J. Dairy Sci. 101:1–6
https://doi.org/10.3168/jds.2017-14361

Short communication: Pair housing dairy calves in modified calf hutches

L. Whalin, D. M. Weary, and M. A. G. von Keyserlingk[1]
Animal Welfare Program, Faculty of Land and Food Systems, University of British Columbia, Vancouver, Canada, V6T 1Z4

ABSTRACT

The objective of this study was to test if body weight (BW) and starter intake increased and reaction to novelty decreased for preweaning Holstein heifer calves pair housed in modified hutches (n = 8 pairs) versus individually housed in a single hutch (n = 14 calves). Calves were alternately assigned to housing treatment at d 5 of age. Cross sucking was recorded in 5-min scans for 30 min after milk feeding once per week over 14 wk. Calf health and BW were measured weekly from birth until approximately 88 d. When calves were 60 d old they underwent a food neophobia test where they were exposed to a novel feed for the first time. Cross sucking was observed only 5 times (in 4 different pairs) over the entire milk-feeding period. Pair-housed calves ate more starter than individually housed calves [0.89 (0.72–1.08) vs. 0.48 (0.42–0.56) kg/d; median and confidence interval], these calves also consumed 2.6 times more novel feed in the neophobia test (150 ± 27 vs. 58 ± 20 g/30 min). We observed no effect of treatment on BW. We concluded that social housing in modified hutches promotes solid feed intake and decreases fearfulness in dairy calves.
Key words: welfare, group housing, behavior, neophobia

Short Communication

Dairy calves are often housed individually; the USDA (2016) reports that approximately 70% of US farms house preweaning heifer calves individually. Across all farm types, outdoor hutches or pens were the most common housing for preweaning heifers, with 40% of respondents indicating that they used hutches (USDA, 2016). However, raising calves in small groups provides welfare benefits without impairing calf health (Costa et al., 2016). Compared with individual housing, group housing results in decreased vocalizations at weaning (Bolt et al., 2017), higher solid feed intake during the milk-feeding period (Bernal-Rigoli et al., 2012), and increased play behavior (Valníčková et al., 2015). These effects may be due to improved social skills and social buffering that helps mitigate the negative effects of stressful events (Boissy and Le Neindre, 1997). At weaning, calves are often exposed to several stressors simultaneously, including a diet change (Khan et al., 2011) and movement to a new pen (Pettersson et al., 2001). During this time, individually reared calves also experience their first physical contact with another calf.

The results of 2 recent studies suggest that pair housing with hutches may provide some benefits and be a feasible option for farmers (Pempek et al., 2016; Wormsbecher et al., 2017). However, those studies did not investigate the effects of pair housing on solid feed intake or reaction to novelty and were conducted on research farms. The aim of our study was to assess differences in performance and response to novelty between pair versus singly housed calves in hutches on a commercial dairy. We predicted that pair-housed calves would have greater starter intake, improved BW gains, and increased intake of novel feed.

This study took place on a commercial dairy farm located in Abbotsford, British Columbia, Canada, from May to December 2016. All procedures were approved by the UBC Animal Ethics committee under protocol #A14–0245. Thirty female Holstein calves were separated from their dam and fed 4 L of colostrum replacer (Calf's Choice TotalTM HiCal, The Saskatoon Colostrum Company, Saskatoon, SK, Canada) within 6 h of birth. At 24 h, serum proteins were analyzed with an optical refractometer (Sun Instruments Corp., Torrance, CA); only calves with serum protein levels above 5.4 g/dL were enrolled into the experiment. At d 5, calves were assigned to either individual housing (n = 14 calves) or pair housing (n = 8 pairs) based on birthdate and BW.

Individual calves were housed in hutches (2 × 1.2 m) that included an outdoor space (1.8 × 1.2 m). Paired calves were provided access to 2 of the same hutches and a shared outdoor space (2.9 × 1.8 m). Calves were weaned, on average, at 60 d and were then moved to an indoor group pen (2.8 × 5.5 m) that housed up to 6 calves.

Received December 28, 2017.
Accepted February 17, 2018.
[1]Corresponding author: nina@mail.ubc.ca

Calves were fed from a nipple bottle High Performance Pro-Gro calf milk replacer (150 g DM/L; Grober Nutrition, Cambridge, ON, Canada; 22% CP, 17% crude fat, 0.15% crude fiber, on a DM basis) for 2 meals per day (at 0800 and 1630 h). From d 1 to 7 calves were fed 6 L/d and from d 8 to d 35 they were provided 10 L/d. At d 35, the daily milk ration was then reduced to 6 L/d over a 2-d period, and on d 58 milk volumes were further reduced such that weaning was completed by d 60. During the milk-feeding period, all pair-housed calves were observed for cross sucking once per week using 5-min scan sampling for 30 min immediately following the afternoon milk feeding during 14 observational weeks.

Throughout the experiment calves were also offered ad libitum hay and a medicated calf starter (LifeLine; Otter Co-op, Aldergrove, BC, Canada; 18% protein, 4% fat, and 9% fiber, medicated with decoquinate at 50 mg/kg, on a DM basis). Starter intake was recorded twice per week by disappearance; the amount of starter remaining was subtracted from the amount fed 24 h previously.

To account for effects of health on response measures, calves underwent a health check once per week (see Costa et al., 2015), recording temperature and signs of respiratory and digestive disorders. Body weight was estimated using a heart-girth tape (following Heinrichs et al., 1992). Respiratory health was assessed by visually inspecting nasal discharge, and a veterinarian or animal health technician listened for sounds of pulmonary infection during auscultation. On the day of examination, air temperature was recorded from a thermometer held inside the hutch. Diarrhea scoring followed De Paula Vieira et al. (2010), where 1 = normal feces, 2 = plaques but not watery, 3 = watery and body temperature <39.5°C, and 4 = watery and body temperature ≥39.5°C. All calves displaying signs of illness were subject to a full veterinary exam and treated according to standard operating procedures for the farm.

A food neophobia test, exposing calves to 900 g of novel feed (TMR), was performed at 60 ± 1 d of age; calves ranged from 52 to 69 d of age. The first 3 pairs and 1 individual were tested in the outdoor, wire enclosure in front of the hutch, which allowed calves to see each other (and thus potentially influence their responses); thus, the methodology was changed so that the rest of the calves were tested inside the hutch such that they could not see and were not visible to other calves when eating. In the case of pair-housed calves, the combined hutch was separated during the test into 2 single hutches using a gate divider. Calves were individually given access to the novel feed for 30 min. The test bucket containing the novel feed was identical to that used for the routine feeding of calf starter and was placed in the same location of the pen. Behaviors during the test were recorded with a camera (Panasonic HDC, Osaka, Japan). The latency to approach the feed (muzzle <5 cm from the bucket) was recorded. The amount of novel feed consumed was measured by disappearance at the end of the trial.

All analyses were performed with SAS (version 9.4; SAS Institute Inc., Cary, NC) using pen (individual calf or pair) as the experimental unit. Intake of calf starter (kg/d), BW (kg), novel feed intake (g/30 min), and latency to approach the feed (s) were considered dependent variables. Treatment differences in starter intake and BW over the trial were analyzed using a mixed model (with an autoregressive covariance structure) that included pen (specified as subject), treatment, age, and an interaction between treatment and age. Starter intake was transformed using a natural log to normalize residuals.

Novel feed intake (g/30 min) was analyzed with the GLM procedure including age, treatment, and the interaction between age and treatment. Analyses were completed with all the calves and without the first 7 calves, as those calves had been tested in the outdoor area with visual contact; results were similar, so the entire data set was used. The distribution of latency to approach the novel feed could not be normalized by transformation, so a Kolmogorov-Smirnov test was used to analyze treatment differences. In this case, age and the interaction between age and treatment were not considered. Results are presented as least squares means and standard errors of the mean for BW and novel feed intake, and results of the back-transformed data for starter intake are presented as geometric means and confidence intervals. We report F-values in the format $F_{(\text{treatment df, error df})}$. Significance was declared at $P < 0.05$.

Age ($F_{1,139} = 380.58$; $P < 0.001$) and housing ($F_{1,20} = 26.93$; $P < 0.001$) both affected the amount of starter calves consumed (Figure 1 A), but we found no interaction between age and housing ($F_{1,139} = 1.67$; $P = 0.20$). Intake [geometric mean (95% CI)] over the entire experiment was higher for pair versus individually housed calves [0.89 (0.72–1.08) vs. 0.48 (0.42–0.56) kg/d]. Body weight increased with age ($F_{1,247} = 2334.22$; $P < 0.001$; Figure 1 B), but did not vary with treatment ($F_{1,20} = 1.08$; $P = 0.31$), and we observed no interaction between age and treatment ($F_{1,247} = 0.43$; $P = 0.51$). At weaning (measured at 63 ± 0.4 d of age), paired calves weighed, on average, 84.3 ± 1.27 versus 82.5 ± 1.37 kg compared to the individually housed calves. Five calves had fecal scores of 4 (1 individual and 4 pair-housed), but none exhibited fever. One calf (individually housed) displayed signs of respiratory infection. On 21