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The level of social contact affects social behaviour in pre-weaned dairy calves

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ABSTRACT

The present study investigated the effects of the level of social contact in the home environment on the social preference, bonding and social behaviour of pre-weaned dairy calves. Twenty-seven pairs of calves were reared from birth until 6 weeks either individually (with limited social contact between bars; *L*-calves), in pairs (with full social contact; *F*-calves), or individually for 3 weeks and in pairs for the next 3 weeks (*LF*-calves). At 5 weeks of age the bonding between calves in a pair was evaluated by measuring their response to separation and the subsequent reunion in the home environment. The following day the social preference was evaluated in a triangular test arena where the calves could choose between the companion and an unfamiliar calf. Finally, at 6 weeks of age the response of the calves to a novel arena, alone and with the companion, was measured. During separation in the home environment *L*-calves spent more time being inactive (*F*: 779 ± 65, *LF*: 731 ± 69, *L*: 975 ± 65 s; $P = 0.04$) compared to *LF*-calves and *F*-calves. During the preference test more *F*-calves approached the companion before the unfamiliar calf, while more *L*-calves approached the unfamiliar calf first (*F*: 8/9, *LF*: 4/9, *L*: 1/9; $P < 0.01$). *F*-calves and *LF*-calves spent more time with the stimuli calves (*F*: 239 ± 42, *LF*: 241 ± 46, *L*: 90 ± 45 s; $P < 0.01$) and performed more social sniffing/licking (*F*: 39 (C.I. 24–56), *LF*: 41 (C.I. 26–61), *L*: 14 (C.I. 6–26) s; $P < 0.01$) than *L*-calves. When tested with the companion in a novel arena, more *L*-calves performed social pushing and mounting compared to *LF*-calves and *F*-calves (*F*: 3/8, *LF*: 2/8, *L*: 8/8; $P < 0.01$), but there was no difference in the duration of social sniffing and licking. In conclusion, these results indicate that calves raised with full social contact (either from birth or from 3 weeks of age) establish a stronger bond with their companion than do calves housed with limited contact.

1. Introduction

Dairy calves are often separated from the cow within 24 h of birth, and housed individually for either part of or all of the milk feeding period with only limited or no social contact with peers. Individual housing is thought to help control disease, abnormal sucking behaviour and feed intake. Social isolation is, however, stressful for calves (Creel and Albright, 1988; Raussi et al., 2003), and may prevent the learning of essential social skills needed to cope with the group environment that all dairy cattle are subjected to later in life (Broom and Leaver, 1978; Veissier et al., 1994). Furthermore, several of the issues addressed by housing the calves individually may be solved by other means. For instance, health risks may be reduced by raising calves of similar age in small groups (Chua et al., 2002; Svensson and Liberg, 2006; Svensson et al., 2003). Abnormal sucking behaviour may be reduced by providing the calves with higher milk allowances (Jung and Lidfors, 2001) from sources that allow the performance of

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sucking behaviour (de Passillé, 2001; Jensen and Budde, 2006; Veissier et al., 2002), and barriers between teat buckets (Jensen et al., 2008) or surrounding the milk feeder (Weber and Wechsler, 2001) are effective in reducing the competition for milk in calves raised in groups.

Current EU law states that calves that are housed individually must be able to see and touch other calves through openings in the separating barriers (EU Council, 1991). The question is whether this limited form of social contact is enough for calves to develop normal social behaviour.

We know from earlier studies that calves have a high motivation for full social contact (Holm et al., 2002), and that the presence of a companion, especially a familiar companion, has a calming effect in various stressful situations (e.g. Færevik et al., 2006; Grignard et al., 2000; Takeda et al., 2003). In addition, providing calves with a social companion from birth may result in the development of a stronger bond (Raussi et al., 2010; Reinhardt et al., 1978). However, in earlier studies calves were housed individually, in pairs, or in groups during the entire milk feeding period, and the effect of age at introduction to full social contact in preweaned calves has not been addressed.Thus, the aim of this study was to investigate the effect of the level of social contact provided, as well as the effect of age at introduction to full social contact on the social bond between calves, the social preference of the calves and the calming effect of a familiar social companion. This was done by conducting three different behavioural tests on calves reared with a companion from birth, reared with a companion from 3 weeks of age, or reared individually with a companion in an adjacent pen with openings in the separating barrier that allowed limited contact.

2. Materials and methods

The present study complied with the ISAE guidelines for ethical treatment of animals in applied animal behaviour research (Anonymous, 2002).

2.1. Animals and housing

The study took place at the cattle research facilities at Research Centre Foulum, Aarhus University, Denmark. Fifty-four Holstein-Friesian calves (nine blocks of six calves) born from mid-September to the end of October 2008 (block one to four), and from mid-December 2008 to beginning of February 2009 (block five to nine) were paired according to the date of birth irrespective of the sex of the individual calves (29 heifers and 25 bulls). Each pair consisted of a test calf (the youngest) and a companion with an age difference of maximum 2½ days. The calves in a pair were either housed together in the same pen, or individually in adjacent pens according to treatment. All pens had sides made of vertical metal bars (bar diameter: 2.5 cm; distance between bars: 10 cm) and were straw bedded. An empty pen between each pair ensured that the calves on all treatments were physically, but not visually and acoustically, isolated from other pairs. Space allowance was 2.25 m^2/calf in both single pens (1.5 m × 1.5 m), and pair pens (1.5 m × 3.0 m).

The calves were separated from the cow, and fed 4 l of colostrum from a bottle within 6 h of birth. Over the next 3 days they were fed 3 l of colostrum twice a day (at 6:00 am and 5:00 pm), and from day 4 to day 42 the colostrum was replaced by whole milk fed via teat buckets. During milk feeding a 55 cm high barrier that protruded 50 cm into the pen was placed between the two teat buckets in paired pens to minimize competition over milk. Calves had free access to water, calf starter and hay throughout the study. Fresh straw bedding was supplied each day between 9:00 and 10:00 am.

Artificial lights were on in the barn from 6:00 am to 10:00 pm. Temperature and humidity (averaged ± S.D.) fluctuated according to overall weather conditions 7.6 ± 2.7° C and 80.2 ± 8.3%.

2.2. Treatments

All test calves entered the study at the time of separation from the cow. Companion calves experienced a short pre-experimental period (equal to the age difference) where they were housed in a single pen without contact with any other calf.

As the calves were born over the course of the study, they were paired and distributed equally on three different housing treatments. This was done according to a predefined block design: each block consisted of three pairs (one from each treatment) and the order of the treatments within the block was randomised. The three treatments were: (1) limited contact (*L*): the calves were housed in adjacent single pens for 6 weeks; (2) limited-to-full contact (*LF*): the calves were housed in adjacent single pens for the first 3 weeks after which the partition between the single pens were removed and the calves shared a pair pen for the next 3 weeks or (3) full contact (*F*): the calves were housed in a shared pair pen for 6 weeks.

The age difference between the oldest and youngest calf in a block was 4.8 ± 1.6 days (mean ± S.D.).

2.3. Behavioural tests

The dates for the behavioural tests were set according to age of the youngest calf in each block, and the three types of tests were conducted in the order listed below. The three pairs in a block were tested on the same day, and the order of testing followed the age of the calves with the older calves being tested first. All test sessions started at 10:30 am. The same people handled the calves during the entire experiment.

2.3.1. Separation test

The separation test was conducted when the youngest calf in the block was 35 ± 1.7 days old (mean ± S.D.). The reaction of the calves to separation from the companion was assessed by leading the companion calf into a test arena in an adjacent barn, while leaving the test calf alone in the home environment. The calves were separated for 20 min during which an observer recorded the behaviour (Table 1) of the test calf continuously using a hand-held computer (Workabout, PSION PLC, UK). After the separation the companion was returned to the home pen and the