

Comparison of group versus individual calf rearing for a summary measure of health

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Introduction

Rearing calves in small groups has been suggested to provide benefits to health, growth and social development as compared to individually reared calves. This study assessed the impact of individual versus group housing on average daily gain (ADG), preweaning disease, and representative fecal microbiomes based on Bifidobacterium which are believed to have a positive association with calf health.

Materials and Methods

This cohort field study was conducted on a 4,000 cow dairy in central WA from December 2017, through November 2018. Alternating groups of 16 calves based on birth order were enrolled into individual versus group cohorts, administered 4 qts of colostrum, and weighed. Calves assigned to group cohorts were trained to suckle from a bottle prior to placement at an average of 7 days of age into group hutches housing 8 calves matched by birth weight. Individually reared calves were fed unacidified whole milk as follows: 3 qts BID for 10 days; 4 qts BID through wk 6; 2 qts BID during wk 7 and SID during wk 8, at which point calves were weighed and weaned (average 58 d). Grouped calves were fed whole milk through a Milk Bar 10-Nipple Feeder until 7 wks of age. Prior to July 2018, each group of 8 calves was fed a fixed quantity (32-36 qts) of unacidified whole milk BID. Thereafter, milk quantities were increased due to health and production concerns. From July through October 2018, grouped calves were fed ad libitum, acidified (pH=4.6) whole milk. In November 2018, citric acid was removed and groups were fed whole milk TID (24-28 qts) due to lower temperatures. During wks 7 and 8 grouped calves were fed 12-16 qts of milk BID in a trough, and then weighed and weaned at an average of 59 days of age. At 2-3 week intervals half of all enrolled calves ≥ 8 days of age were randomly selected to have fecal samples collected per rectum for fecal DNA extraction, qPCR amplification, and quantification of the groES gene associated with Bifido.

Results

Overall, 799 individually reared calves and 783 grouped calves were enrolled. The mean ADG for individual calves (0.64 kg) was larger than for grouped calves (0.59 kg; $P < 0.001$). However, grouped calves born after the switch to increased provision of milk in July 2018, had a similar ADG

(0.69 kg) to individual calves (0.67 kg; $P = 0.27$). Mortality in grouped (10%) and individual calves (12%) was similar ($P = 0.17$). Likewise, the number of calves treated for scours was similar ($P = 0.63$) for grouped (28%) and individual calves (29%). On the other hand, throughout the year more grouped calves were treated for respiratory disease (77%) than were individual calves (57%; $P < 0.001$). A total of 2,217 fecal samples were collected during the study and fecal Bifido quantities were categorized as low ($< 50,000$ CFU/mL) or high ($\geq 50,000$ CFU/mL). Regardless of the category of calf rearing or the time of year, Bifido levels were more frequently high during the first month of life (60%) than during the remaining preweaning period (32%; $P < 0.001$). Overall, grouped calves had more fecal samples with high levels of Bifido (49%) than did individual calves (39%; $P < 0.001$). Although high levels of Bifido in grouped calves stayed steady before (50%) and after (48%) July ($P = 0.41$), individual calves saw an increase in the proportion of samples with high levels of Bifido taken before (36%) and after (46%) July ($P = 0.001$).

Significance

The discrepancies in ADG during the first half of this study reflected the challenges surrounding managing milk consumption and health oversight when switching to group housing. Furthermore, respiratory disease remained an issue in grouped calves throughout the study irrespective of milk intakes. Of particular interest was the finding that fecal Bifido levels were more frequently higher in grouped calves than individual calves. It is plausible that group housing may have influenced the GI microbiota such that there was a uniformity in the frequency of high levels of Bifido throughout the year regardless of milk quantity and type consumed.