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Housing system may affect behavior and growth performance of Jersey heifer calves

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ABSTRACT

Social pressure is increasing to adopt alternative housing and management practices that allow farm animals more opportunity to exercise and demonstrate social behavior. The present study investigated the effect of pair housing on the behavior and growth performance of Jersey heifer calves. Forty female Jersey calves were allocated to individual or pair housing at birth and monitored for 9 wk. Calves were provided with a single hutch, and those allocated to the pair housing treatment were provided a pen enclosure twice the size of individually housed calves and only one hutch was provided per pair. All calves were fed milk replacer via bucket twice per day (1.89 L/feeding first 7 d; 2.27 L/feeding until weaned) and had ad libitum access to grain and water. Gradual weaning commenced on d 49 by reducing the calves' milk allowance to one feeding per day, and weaning occurred on d 56. Grain consumption was monitored daily and calves were weighed weekly. Direct behavioral observations were conducted twice per week. Calves housed in pairs tended to have greater average daily gain compared with calves housed individually (0.63 vs. 0.59 ± 0.02 kg/d, respectively). Pair housing also increased final body weight compared with individual housing (64.9 vs. 61.7 ± 0.59 kg, respectively). During observation periods, calves housed individually spent more time engaging in nonnutritive sucking than calves housed in pairs (21.5 vs. 8.15 ± 0.03% of total observations). Calves housed in pairs were observed cross sucking 13.5% of the time during observational periods. Although housing Jersey calves in pairs may increase measures of growth performance, future research should aim to reduce cross-sucking behavior within the Jersey breed through alternative feeding systems or environmental enrichment.

Key words: animal welfare, Jersey calf, housing method, calf behavior

INTRODUCTION

Modern dairy production is sometimes criticized for on-farm procedures including early separation of the calf from the dam (<24 h after birth) and individually housing preweaned heifer calves (as opposed to housing in pairs or groups; Rushen et al., 2010). In a recent survey (USDA, 2012), 78.9% of respondents reported that they housed preweaned heifer calves individually, with 42.1% of the population being housed outside, 10.5% housed inside with heat, and 26.3% housed inside without heat. This is in contrast to 15.9% of survey respondents that reported housing preweaned animals in any kind of group facilities. Although common, individual housing has been criticized due to restricted space and social isolation from other animals, and state and federal governments are increasingly being pressured to move toward alternative housing standards (Rollin, 1996; Croney and Millman, 2007; Croney and Anthony, 2011).

Historically, the dairy industry favored housing preweaned calves individually to reduce disease transmission (Gulliksen et al., 2009). However, in the past 2 decades, experiments conducted to evaluate calf health status when housed individually or in groups have challenged this traditional claim (Kung et al., 1997; Chua et al., 2002). For example, Chua et al. (2002) examined the health status of preweaned heifer calves housed individually or in pairs and reported no differences in health status between individual and pair-housed calves with all calves remaining healthy with no incidence of diarrhea. Similarly, Kung et al. (1997) reported that fewer days of medication were provided to calves housed in small groups compared with those housed individually in hutches, suggesting that grouping calves does not increase the likelihood of disease transmission, frequency, or duration of treatments.

Housing preweaned heifer calves in pairs or small groups may also be advantageous during the cold winter months, as cold temperatures impair the absorption

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of colostral immunoglobulins and increase the calves' susceptibility to disease (Vasseur et al., 2009). Soberon et al. (2012) also reported that preweaning ADG and first-lactation milk yield are negatively affected by the average ambient temperature at birth; calves born during the colder months (0.2°C) produced 532 kg less milk than calves born within thermoneutral conditions. Young dairy calves are subject to hypothermia or cold stress when environmental temperatures fall below 10 to 20°C (Scibilia et al., 1987), and small breed calves (i.e., Jersey) are more susceptible to cold stress than large breed calves (i.e., Holstein) because of their large surface area (**SA**) relative to their BW. Thus, housing calves in pairs or small groups may promote the maintenance of core body temperature and reduce the animal's susceptibility to hypothermic conditions; 2 or more animals together can modify the effects of a fall in ambient temperature by huddling (Ingram and Mount, 1975).

From a behavioral standpoint, individual housing systems prevent calves from making physical contact with conspecifics, thus impeding social development, which can result in increases in fearful and aggressive behaviors toward novel conspecifics after grouping (Bøe and Færevik, 2003; Rushen et al., 2010). Because of the natural complex hierarchies established by dairy cattle, it is important for calves to learn how to interact socially with conspecifics (Jensen et al., 1999). Gaillard et al. (2014) recently reported that individual rearing (as opposed to group rearing) results in cognitive impairments in young dairy calves as assessed by calf performance in a reversal learning task. Gaillard et al. (2014) trained calves to associate a white- or black-colored stimulus with a food reward, and once calves reached the appropriate learning criterion, the colors were reversed (i.e., calves that were initially trained to associate the white stimulus with the reward then had the reward paired with the black stimulus and vice versa). Pair-housed calves were better able to adapt and modify their behavior to obtain the food reward after the stimuli were reversed, yet individually housed calves continued to choose the incorrect stimulus. Social contact with conspecifics introduces variability into the environment, and the authors suggested that individually housed calves lacked behavioral flexibility (Coppens et al., 2010) or the ability of an animal to alter their behavior to changing environmental stimuli. In addition, De Paula Vieira et al. (2010) demonstrated that calves that are group-housed before weaning are also better able to learn how to use automated feeding equipment after weaning, as they visit the feeder more often and ingest more grain than calves that were previously housed individually. Thus, individual rearing during the preweaning period may reduce behavioral flexibility and limit the calves' ability to cope with novel situations or changes within their environment later in life.

In contrast, social interactions may result in poor welfare for the individual calf as calves are able to express undesirable behaviors such as cross sucking on one another. Cross-sucking is defined as an abnormal behavior wherein nonnutritive sucking directed toward another calf's ears, mouth, navel, scrotum, prepuce, or other body parts occurs (de Wilt, 1985), and this behavior stems from redirection of the calf's innate desire to suckle (Jensen, 2003). One reason dairy producers are reluctant to adopt modern group-housing systems is because this behavior may cause hair loss, inflammation, or infection of the body part exposed to cross sucking (Lidfors, 1993). Jersey cattle are an important breed to evaluate in a group setting, as the Jersey breed has been identified to have heightened cross-sucking behavior and are more frequently observed performing oral stereotypic behaviors, such as tongue-rolling and intersucking, compared with other breeds (Lidfors and Isberg, 2003). However, to date, the majority of studies have been conducted with Holstein calves, and it is currently unknown if Jersey calves will behave the same as Holstein calves when pair-housed. The duration, frequency, or both of cross-sucking behavior have yet to be quantified for group or pair-housed Jersey calves. Behavioral differences among breeds of other species, such as aggression in pigs (Breuer et al., 2003), are known to exist; therefore, it is inappropriate to assume that all breeds of dairy calves behave in the same manner when housed similarly.

The objective of this experiment was to compare the behavior, growth performance, and health of Jersey heifer calves housed individually or in pairs. We hypothesized that cross-sucking behavior would occur in pair-housed calves, as the Jersey breed appears to have a higher frequency of performing this behavior compared with Holstein calves. In addition, we hypothesized that pair-housed calves would have increased measures of growth performance compared with individually housed calves in part due to social facilitation.

MATERIALS AND METHODS

This study was conducted at The Ohio State University's Waterman Dairy Center, located in Columbus, Ohio, in accordance with guidelines set by the Institutional Animal Care and Use Committee (protocol no. 2012A00000099). Forty female Jersey calves born between August 2012 and February 2013 were used in this study. Calves were blocked by date of birth and weight and allocated to 1 of 2 treatments: treatment 1, individual housing; treatment 2, pair housing. At birth,