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Continuous presence of male on estrus onset, estrus duration, and ovulation in estrus-synchronized Boer goats

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ABSTRACT

The objectives of the present study were to assess the effect of permanent contact of teasers without copulation on the interval from controlled internal drug release (CIDR) removal to estrus onset, estrus duration, ovulation time, number of ovulations, and interval from CIDR removal to ovulation time on estrus-synchronized Boer goats. During the fall season, a controlled randomized design experiment with two groups, control (CON; n = 18) and treatment (TRE; n = 18), was performed. The TRE group was maintained permanently in a pen with an aproned buck immediately after CIDR removal. The CON group was maintained in a different pen without permanent exposure to the male. All females were estrus synchronized with CIDR maintained in the vagina for 7 days and received 50 μg of GnRH im at device insertion and 5 mg of natural prostaglandin F-2α at device removal. Females were considered to be in estrus when they accepted mounting by the aproned bucks. Estrus was detected four times a day after CIDR removal (at 6 AM, 12 noon, 6 PM, and 12 midnight) using bucks with canvas apron as teasers. The ovulation time and number of ovulations were assessed by transrectal ultrasonography starting 24 hours after estrus onset and repeated every 6 hours until complete ovulation was detected. The estrus onset for the CON group was 44.0 ± 8.3 hours and for the TRE group, it was 37.0 ± 7.7 hours (P = 0.01). Estrus duration from the CON group was 43.7 ± 9.2 hours and for the TRE group, it was 38.3 ± 6.6 hours (P = 0.05). The first, last, and mean ovulation times for the CON group were 32.4 ± 5.3, 38.4 ± 3.4, and 35.4 ± 3.9 hours, and for the TRE group, the times were 31.8 ± 2.8, 36.7 ± 3.0, and 35.8 ± 3.6 hours, respectively (P = 0.85, P = 0.23, and P = 0.82, respectively). The number of ovulations for the CON and TRE groups was 2.6 ± 0.7 and 2.6 ± 0.6 ovulations, respectively (P = 0.96). The interval time for CIDR removal to ovulation for the CON group was 79.2 ± 8.2 hours and for the TRE group, the interval time was 73.2 ± 6.2 hours (P = 0.05). It was concluded that the permanent presence of male without copulation with estrus-synchronized does hastened estrus onset, reduced estrus duration, and decreased the interval time from CIDR removal to ovulation without modification of ovulation time and number of ovulations in Boer goats.

1. Introduction

Caprine estrus length exhibits great variations [1–4]. Estrus duration is essential to artificial insemination (AI) technology [5,6]. It has been traditionally recommended that goats be inseminated 12 hours after the onset of estrus

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and inseminated again the following day if they are still in estrus [6] or immediately after estrus detection and 12 hours later [7]. In previous investigations, a decrease in estrus duration from 9.3 to 19.2 hours (from 26% to 44% reduction compared with the CON group) was found after copulations during the first 12 hours of estrus [4,8–12]. This effect was independent of the number of copulas [8], and it was because of the mechanical effect of the penis against the vaginal fornix and not to the accessory sexual fluid [9]. The mechanical effect of the penis was eliminated by local and regional anesthesia [10]. In a further study, no differences between the CON and TRE groups, either in the number of ovulations or ovulation times when assessed at 8-hour intervals by laparoscopy, were detected [11]. However, in a recent study, it was shown that copulation at the beginning of estrus not only reduced estrus duration but also hastened the ovulation time when assessed at 4-hour intervals by transrectal ultrasonography [13]. Interestingly, in this last study, a small but significant difference of estrus duration between the CON and TRE groups was detected. The reason was the short estrus length of the CON group compared with earlier studies [4,8–12]. The close proximity of males during all period of investigation could be the potential factor of this short estrus length in the CON group. In this study, all the bucks were not only used more frequently for teasing (every 4 hours rather than every 6 hours) as in previous investigations but also were kept together after estrus detection in an adjacent pen in close proximity to the females' pens, therefore, permitting continual visual, olfactory, and auditory communication with the females [4,8–12]. In previous research, the permanent presence of bucks with female estrus synchronized using either progestogens or luteolytic hormones that hastened the estrus onset compared with females not exposed continuously to male; however, neither estrus duration nor ovulation was studied [14,15]. Consequently, the possible influence of permanent contact without copulation on estrus duration and ovulation warranted further investigation.

The objectives of the present study were to evaluate the effect of permanent contact of bucks without copulation on estrus-synchronized does on the interval period from controlled internal drug release (CIDR) removal to estrus, estrus duration, ovulation time, number of ovulations, and interval period from CIDR removal to ovulation during the fall season in Boer goats.

2. Material and methods

2.1. Animals

In this experiment, all procedures used were in compliance with the Guide for the Care and Use of Agriculture Animals in Research and Teaching and were approved by the Texas A&M University Institutional Animal Care and Use Committee; 36 Boer females (22 pluriparous and 14 nulliparous) and 5 bucks from the Teaching and Research Goat Herd at the Large Animal Clinical Sciences Department at the College of Veterinary Medicine and Biomedical Sciences of Texas A&M University were randomly selected. The animals were clinically healthy and submitted to breeding soundness examination 4 weeks before the investigation according to the Society for Theriogenology criteria and were declared satisfactory potential breeders [16]. The females and males were maintained in different pastures with cover sheds before being moved to the building for this investigation. The males were separated from females by only one fence at the pastures. Does were housed in groups of no more than four does per cover pen, with free coastal hay available and supplemented with a commercial mixed concentration (16% crude protein, 3.0% crude fat, 16% crude fiber, 0.9% Ca, 0.55% P) and fed individually twice daily with 450 g per doe per meal. All does had free access to water and trace mineral salt. The age, weight, and body condition score were evaluated at the time of CIDR removal [17]. The female mean age was (±SD) 2.9 ± 1.6 years (range 1–5), mean weight was 52.3 ± 13.1 kg (17.6–75.0), and mean body condition score was 3.2 ± 0.3 (2.5–3.75). All animals were vaccinated, had their hooves trimmed, and had their feces analyzed for gastrointestinal parasites according to the pre-established standard operating procedures. All the animals were free of caseous lymphadenitis and caprine arthritis encephalitis.

2.2. Experimental design

During the fall season, a controlled randomized design experiment with two groups, control (CON; n = 18) and treatment (TRE; n = 18), was performed. Each group was formed by 11 pluriparous and seven nulliparous does. All females were estrus synchronized with CIDR (progesterone 300 mg) maintained in the vagina for 7 days and received 50 μg of GnRH im at device insertion and 5 mg of natural prostaglandin F-2_α im at device removal. CIDRs were inserted in the morning at unknown stages of the estrous cycles. The TRE groups were maintained permanently in pens with an aproned buck immediately after CIDR removal and were maintained during all investigation period. The number of does per buck and per pen was between 3:1 and 4:1. The CON group was maintained in different pens without permanent exposure to the male. All the animals were housed in the same barn, but the TRE group was separated from the CON groups by 10 m. The experiment was performed in three replicates of eight, 14, and 14 does each. At each replicate, the females were randomly divided equally in the TRE and CON groups. The intervals among replicates were 2 weeks. The CON and TRE groups did not receive any copula during estrus; only mounts were permitted. Females were considered to be in estrus when they accepted mounting by the bucks. Estrus was detected four times a day after CIDR removal (at 0600, 1200, 1800, and 2400 hours) using five bucks from 1 to 4 years old with high serving capacity as teasers with canvas apron conducted by leash as in previous investigations [4,7–11]. Estrus response was defined as the proportion of females in estrus within the 5 days of CIDR removal from the total estrus synchronized. Estrus onset was defined as the time elapsed from CIDR removal to the middle of the time between the last unaccepted mount and the first accepted mount. Estrus duration was the interval from the first to the last accepted mount. The ovulation time and number of ovulations were assessed by transrectal ultrasonography