewes that had ovulations and come into estrus after being stimulated with wool from adult or yearling rams were compared. As conception and pregnancy rates were greater when adult rams were used, another trial was designed to determine if there are differences in mounting and mating behavior between adult and yearling rams.

2. Materials and methods

2.1. Experiment 1: response to adult and yearling rams

The experiment was performed on a private farm located in Flores, Uruguay (34° S), during the non-breeding season (October), with 242 Merilin ewes [$n = 107$ multiparous (M), $n = 135$ nulliparous (N)]. Body weight was 46.1 ± 5.2 and 38.3 ± 4.4 kg for M and N, respectively (mean \pm S.E.M.). All ewes were managed together, and were grazed on improved pastures.

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