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A method of outdoor housing dairy calves in pairs using individual calf hutches

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ABSTRACT

Interest in housing dairy calves in groups is currently growing. Group housing using individual calf hutches, a resource already available in most dairy farms in North America, could provide a novel housing method that can be a simple way to implement group housing on farm. The main objective of this study was to determine whether pair housing dairy calves in hutches outdoors would result in similar weight gain and milk intake compared with individual housing in hutches. The study was designed to avoid competition for resources (including milk and solid feed, teat, bucket, outdoor space, and hutch) to test a setup that has the potential to maximize performance and calf growth. Secondary objectives were to document how calves in both treatments use their environment in terms of time spent and behaviors performed in each area, how paired calves interact, and the time they spend together. Single calves ($n = 6$ /season) were housed in 1 hutch with an attached outdoor environment; paired calves ($n = 6$ pairs/season) were given twice the resources. Calves were fed up to 16 L/d of milk replacer. Daily milk intake and weekly weight gains were recorded. Behavioral observations were recorded live once per week for 5 (summer) or 4 (winter) nonconsecutive periods. Paired and single calves had similar weight gain (averaging from 1.1 to 1.3 kg/d across trials) and milk intake (averaging from 11.1 to 13.7 kg/d across trials), showing no difference in performance between treatments. Low occurrences of cross sucking (averaging from 0.1 to 0.4 bouts/h of observation per pen across trials) and displacements at the teat (0.8 to 1.4 bouts/h of observation per pen across trials) were found. All calves altered their behavior in some way to accommodate companions; paired calves were seen interacting and spending time together (i.e., lying in the same hutch), and in the summer trial

single calves spent less time lying inside the hutch than paired calves, presumably to have visual access to other calves. The solution of mixed indoor and outdoor housing environments tested as part of this study showed that calves make use of all spaces provided to them in winter and in summer conditions while maintaining good performance. Housing calves in pairs using individual hutches can be a suitable alternative to housing calves individually in hutches outdoors.

Key words: dairy calf, calf hutch, social housing, outdoor housing

INTRODUCTION

Dairy farmers in the United States and Canada still routinely house their replacement heifers individually either in hutches or in single pens (USDA, 2010; Vasseur et al., 2010), and calves typically have visual contact with one another (Marcé et al., 2010). Group-housed calves have been shown to have higher intakes of solid feed and improved BW gains compared with individually housed calves (Babu et al., 2004; De Paula Vieira et al., 2010) and are able to interact socially and perform natural behaviors such as social licking and play behavior (Sato et al., 1993; Faerevik et al., 2007; Jensen et al., 2008). This study examined whether it would be possible for producers to use existing individual hutches—a resource already available on most dairy farms—as an alternative to remodeling their calf barn to provide group housing for calves.

The social isolation that occurs with individual housing is thought to be stressful for calves and can prevent the learning of social behaviors (Duve and Jensen, 2011). Some studies have shown that individually housed calves have an impaired ability to socialize with other calves (De Paula Vieira et al., 2010; Jensen and Larsen, 2014). The increased social interaction found in paired housing can be beneficial to the calf with respect to learning social cues as well as adapting to future changes in the feeding system or environment (Costa et al., 2014).

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One reason why producers have shied away from group housing in the past is that cross sucking and competition at the feeder can occur. Cross sucking is a nonnutritive sucking behavior (Rushen and de Passillé, 1995) that can lead to hair loss and inflammation of the sucked area (Sambraus, 1980). However, cross sucking can be decreased when calves are allowed to suck for their milk or are able to redirect their sucking motivation to a dry teat on the wall (Veissier et al., 2002). Displacements at the teat can also be a problem with group housing, but this can be managed by providing more teats (von Keyserlingk et al., 2004). Some authors have looked at whether pair housing can yield improvements in calf welfare that are similar to the improvements group housing yields and found similar weight gains and milk intakes as in group housing (Cobb et al., 2014) and individual housing (Chua et al., 2002). As well, calves housed in pairs can benefit from the social contact provided by a companion (Meagher et al., 2015). Producers have already invested in hutches, so pair housing in individual hutches may be a way to provide social enrichment. Calves housed in hutches typically are tethered or enclosed in a small pen (Davis et al., 1954; Macaulay et al., 1995); raising them loose in a larger outdoor pen could provide them with spatial or physical enrichments. An enrichment can be considered as anything that helps prevent frustration in the animal or helps fulfill the animal's needs (Mandel et al., 2016). This outdoor area would allow calves to run more when paired together, provide multiple areas inside or outside the hutch for the animals, and provide the choice to have physical contact (Ninomiya and Sato, 2009). Much research has looked at the effect of hutch housing in summer (Moore et al., 2012; Carter et al., 2014; Friend et al., 2014); however, little research has examined outdoor hutch housing in winter. A previous experiment by Pempek et al. (2016) looked at Jersey calves allocated to individual or pair housing 1 hutch in both treatments regarding the number of calves, and restricted milk feeding; the experiment was conducted from late summer to mild Ohio winter. No difference in ADG between treatments or effect of temperature on calf performance was found, but numerous cross sucking and nonnutritive behaviors were observed in both treatments. As a very first step in building recommendations for outdoor housing in cold winter as experienced in Eastern Canada, some research has been conducted to test dairy cattle preference for the outdoors when the option is offered to animals in these climatic conditions. Krohn et al. (1992) reported that cows reduced their time spent outside during extreme adverse weather conditions and preferred to stay indoors when the temperature dropped below 0°C. However, Shepley et al. (2017) showed that dairy cows accustomed to

year-long outdoor access choose to spend a minimum of 1 h/d outdoors during Eastern Canadian winter conditions, even with cold temperatures and snow coverage, indicating that previous experience may play a role in cattle preference for being outdoors. Based on those investigations on adult cattle, the feasibility of a mix of indoor and outdoor environments in dairy calves should be tested in both winter and summer.

In this experiment we compared single and paired calves housed in hutches with an outdoor enclosure and unlimited feed access. The study was designed to avoid competition for resources (including milk and solid feed, teat, bucket, outdoor space, and hutch) to test a setup that has the potential to maximize performance and calf growth. The objective of this experiment was to test how single and paired calves would perform when provided with the best setup possible and to replicate the study in both summer and winter to evaluate how calves would perform in this system in both seasons. Our first objective was to determine whether growth and feed intake differ between single and paired calves. Our second objective was to determine how single and paired calves use their environment in terms of time spent and behaviors performed in each area. Our third objective was to document the interaction between paired calves and the time they spend together. Both a summer trial and a winter trial were conducted to see whether the housing method was successful under Canadian extremes.

MATERIALS AND METHODS

The experiment was conducted at the University of Guelph's Alfred Campus (Alfred, Ontario, Canada) and was approved by the University of Guelph's Animal Care Committee, which adheres to the Canadian Council on Animal Care (2009) guidelines. A summer trial was conducted during the months of June to August of 2014, whereas a winter trial was conducted during the months of February to April of 2015.

Animals, Housing, and Management

For each trial, 18 Holstein heifer calves were purchased from external sources before the start of the trial. Upon arrival at the experimental site, the calves were randomly assigned to 2 treatments—housed either as singles ($n = 6$ calves for each season) or as pairs ($n = 6$ pairs, or 12 calves, for each season)—blocked by time of arrival on farm. Single calves had access to a 6.9-m² outdoor pen and 1 plastic hutch (2.4 m² of indoor space). Indoor and outdoor areas were exactly doubled for paired calves (13.7 m² of outdoor space and 4.8 m² of indoor space in 2 hutches). No shade was pro-

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