



## Short communication: Use of a mechanical brush by Holstein dairy cattle around parturition

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### ABSTRACT

Grooming is a normal behavior that may contribute to relief of stress. The purpose of this study was to investigate the effect of access to a mechanical brush on auto-grooming behavior in parturient cows. The hypothesis was that cows would increase the total time spent scratching using the brush if they had access to a brush around the time of calving, whereas auto-grooming would be lower for the brush group compared with the no-brush group. The use of a mechanical brush was analyzed both in a group-housed pen (72 to 48 h before calving) and in an individual maternity pen (6 h before to 6 h after calving) in 16 multiparous Holstein cows. In the maternity pen, cows were randomly assigned to have access to the brush or not. The provision of a mechanical brush in the individual maternity pen did not change the amount of time spent auto-grooming but cows did use the brush before calving and after the calf was removed. Despite being housed in pens containing a brush, cows failed to use it when the calf was present. However, cows with access to a brush spent more time licking their calves in the first hour postcalving ( $\beta = 8.7$  min; 95% confidence interval: 1.5, 15.8) than cows that did not have access to a brush. Regardless of treatment, cows increased the time spent auto-grooming and scratching following separation of their newborn calf ( $\beta = 1.4$  min; 95% confidence interval: 0.46, 2.3 and  $\beta = 0.07$  min; 95% confidence interval: 0.02, 0.12, respectively). Further research is warranted to investigate possible benefits of mechanical brush devices at the time of calving, particularly for cows that experience difficult calving and require manual or mechanical assistance.

**Key words:** animal welfare, cow comfort, maternal behavior, grooming

### Short Communication

Researchers have shown that grooming activity is an innate behavior in most animal species, and grooming one's own body is called auto-grooming (Spruijt et al., 1992). Studies have shown a decrease in auto-grooming in animals when they are sick or in pain (Hart, 1988; Kruk et al., 1998; Anil et al., 2005). Another study has shown an increase in auto-grooming following the injection of adrenocorticotrophic hormone in rats (Van Erp et al., 1994). Cattle put in social isolation or deprived of the ability to lie down increased their auto-grooming frequency (Munksgaard and Simonsen, 1996).

Mid-lactation dairy cows in tie-stalls have been shown to spend, on average, 5 min/d either auto-grooming or scratching themselves against walls and fixtures in a stall (Munksgaard and Simonsen, 1996). Georg and Totschek (2001) concluded that mechanical brushes available in an intensive housing system promoted natural grooming behavior in lactating dairy cattle. DeVries et al. (2007) found that installation of mechanical brushes in freestall pens increased the time spent performing scratching behaviors using the brush in mid-lactation cows, especially in hard-to-reach places by the cow, such as the neck, back, and tail, while decreasing the scratching behavior on pen objects, such as the wall and water trough. It has been suggested that grooming is a way to cope with physiological stress (Spruijt et al., 1992; Van Erp et al., 1994). If so, providing a mechanical brush might help the cow cope with stressors associated with parturition.

Parturition in mammals is associated with a peak in corticotropin-releasing hormone leading to a peak in cortisol levels (Smith, 2007). Elevated corticotropin, adrenocorticotrophic hormone, and cortisol levels have been shown to be associated with increased auto-grooming. It follows that periparturient cattle may demonstrate increased auto-grooming (van Erp et al., 1994; Munksgaard and Simonsen, 1996; Kruk et al., 1998). Evidence suggests that a large proportion of cows perform grooming (self-licking) behavior during the first stage of labor (87% of cows and 70% of heif-

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ers; Wehrend et al., 2006). Providing cows access to a mechanical brush around calving may help to meet a behavioral need.

The suite of maternal behaviors associated with the birth of the newborn calf is extensive, with licking of the calf being one of the most important from the calf's perspective (reviewed by von Keyserlingk and Weary, 2007). To our knowledge, no work to date has addressed the effects of providing cows access to a mechanical brush in the maternity pen on the expression of maternal behavior.

The primary aims of this study were to describe auto-grooming and scratching behaviors in the periparturient period and to determine if provision of a mechanical brush would alter auto-grooming and scratching behaviors on pen objects in the maternity pen. A secondary aim of this study was to determine if access to a mechanical brush in the maternity pen affected licking of the newborn calf, an important maternal behavior.

Twenty-two multiparous (parity =  $3.6 \pm 1.7$ ; mean  $\pm$  SD) nonlactating Holstein cows in late pregnancy were enrolled in this study, which was conducted at the University of British Columbia's Dairy Education and Research Centre (Agassiz, BC, Canada). All animals were cared for according to the guidelines of the Canadian Council on Animal Care (2009). All cows entered the prepartum pen at a target of  $25 \pm 2$  d before their expected calving date where they were housed in groups of 12. Each pen contained 12 freestalls with a mattress (Pasture Mat, Promat Inc., Woodstock, ON, Canada) covered with 5 cm of sand bedding. Prepartum cows in the group-housed pens and individual maternity pens were fed twice daily at approximately 0800 and 1600 h. The diet was a TMR provided ad libitum, consisting of 21.3% corn silage, 42.8% alfalfa hay, and 35.9% concentrate and mineral mix on a DM basis (DM:  $50.8 \pm 1.2\%$ , CP:  $14.4 \pm 1.0\%$  of DM, ADF:  $35.0 \pm 2.7\%$  of DM, NDF:  $45.6 \pm 2.6\%$  of DM, and  $NE_L$ :  $1.4 \pm 0.1$  Mcal/kg). In the prepartum pens, cows were fed through a headlock feed barrier, with one headlock per cow spaced at 60 cm on center. Postpartum, cows were fed a TMR consisting of 21.3% grass silage, 14.7% corn silage, 12.3% alfalfa hay, and 51.7% concentrate and mineral mix on a DM basis (DM:  $51.1 \pm 1.8\%$ , CP:  $17.7 \pm 1.0\%$  DM, ADF:  $23.7 \pm 1.4\%$  DM, NDF:  $36.1 \pm 1.8\%$  DM, and  $NE_L$ :  $1.7 \pm 0.02$  Mcal/kg). Pens had vulcanized rubber floors in the alleys and crossovers (Red Barn Dairy Mat, North West Rubber Mats Ltd., Abbotsford, BC, Canada). A mechanical brush (Lely Luna, Lely Industries, NV, Maassluis, the Netherlands) was installed in the alley between the feed bunk and the stalls of the prepartum pen to allow cows to habituate to it. The brush was present at all times for all cows while they were in the prepartum group pen.

At the first signs of imminent calving, such as udder enlargement, milk let-down, relaxation of sacrosciatic ligament, and increased restlessness (Huzzey et al., 2005), abdominal contractions, mucus discharge from the vulva, or raised tail, cows were moved to 1 of 2 adjacent individual maternity pens (3.5 by 4.6 m) containing a sand-bedded pack. The 2 maternity pens were each fitted with a mechanical brush identical to those in the prepartum pens. The brushes were located midway along the same side of each pen in such a way that they could be either fixed in place to allow cows within the pen access to the brush or lifted and rotated out of the pen so that they were no longer accessible by the cow housed in the maternity pen. In the latter case, visual contact of the brush was also prevented by completely covering it with a cardboard box. To control for any potential pen effects, we repositioned the brushes within each pen once a week, with the 2 maternity pens always being on alternate treatment (brush versus no brush). Cows were randomly assigned to pens with or without a brush. Animals remained in the maternity pens for 24 h after calving. Calving scores were allocated as 0 = unassisted (eutocia) or 1 = assisted manually (dystocia). Cows that had twins were mechanically assisted with a calving jack, and those that had a Caesarian section were excluded ( $n = 3$ ). Three cows in the brush group were removed from the statistical analyses. For 1 cow, the brush was too high to reach. In the case of the other 2 cows, video footage was missing following calving. Thus, the brush group included 7 cows and the no-brush group included 9.

Behavior of the cows in the precalving pen and maternity pen was recorded using 24-h video surveillance with a wide-angle camera lens (Super Dynamic III Panasonic camera, WV-CP484, <http://www.panasonic.com>), connected to a recording system (UVS 1240E2, GeoVision Inc., USAVisionSys, Irvine, CA). In the prepartum pen, individual animals were identified by their hide pattern, or by previously hair-dyed symbols from another trial 2 to 3 mo before this trial, to determine if they used the brush (and if the habituation to the brush was successful, by using the brush for at least 1 min continuously). Brush use was defined when the cow first touched the brush until the cow moved away, no longer touching the brush. The total time spent using the brush during the period from 72 to 48 h before calving (defined based on the actual time of delivery of the calf) was determined from video. In the maternity pen, video was used to measure auto-grooming (i.e., self-licking), rubbing/scratching (when the cow rubbed against the walls or fixtures of the pen, i.e., pen objects), and the use of the mechanical brush (when it was present in the pen). The periods while cows were housed in the maternity pens during which the auto-

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