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The effect of permanent or temporary contact with the lamb and contact with males on the lambing to first ovulation interval in Saint Croix sheep

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ABSTRACT

The effect of suckling and presence of the lamb, or ram, on the lambing to first ovulation interval in Saint Croix sheep was determined. Ten days after lambing 50 ewes and their lambs were assigned to three different suckling treatments: continuous suckling (CS), restricted suckling (RS), restricted lamb presence (RP). Ewes from each treatment were allocated to groups that had contact with a ram (TR) or remained isolated from rams (IR). Therefore, overall, there were six groups with 2 factors: CS-IR (n = 7) CS-TR (n = 7); RS-IR (n = 11); RS-TR (n = 11); RP-IR (n = 7), and RP-TR (n = 7). The presence of the ram ($P = 0.01$) and restricted suckling ($P = 0.05$) reduced the interval from lambing to first ovulation, while no interaction was found ($P > 0.05$) between these two factors. An effect of treatment and its interaction influenced significantly the number of vocalizations and growth rate in lambs. At the day of weaning RP vocalized more than RS ($P < 0.01$), which in turn vocalized more than CS ($P < 0.01$), followed by a general decline to pre-weaning levels 48 h later. Lambs in RP had greater growth rate during first 3 d after weaning compared with RS ($P < 0.05$), which displayed greater growth rate that CS ($P < 0.05$). In addition, an effect of treatment ($P = 0.05$) was found in cortisol concentration. Our results indicate that Saint Croix ewes respond to the ram effect in early postpartum, shortening the resumption of postpartum ovarian activity. When this technique is combined with restricted suckling, additional benefits are achieved for lambs with reduced weaning stress.

1. Introduction

The interval between parturition and the resumption of reproductive activity in ewes is one of the factors that determines the frequency of lambing and the overall lifetime productivity of sheep. Most sheep breeds show a seasonal reproductive pattern that confines lambing activity to the spring months, thus limiting the reproductive outcome to one lambing/year. However, accelerated reproductive programs aim to increase the number of parturitions per year (e.g.: 3 lambings in 2 years; Dzakuma et al., 1982). This type of program requires that ewes rebreed and become pregnant during the early postpartum period. For example, to complete two gestations per year, ewes need to come into estrus and conceive within the first 5 weeks after parturition. Postpartum pregnancy is limited by the time of uterine involution (which in sheep is completed by the third week; Rubianes and Ungerfeld, 1993), and ability to maintain pregnancies (Goff et al., 2014), as well as the interval to reassume the cyclic activity. After parturition, ovarian activity is delayed by suckling (Morales-Terán et al., 2004; Camacho et al., 2008; Morales-Terán et al., 2011) and the presence of the young lamb that inhibits LH secretion probably through endogenous opioids secretion (Gregg et al., 1986; Malven and Hudgens, 1987; Lozano et al., 1998).

Although weaning may be an adequate strategy to advance postpartum rebreeding in non-seasonal breeds (Pérez et al., 2009), there is scarce information about the effect of suckling –and thus, weaning– in the ovarian resumption activity (Mandiki et al., 1990; Ascari et al., 2013; Goff et al., 2014). On the other hand, weaning is a stressful event that may also alter the response to reproductive stimulation in postpartum ewes. Therefore, restricted suckling, which decreases the negative responses to weaning (Arroyo et al., 2011), may be a practical management tool to advance ewes' postpartum rebreeding.

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Estrus can be induced in postpartum ewes with the ram effect (Wright et al., 1989; Lassoued et al., 2004; Silva and Ungerfeld, 2006), an effective technique based on the introduction of rams to previously isolated ewes increasing the eweís frequency of LH pulsatility leading to a preovulatory surge, and to ovulation (for reviews see: Martin et al., 1986; Ungerfeld et al., 2004). Moreover, the introduction of rams may be combined with weaning to improve ewes' reproductive response (Morales-Terán et al., 2011). However, the stress of weaning may limit the capacity of ewes to respond to the ram effect. The reproductive response of Kathadin ewes was not improved by weaning lambs 3 days before the introduction of the rams (Ungerfeld and Sánchez-Dávila, 2012). An alternative strategy may be to begin stimulating ewes earlier, and re-stimulate them frequently with the reintroduction of rams to separate the stressor effects of weaning and the reproductive induced response.

Thus, the purpose of the present experiment was to evaluate the effect of contact with the lamb (full contact, restricted suckling or restricted lamb presence) and frequent short-term contact with rams on resumption of postpartum ovarian activity in Saint Croix ewes. As these alternatives may be included in farm management, a complementary aim was to determine if restricted suckling affected lambsí responses at weaning.

2. Materials and methods

This study was approved by The Code of Ethics for experiments of the Universidad Autónoma del Estado de Morelos, Mexico.

2.1. Location

The study was carried out in Cuernavaca, Mexico (18°58′N and 99°13′W, 1804 m above sea level) from September to November 2013. The climate is dry and warm with a rainy season from May to October.

2.2. Animals and general management

Lambing was carefully recorded four times per day, and 50 multiparous Saint Croix ewes (2–4 years of age) that lambed during a 6-day period were used for the study. From these, 20 had singletons, 24 twins and 6 triplets. Ewes and lambs were identified by painting large numbers on their flanks. Ten days after lambing, ewes weighed 55 ± 5 kg (mean ± SEM), and were assigned to one of six treatments in a 3 × 2 arrangement, balancing groups according to body weight and litter size.

All animals had calm temperaments, and were habituated to handling and human presence, having experienced people walking around them every day since lambing.

2.3. Postpartum management

Ewes received 1 kg/animal/day of a commercial concentrate (14% protein; Nü3, Mexico), plus alfalfa and Taiwan grass chopped hay in a 30:70% of the total food amount, respectively, to cover lactation requirements. They had free access to salt and water. High-quality concentrate (16% protein; Nü3, Mexico) was available for all lambs from 10 days of age through a creep-feeding system.

All lambs were weaned at 60 days of age by moving them to a different pen (1.0 m^2/lamb), avoiding physical and visual contact with their mothers.

2.4. Experimental treatments

Ewes were allocated to three suckling treatments: continuous suckling (CS), restricted suckling (RS), restricted lamb presence (RP). Ewes from each treatment were allocated to groups that had full contact with a ram (TR) or remained physically isolated from rams (IR). Therefore, overall, there were six groups with 2 factors: CS-IR (n = 7) CS-TR (n = 7); RS-IR (n = 11); RS-TR (n = 11); RP-IR (n = 7), and RP-TR (n = 7). Ewes with triplets and twins were evenly distributed among groups. Each group was housed in a separate pen (30 m^2).

In the RS treatments, nursing was prevented by covering the udder of the ewe with a net that was fixed to the back of the animal (Schichowski et al., 2008). The udder was left uncovered for 30 min twice daily, from 08:30 to 09:00 h and from 16:30 to 17:00 h. In RP treatments, lambs were moved to an isolated pen (4 × 3 m) approximately 30 m from their mothers, and were only with their mothers to suckle for 30 min, twice daily. From 08:30 to 09:00 h and from 16:30 to 17:00 h. During separation, no visual contact between ewes and lambs was possible, and high quality concentrate with 16% protein and water were offered to the lambs *at libitum*.

In TR groups, a ram fitted with an apron was introduced to the pen for 30 min twice daily, from 08:00 to 08:30 and from 16:00 to 16:30. Rams were alternated sequentially among pens to avoid habituation, and remained the rest of the time in a pen 20 m away from the ewes.

2.5. Determination of postpartum rebreeding

Blood samples were collected from ewes in evacuated glass tubes by venipuncture of the jugular vein at 17:00 h twice weekly from 10 to 60 days postpartum. All samples were immediately identified, cooled and held in ice water until serum separation by centrifugation at 3500 rpm for 15 min within 40 min of collection. Serum samples were frozen at −20 °C until analyzed. Serum progesterone concentration was determined in samples from days 10–60 by radio-immuno-analysis, using a direct solid phase RIA kit (Coat-A-Count TKPG, Siemens, Diagnostic Products Corporation, Los Angeles, CA, USA). The detection limit of the assay was 0.06 ng/mL, the inter-assay coefficient of variation (CV) was 8% and the intra-assay CV was 12%. Progesterone concentrations above 1 ng/mL were considered indicative of a luteal phase (Huchkowsky et al., 2002); it was considered that a ewe could rebreed when two consecutive serum samples had progesterone concentrations over 0.5 ng/mL, or one sample had concentrations > 1 ng/mL (Thorburn et al., 1969).

2.6. Lambs' responses to weaning

Responses of lambs to weaning were recorded only in the lambs of the three IR groups, but not in the lambs from the groups stimulated by rams.

Lambs were weighed immediately before weaning and 2 days later (60 and 62 days after birth). To avoid the influence of previous body weight and to emphasize the growth rate corresponding to the first three days of weaning, growth rate was calculated under the following formula:

$$\text{growth rate} = \frac{\text{weight at day 62} - \text{weight at day 60}}{\text{weight at day 60}}$$

Blood samples were collected daily from lambs in nonheparinized evacuated glass tubes by venipuncture of the jugular vein at 17:00 h from days 61–63. All samples were immediately identified, cooled and held in ice water until serum separation by centrifugation at 3500 rpm for 15 min within 40 min of collection. Serum samples were frozen at −20 °C until analyzed for cortisol concentration by radio-immuno-analysis. The sensibility of the assay was 1.1 ng/ml, with intra- and inter-assay coefficients of variation of 3.7 and 4.2%, respectively.

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