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Effect of estrus synchronization on daily somatic cell count variation in goats according to lactation number and udder health status

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ABSTRACT

Two repeated experiments were carried out in 2 different years to study the effect of estrus on somatic cell count (SCC) in dairy goats. In the first year, 36 Murciano-Granadina goats were used [12 primiparous and 24 multiparous; 22 healthy and 14 with an intramammary infection (IMI)] and, after a 6-d pre-experimental period, were divided into 2 groups according to lactation number, udder health status, SCC, and milk production. One group was kept as a control, whereas the other received an estrus synchronization hormonal treatment lasting 11 d. At 24, 48, and 72 h after cessation of the hormone treatment, goats were placed in contact with a buck to confirm that they were in estrus. For 32 consecutive days (6 pre-experimental, 11 in hormone treatment, and 15 post-treatment) the SCC per gland and udder were monitored in all animals. In the second year, we repeated the same experimental design using a total of 38 Murciano-Granadina breed goats (12 primiparous and 26 multiparous; 26 healthy and 12 with IMI). Throughout this experiment, milk yield and composition were also recorded daily for each goat. Upon termination of the hormonal treatment, the SCC in udder milk increased significantly in the treatment group compared with the control group over 3 consecutive days. This increase was observed for year (1 and 2), parity (primiparous and multiparous), and udder health status (healthy and IMI). The $\log_{10}$ SCC (cells/mL) increased from 5.5 ± 0.09 before estrus to 6.04 ± 0.09 during treatment; therefore, the geometric mean of the SCC increased 3.5 times during treatment. The maximum values obtained in healthy glands of primiparous goats (geometric mean = 0.37 million cells/mL) were lower than in healthy glands (1.1 million cells/mL) or infected glands (1.7 million cells/mL) of multiparous goats. The increase in SCC observed during estrus (200% increase in geometric means) could not be explained by the changes in milk production, which only fell by 13%. During estrus, the percentage of protein and dry matter in the milk also increased significantly. We concluded that it is necessary to consider the presence of estrus to correctly interpret milk SCC, as an indirect method for detecting IMI or as a commercial milk quality parameter.
Key words: somatic cell count, goat, estrus

INTRODUCTION

Milk SCC is commonly used in dairy cattle, sheep, and goats as an indirect detection method for IMI and, in bulk tank milk, as a commercial milk quality parameter (Bergonier et al., 2003; Paape et al., 2007; Pirisi et al., 2007). However, many works have reported that noninfectious factors affecting SCC are more important in goats than in other species (Paape et al., 2001; Gonzalo, 2005). Although plenty of information is available on the effect of main noninfectious factors, such as stage and number of lactation (Dulin et al., 1983; Kalogridou-Vassiliadou, 1992; De Crémoux et al., 1996; Luengo et al., 2004), other factors influencing SCC variability are not sufficiently described. For example, Wilson et al. (1995) found that 77% of individual milk SCC variability could not be explained on the basis of known infectious or noninfections factors.

Some works have indicated that estrus in dairy goats can induce a transient increase in SCC. This was observed under on-field conditions during the mating season (Lerondelle et al., 1992; Wilson et al., 1995; Calderini et al., 1996) and under experimental conditions in which estrus occurred naturally (Moroni et al., 2007) or was hormonally induced (Aleandri et al., 1996; McDougall and Voermans, 2002; Christodoulopoulos et al., 2008). Some authors (Paape et al., 2001) suggest that the increase in SCC associated with the presence of estrus could also be due to a decrease in milk production; however, McDougall and Voermans (2002) found that estrus increases SCC without a significant decrease in milk production.

Moreover, other aspects in the relationship between estrus and SCC in goat milk are not yet sufficiently clear. For example, no works studying whether the es-

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trus effect is different in primiparous goats compared with multiparous are available. Likewise, some controversy exists as to whether estrus may affect SCC differently depending on the health status of the gland. Thus, Bergonier et al. (2003) stated that estrus may cause a greater SCC increase in glands with IMI than in healthy ones, whereas McDougall and Voermans (2002) found no effects of estrus on milk SCC when healthy and IMI udders were compared; however, we must point out that the latter study was conducted with a low number of infected udders (n = 4 per treatment).

The aim of this paper is to examine whether estrus' effect on SCC is different in primiparous goats compared with multiparous goats or in healthy udders compared with IMI udders. Moreover, we intend to confirm that the increase in SCC during estrus cannot be explained by changes in the animals' milk production.

MATERIALS AND METHODS

Experimental Design

The present study was carried out at an experimental farm of the Polytechnic University of Valencia, using Murciano-Granadina dairy goats. Annual health checks done by official veterinary services showed that the farm was free from brucellosis, tuberculosis, *Mycoplasma agalactiae*, and caprine arthritis-encephalitis virus.

The experiment was repeated in two years, both in June and July, using a total of 74 goats in their third to fifth month of lactation. In the first year, 36 goats were used (12 in first lactation: 8 healthy and 4 with unilateral IMI; 24 in second lactation or higher: 14 healthy and 10 with unilateral IMI), which, after a 6-d pre-experimental period, were distributed into 2 balanced groups according to lactation number, udder health status, SCC, and milk production. One group received an estrus synchronization hormonal treatment, whereas the other received no treatment (control). The hormone treatment applied consisted of 11 d with polyurethane foam vaginal sponges impregnated with 30 mg of fluorogestone acetate (Sincropart, Ceva Salud Animal, Barcelona, Spain) and i.m. administration of 300 IU of equine chorionic gonadotropin (Sincropart PMSG, Ceva Salud Animal) and 0.5 mL of Enzaprost (synthetic analog of $PGF_{2\alpha}$, Ceva Salud Animal) 48 h before sponge removal. For 32 consecutive days (6 pre-experimental, 11 in hormone treatment, and 15 after sponge removal), the SCC per each gland and the whole udder were monitored in all animals. In addition, 6 health checks were also performed on each gland on experimental d −17, −13, −7, 0, 7, and 14, with d 0 being the final day of hormonal treatment (sponges removed at 1200 h). All infections were due to CNS, except one case caused by *Corynebacterium* spp. Estrus detection was carried out in all goats (estrus and control groups) 24 h after removing the sponges, and detection was repeated again at 33 and 48 h in the treatment group goats that showed no estrus symptoms. For estrus detection, goats were individually transferred to a pen with a buck, a doe being considered in estrus when she accepted mounting. In the first year, one primiparous and another multiparous goat from the control group, both initially healthy, suffered subclinical and clinical mastitis, respectively, during the hormone treatment, and were not included in the results.

In the second year, the previous design was repeated, using a total of 38 goats (12 in first lactation: 10 healthy and 2 with unilateral IMI; 26 in second lactation or higher: 16 healthy, 8 with unilateral IMI and 2 with bilateral IMI; all infections caused by CNS), of which 19 were allocated to the treatment group and the other 19 to control group, using the same criteria described for the yr 1 experiment. In addition, the production and composition (fat, protein, lactose, and DM) of the milk were also recorded daily for each animal. In the second year, the results for 3 goats from the treatment group were not taken into account: 2 because no estrus was detected (1 primiparous and the other multiparous, both infected) and 1 healthy multiparous goat that suffered an accident before sponge removal causing a sudden drop in milk production.

Management and Feeding of the Goats

Goats were machine milked once daily (0800 h) in a routine including machine stripping and dipping of the teats in iodine after teatcup removal. The milking parlor (2 × 12) had 6 clusters (Almatic cluster G50, Delaval Agri, Tumba, Sweden) and a milk pipeline at 1.0 m above the platform (midlevel). Milking parameters were set at a rate of 90 pulsations per minute, a vacuum level of 40 kPa, and a 60% pulsation ratio. In each experiment, all goats were permanently stabled and kept together in the same straw-bedded pen (available surface = 1.5 m^2/goat; feeder = 0.4 m/goat) and received the same feed offered per head (as-fed; commercial concentrate for lactating goats = 1.2 kg/d; alfalfa hay = 1.0 kg/d; citrus pulp = 2.0 kg/d; ad libitum barley straw). Water was freely available in the pens.

Measured Variables

Total daily milk (machine milk plus machine-stripped milk) from each animal was recorded using 3.5-L jars, graduated in 50-mL divisions (Esneder Ref. 90001, Industrias Berango S.L., Urduliz; Spain).