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Dairy calves' adaptation to group housing with automated feeders

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ABSTRACT

Group housing of dairy calves with automated milk feeders has likely welfare and labour saving advantages but delays in the calves adapting to the feeding system may reduce these advantages. We examined factors that influence calves' adaptation to the feeders. In Exp. 1, 77 Holstein calves were reared in individual "baby" pens with free access to milk from a teat attached to a bucket for 5–6 d after birth. Milk intakes and weight gains were recorded and accelerometers measured the time spent standing. After 6 d, the calves were introduced to group pens with automated feeders. Latency to the first voluntary milk ingestion, milk intakes and weight gains were recorded. In the group pens, approx. 70% of calves ingested milk during the first voluntary visit to the milk feeder, but a large variation was found in the latency to the first voluntary ingestion of milk (10–240 h). Milk intakes were significantly lower on the first day in the group pen than in the baby pens ($P < 0.001$) and milk intake over 14 d in the group pens was negatively correlated with the latency to the first voluntary milk intake in the group pen ($r = -0.29$, $P = 0.02$). Latency to the first voluntary milk intake in the group pen was negatively correlated with body weight at introduction to the group pen ($r = -0.25$, $P = 0.05$) and the duration of standing in the baby pen ($r = -0.30$, $P = 0.02$). In Exp. 2, 55 Holstein calves were housed for 8–14 d after birth either individually in single baby pens or as pairs in double baby pens (with milk supplied ad libitum through teats attached to buckets) and then transferred to group pens (as in Exp. 1). There were no differences between calves housed in single or double baby pens on the latency to first voluntary milk intake after group housing ($P > 0.10$). The latency to first voluntary milk ingestion in the group pens was negatively correlated with milk intake over 6 d in the group pens ($r = -0.38$, $P = 0.03$). When data from the two experiments were combined, latency to the first milk intake in the group pens was negatively correlated with age at time of introduction to the group pens ($r = -0.23$, $P = 0.009$) and duration of standing in the baby pens ($r = -0.21$, $P = 0.02$). There are large differences between calves in how quickly they learn to use automated milk feeders and a delay in learning to use the feeder is associated with lower milk intakes over 1–2 weeks. Pair housing immediately after birth did not help. Younger calves at the time of introduction are more likely to take longer to adapt than older calves but many 6 d old calves adapt quickly, especially those that show high vigour in the first week after birth.

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1. Introduction

Group housing of dairy calves with automated feeders is increasingly popular on commercial dairy farms because of a reduced need for labour (Kung et al., 1997), improved calf growth (e.g. Bernal-Rigoli et al., 2012; Hepola et al., 2006), because it allows for more natural feeding behaviour for the calves (i.e. calves can choose when and how much to eat and drink), and provides them with more opportunities for exercise and social behaviour (Bøe and Færevik, 2003; Hepola, 2003). However, poor management of groups with automated feeders can result in increased health problems (Svensson et al., 2006), and so there is a need to identify potential risks to calf welfare and develop optimal management strategies to reduce these risks.

On larger commercial farms, calves are continuously introduced to the group, creating a dynamic group structure, to which younger or newly introduced calves may have difficulties adapting. Jensen (2007) found that 6-d old calves required more training from the stockperson and had difficulty accessing the feeder than 14-d old calves. However, farmers prefer grouping calves as early as possible in order to reduce the labour of feeding. Little research has been done to examine how rapidly calves adapt to drinking milk from automated feeders, what the consequences are of a slower adaptation, or what factors may facilitate this adaptation.

The vigour of the calf after birth may be an important factor affecting their adaptation (Murray and Leslie, 2013). Calves that can stand for longer after birth are able to drink more colostrum (Vasseur et al., 2009). Usually, calves are kept individually for a few days after birth before being introduced into groups, but pair housing of calves prior to weaning (especially with an older companion) can increase the speed that calves learn to use automated grain feeders (De Paula Vieira et al., 2010, 2012). Recently, Duve et al. (2012) found that calves pair housed for 4 weeks after birth spent more time feeding in a feeding competition task than singly housed calves. Possibly, pair housing of calves during the days after birth may improve their ability to adapt to automated milk feeders.

In this study, we investigated some of the factors that might be associated with a quicker adaptation to automated milk feeders, both to ensure good animal welfare and to maintain the labour-saving advantages. We hypothesized that calves would adapt more quickly to the feeders if they were more active or drank more milk in the days after birth, were older, or were pair housed after birth and prior to group housing.

2. Material and method

All procedures met the requirements of the Canadian Council for Animal Care.

2.1. General housing and calf management

Holstein calves were born in individual calving pens and given 4 L of colostrum within 6 h after birth. Only calves with serum protein levels above 5.5 g/dL 24 h after colostrum ingestion were included in the experiment. Within 6 h of birth, calves were weighed and transferred to "baby" pens (single pen: 1.22 m × 2.44 m) with concrete floors and wood shavings bedding. Calves were allowed up to 12 L/d of pasteurized whole milk from cows from the farm (herd averages of 3.97% fat, 4.10% protein, 3.30% lactose from bulk tank samples), with 6 L delivered twice a day (approximately 09:00 h and 15:00 h) in a plastic bucket with a rubber teat attached to the front fence of the pen and connected to the bucket by a hose. In the baby pens, the calves were trained to suck from the teats by holding them up gently and guiding the teat into the mouth while allowing the calf to suck on the trainer's fingers. The calf was held in this position until it was seen to be sucking from the teat. An accelerometer (HOBO ware® version 3.3, Onset Computer Corporation, Bourne, MA, USA), attached to a hind leg with elastic tape, was set to record the leg orientation (vertical or horizontal) every 60 s in order to measure the time spent standing and lying (Ledgerwood et al., 2010).

At 5–6 d of age, calves were sedated with xylazine (T M Rompun, Bayer Inc., Animal Health, ON, Canada) and dehorned using caustic paste (Dr Naylor's, Morris, NY, USA) (Vickers et al., 2005). After dehorning, calves were transferred to 7 m × 4.68 m group pens with a sawdust-bedded resting area (4.47 m × 4.68 m) and plastic coated expanded metal floors (2.53 m × 4.68 m) in front of the automated milk and grain feeders (described in Sweeney et al., 2010). There were between zero and eight calves in the pen when the calves were introduced and group size was never greater than nine, with maximum age difference between oldest and youngest calves of 34 d. We used these small groups to reduce the risks of illness (e.g. Svensson and Liberg, 2006).

In the group pens, the calves were fed milk and starter feed from automated feeders, with both feeders controlled by a single computer (CF 1000 CS Combi, DeLaval Inc., Tumba, Sweden). The feeders were fitted with sensors that could identify each calf from its RFID ear tag. The teats in the milk feeders were of similar size, and material as those used in the baby pens. Calves were allowed 12 L/d pasteurized milk at 40 °C and had ad libitum access to a textured calf grain starter (CP = 17.9% on a DM basis, with the main ingredients being 16% wheat, 14% barley, 13% canola meal, 13% oats, 10% soya, 10% corn, and 4% molasses: Unifeed Ltd., Chilliwack, BC, Canada). Grass hay (DM = 90.8%; CP = 15.1%; NDF = 51.1%; ADF = 33.6%) and water were available ad libitum from automated feeders which weighed the intake of each calf at each meal (RIC, Insentec B. V. Marknesse, The Netherlands). Each feeding stall (142 cm × 100 cm for the milk and water feeders, and 94 cm × 50 cm for the grain and hay feeders) allowed access to only one calf at a time. Calf health was monitored every day in the individual pens and three times a week in the group pens according to a standard operation procedure, which involved checking for presence of diarrhoea, presence of nasal and ocular discharges, general state of the coat, and muzzle humidity (Borderas et al., 2009). All calves were weighed at birth, daily while in the baby pens, on the day of introduction and weekly thereafter. The calves were individually removed from the baby pens and the group pens for weighing.