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Nursing regimens: Effects on body condition, return to postpartum ovarian cyclicity in Santa Ines ewes, and performance of lambs

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ABSTRACT

The effects of nursing regimens on the body condition, onset of ovarian cyclicity postpartum and weaning weight of lambs were assessed in Santa Ines ewes. Thirty-two ewes were blocked according to parity, number of lambs, and body weight at lambing and within each block randomly allocated to treatments: continuous nursing (CN), controlled nursing (CN2) with two daily feedings for an hour after the 10th day postpartum, or early weaning (EW) with total separation from the lambs after the 10th day. The animals were evaluated from the 12th day postpartum until the first estrus or until 60th day. The dry matter and nutrients intake did not differ among treatments ($P > 0.05$) but did differ over time ($P < 0.01$). The weight, body condition score, serum concentrations of non-esterified fatty acids and prolactin, the percentages of ewes in estrus, of ewes that ovulated within 60th day and had ovulation silent, the period from lambing to estrus, ovulation and follicle with a diameter $\geq$5 mm and the maximum follicular diameter did not differ ($P > 0.05$) among the treatments. The percentage of ovulation until 30th day was greater ($P < 0.05$) in the EW group. The percentage of short luteal phases was higher in the CN2 and EW groups ($P = 0.07$) and normal luteal phases were higher in the CN group ($P = 0.01$). Lamb weight weaning was lower in the EW group ($P < 0.05$). It is possible to use CN to obtain lambing periods less than eight months in Santa Ines ewes, with the advantages of simpler management and higher lamb weaning weights.

1. Introduction

Reproductive seasonality is a hindrance to the production of meat and/or milk. The Santa Ines sheep stands out as an excellent breed with which to address this barrier. In addition to having high adaptive and productive value, it is also characterized as being non-seasonally polyestrous (Sasa et al., 2002) when nourished well, which enables the implementation of more than one mating season per year. The Santa Ines is considered to be one the most important breeds in Brazil and is the basis of most commercial herds; however, its production system still needs improvement to meet the demands of domestic and foreign markets.

With the intensification of sheep production systems, there is a need to reduce lambing interval to obtain three births in two years, which enables the production of more

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lambs throughout the life of an ewe. One important economic factor is the duration of postpartum anestrous, given that a minimal period between birth and the onset of ovarian cyclicity enables a new conception within a shorter period after lambing.

Several factors influence the return to postpartum ovarian cyclicity in ewes. Nutrition plays an important role in follicular development through a variety of endocrine, neural, and metabolic mechanisms and consequently influences the period from lambing until the first estrus and ovulation. Mbayahaga et al. (1998) suggested that weight loss is one of the main factors that limit the resumption of postpartum cyclic ovarian activity in Burundian ewes. Scaramuzzi et al. (2006) reported that adequate postpartum nutritional intake directly influences weight and body condition and promotes folliculogenesis.

The act of suckling interferes with the hypothalamic release of gonadotropin-releasing hormone (GnRH) (Pelletier and Thimonier, 1975), leading to the marked suppression of luteinizing hormone (LH) pulses (Smart et al., 1994). Sight and smell also play critical roles in developing the maternal-offspring bond, and the abolition of both senses attenuates the negative effects that nursing has on LH secretion (Montiel and Ahuja, 2005). In this context, the separation of offspring from their mothers can be useful in reducing the effects of nursing on reproduction and, therefore, the period between lambing and the first ovulation (Hernandez et al., 2009; Takayama et al., 2010). However, few studies have linked nursing to the interval from lambing to estrus and ovulation in Santa Ines ewes, and the results are inconsistent (Assis, 2009; Leite, 2010; Eloy et al., 2011). There is a lack of information available about the individual nutrients intake by ewes during this period, which is significant because lactational anestrus is even more evident when nutrition is poor (Gordon, 1997). The weaning weight of lambs subjected to different nursing regimes should be evaluated, too, because it is not desirable to have impairment in their development.

The aims of this study were to evaluate the effects of continuous nursing, controlled nursing, and early weaning on the body condition, return to postpartum ovarian cyclicity in Santa Ines ewes, and weaning weight of lambs. The effect of these treatments on changes in prolactin serum concentration was also assessed. The hypothesis that decreased nursing duration can anticipate the first postpartum estrus and ovulation in Santa Ines ewes was tested.

2. Materials and methods

Experiments were conducted at the Sheep Production Unit of the Department of Animal Science, Federal University of Lavras (Universidade Federal de Lavras – UFLA), Minas Gerais, Brazil, latitude 21°14′43 south, longitude 44°59′59 west at 919 m of altitude, from March 2010 to January 2011. The project was approved by the Committee on Animal Research and Ethics of the Federal University of Lavras, which was registered under the protocol number CEUA/UFLA 042/10.

2.1. Installations and pre-experimental management

Fifty-one Santa Ines ewes were used. The animals were in good health and were treated for worms and vaccinated against clostridial diseases. They weighed 50.3 ± 6.6 kg and had body condition scores (BCS) from 3.0 to 3.5 (where, 0 = emaciated and 5 = very fat; Gordon, 1997).

The estrus was synchronized with an intravaginal sponge impregnated with 60 mg of medroxyprogesterone acetate (Progespon, Sintex S.A., Buenos Aires, Argentina) and left in for 11 days along with an intramuscular injection of 250 IU of equine chorionic gonadotropin (eCG) (Novormon, Syntex S.A., Buenos Aires, Argentina) and 50 μg of cloprostenol sodium (Ciosin, Coopers, São Paulo, Brazil) nine days after sponge insertion. Estrus signs were monitored twice daily (at 6–7 a.m. and 5–6 p.m.) with the aid of teasers, beginning 12 h after the sponges had been removed. Ewes in estrus were mated with three Santa Ines rams. Pregnancy diagnosis was performed 35 days after mating by transrectal ultrasound (SSD-500, Aloka Co. Ltd., Japan) with a 5 MHz linear transducer. The percentage of ewes in estrus, the conception rate, and the prolificacy were 94% (48/51), 69% (33/48) and 1.27 ± 0.07 lambs, respectively.

During the last month of gestation, the ewes were confined in a collective pen and received a complete diet twice daily (Table 1) that was prepared according to the NRC (2007) to meet their nutritional requirements. The orts were weighed daily to adjust the amount of food offered, allowing at least 10% leftovers. Water was supplied *ad libitum*.

2.2. Experimental design and treatments

One ewe was removed from the study due to the death of the lamb at beginning of the trial period. The remaining

Table 1
Ingredient and nutrient composition of the diet that was given to ewes pre- and postpartum.

Ingredients	Ratio (% DM)	
	Prepartum	Postpartum
Corn silage	73.5	63.7
Soybean meal	7.0	22.2
Corn meal	17.3	12.1
Minerals[a]	2.1	2.0
Chemical composition		
DM[b] (% of as fed)	43.1	41.8
CP[c] (%DM)	12.4	19.1
NDF[d] (%DM)	35.3	29.4
Ash (%DM)	8.6	6.8
EE[e] (%DM)	4.2	5.1
NFC[f] (%DM)	39.5	39.6

[a] Minerals (Vacci-phos for sheep without copper, Vaccinar, Belo Horizonte, Brazil): 155.0 g Ca; 85.0 g P; 5.0 g Mg; 15.0 mg S; 140.0 g Na; 3500.0 mg Zn; 5000.0 mg Mg; 42.0 mg I; 15.0 mg Se; 36.0 mg Co; 1000.0 mg F; and 1000.0 mg Mn.
[b] Dry matter.
[c] Crude protein.
[d] Neutral detergent fiber.
[e] Ether extract.
[f] Non-fibrous carbohydrate.
NFC = DM − (CP + NDF + EE + ash).