



Effect of restricted suckling on milk yield, composition and flow, udder health, and postpartum anoestrus in grazing Holstein cows

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ABSTRACT

The effect of restricted suckling on milk yield and composition, udder health, and postpartum anoestrus in dairy cows in pasture-based systems, was studied in 32 Holstein multiparous cows and their calves. At calving, each cow–calf pair was randomly assigned to one of two treatments: restricted suckling (RS) of the cows by her own or another calf, twice daily for 30 min or artificial rearing (AR) of the calves with milk obtained from the bulk tank, offered twice a day in buckets. Treatments were applied until week 8 after calving. The diet of the cows consisted of direct grazing in improved pastures, corn silage and a commercial concentrate which was offered at milking. Milk production and composition, udder health, body condition score of the cows, body weight and milk intake of the calves were measured weekly, and the first postpartum ovulation was determined three times a week by ovarian ultrasonography. Cows with RS management had a lower machine-milked milk yield (17.9 vs. 24.8 kg/d), a lower fat percentage (3.21 vs. 4.11%) and 4% fat-corrected milk yield (16.2 vs. 25.7 kg/d), and also a lower average milk flow (1.35 vs. 1.76 kg/min) than cows in the AR treatment. There was no effect of treatment on milk protein percentage or udder health as measured by milk electrical conductivity. The interval from calving to first postpartum ovulation was shorter in the AR cows than in the RS cows (18.5 vs. 21.8 days). The RS calves consumed more milk (7.2 vs. 5.4 kg/d), gained more body weight (0.813 vs. 0.656 kg/d), and had a higher body weight at weaning (84.3 vs. 73.3 kg) than AR calves. Restricted suckling of grazing dairy cows had a negative effect on machine-milked milk yield, fat percentage and 4% fat-corrected milk yield, but had no effect on udder health or on improved weight gain and body weight at weaning of the calves.

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1. Introduction

In intensive dairy production systems, calves are generally separated from their dams 1 to 3 days after birth. Female calves are artificially reared by bucket feeding of milk, in groups or individually, until weaning at about 40–70 days. Male calves are sold to fattening farms a few days after birth.

However, both male and female calves may be reared in the dairy farm for meat production as an alternative to diversify income, especially among smallholder farmers and when meat prices are high (Piñeiro et al., 1998). Milking cows along with restricted suckling after milking may be a viable alternative for raising calves, because they can achieve a higher milk intake than is normally recommended in systems with artificial rearing. Furthermore, this may allow to achieve faster growth rate and higher body weight at weaning (Margerison et al., 2002; Boonbrahm et al., 2004b). Furthermore, heifers reared under a restricted suckling system grow faster and thus can be bred and calved at an earlier age than

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those artificially raised (Bar-Peled et al., 1997). Also, there is increasing public concern regarding the negative effects on the welfare of the calf and the dam because of immediate separation after calving (Grøndahl et al., 2007).

In *Bos indicus* or *B. indicus* × *B. taurus* dairy cows, total milk production may be increased with restricted suckling in comparison with non suckled cows, while machine-milked milk is not affected (Margerison et al., 2002) or is even increased (Combellas et al., 2003; Fröberg et al., 2007). In *B. taurus* cows, total milk production may also increase with restricted suckling but machine-milked milk is decreased, probably due to inefficient milk ejection (Bar-Peled et al., 1995; de Passillé et al., 2008). Udder health is not affected (Fulkerson et al., 1978; Thomas et al., 1981) or is improved (Boonbrahm et al., 2004a; Fröberg et al., 2008) in cows being suckled and milked simultaneously. The effect of restricted suckling on reproductive performance of cows is inconsistent, with some experiments reporting an increase in the length of the interval from calving to first postpartum (PP) ovulation (Thomas et al., 1981; Little et al., 1991), especially when cows are suckled by their own calf (Margerison et al., 2002), while others reported no effect of restricted suckling on the reinitiation of PP oestrus activity (Msanga and Bryant, 2003).

Most research on restricted suckling has focused on *B. indicus* or *B. taurus* dairy cows or their F1 under stabled conditions, and information regarding *B. taurus* cows like Holstein under grazing conditions, where the interactions between mother and offspring may be different, is scarce. Therefore, the aim of this experiment was to study the effect of restricted suckling on yield, composition, milk flow during milking, and udder health of high-producing grazing dairy cows in early lactation. Moreover, the overall performance of the calves in relation to the two systems was evaluated. The hypothesis was that a system with restricted suckling would decrease milk yield during milking and increase the interval from calving to first ovulation, but would increase calf performance.

2. Materials and methods

The experiment was carried out at the Experimental Dairy Farm of “La Estanzuela” of the National Agricultural Research Institute (INIA), in Colonia, Uruguay (S 34°29', W 57°44'). Thirty two Holstein multiparous cows (between 2 and 5 lactations, with previous lactation average milk yield = 6160 kg and average individual somatic cell count = 273,910 cells/mL, and with no previous history of clinical mastitis) calving between mid February and mid March (average body weight (BW) after calving = 565 ± 13 kg) with their respective calves were selected from the herd of the Experimental Dairy Farm. At calving, each cow–calf pair was randomly assigned to one of the following treatments: (1) Artificial Rearing (AR) of calves with milk offered in buckets twice daily, or (2) Restricted Suckling (RS) of cows by calf (own or from other cows) for 30 min 2 h after each milking. Treatments were applied until week 8 after calving.

2.1. Calf management

After parturition, calves remained with their respective dams for 24 h to allow an adequate colostrum intake, and after separation, they were assigned to their respective treatments. Calves were maintained during the experimental

period in two adjacent paddocks (20 × 30 m), one for each treatment group, with permanent access to fresh water.

Calves in the RS treatment were put with their dams daily, for 2 h after each milking (0800 and 1900 h), and allowed to suckle any of the 16 cows of the corresponding treatment twice a day, for 30 min. After week 6, suckling was allowed only after the morning milking. Calves in the AR treatment were fed individually twice a day in buckets with milk of the previous milking taken from the bulk tank; during the first 2 weeks of life they were offered 4 L per day (half at each feeding), and from weeks 3 to 7, 6 L per day. This resulted in a milk intake equivalent to 8–10% of calf BW, as suggested by the NRC (2001). After week 7, 3 L of milk per day were offered at 0800 h.

After the second week of life, calves in both treatments had access to a starter concentrate (Nutritrnera, Erro S.A., Dolores, Uruguay) which was collectively offered once daily at 0900 h, after removal of cows in the RS treatment. The allowance was increased from 0.25 kg (fresh basis) to 1 kg at a rate of 0.25 kg per week. All calves were weaned at 8 weeks of age, when daily intake of concentrate was at least 1 kg.

2.2. Cow management

At 21 days before expected calving, cows were moved to a paddock with native pastures and permanent access to fresh water, and were offered 8 kg (fresh basis) of corn silage daily. When the calves were separated from their dams after calving, each cow was assigned to the respective treatment.

Cows were milked twice daily (0600 and 1700 h), and the feeding regime was the same for both treatments. At each milking, cows were individually offered 3 kg (fresh basis) of a commercial concentrate (Tamberina FP 18, Erro S.A., Dolores, Uruguay). After the morning milking, all of the cows were moved to two paddocks (one for each treatment) and were collectively offered 12 kg (fresh basis) of corn silage per cow per day. After 2 h, RS cows were moved to another paddock where they joined their calves, and remained with them for 30 min as previously described. Once the calves were removed, all of the cows were moved to a paddock and grazed as a single group in strips of improved pastures of a mixture of grass (*Festuca arundinacea*) and legumes (*Trifolium repens*, *Lotus corniculatus*, *Medicago sativa*) with a daily forage allowance of 18 kg DM per cow, until the afternoon milking. The areas were limited by electric fences, and a new strip was provided every day. After the afternoon milking the cows followed the same routine described for the morning milking. After the afternoon suckling of RS cows, all of the cows were again moved to the same pasture until the morning milking. Cows had access to fresh water at pasture and commercial vitamin–mineral blocks (Foser 100, Erro S.A., Dolores, Uruguay) after each milking.

2.3. Measurements

All calves were weighed at birth and on two consecutive days every week, before the morning milk feeding or suckling in AR and RS calves respectively, with a Ruddweigh 200 scale (International Scale Co. Pty. Ltd., Guyra, Australia). Milk intake of RS calves was determined by the differences in body weight before and after suckling as described by Beal et al. (1990).

Daily machine milk yield was recorded with Metatron milk meters (Westfalia, Elk Grove Village, IL, USA) from day

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