J. Dairy Sci. 100:713–725
https://doi.org/10.3168/jds.2016-11401

Clinical trial on the effects of a free-access acidified milk replacer feeding program on the health and growth of dairy replacement heifers and veal calves

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ABSTRACT

The objectives of this study were to evaluate the effects of free-access acidified milk replacer feeding on the pre- and postweaning health of dairy and veal calves. Individually housed calves were systematically assigned at birth to 1 of 2 feeding programs: free-access feeding (ad libitum) of acidified milk replacer (ACD, n = 249) or traditional restricted feeding (3 L fed twice daily) of milk replacer (RES, n = 249). Calves were fed milk replacer containing 24% crude protein and 18% fat. Acidified milk replacer was prepared to a target pH between 4.0 and 4.5 using formic acid. Calves were weaned off milk replacer at approximately 6 wk of age. Weaning occurred over 5 d, and during this weaning period, ACD calves had access to milk replacer for 12 h/d and RES calves were offered only one feeding of milk replacer (3 L) daily. Calves were monitored daily for signs of disease. Fecal consistency scores were assigned each week from birth until weaning. A subset of calves was systematically selected for fecal sampling at 3 time points between 7 and 27 d of age. Fecal samples were analyzed for enterotoxigenic *Escherichia coli* F5, *Cryptosporidium parvum*, rotavirus, and coronavirus. Hip width, hip height, body length, heart girth, and body weight were measured at birth and weaning. Postweaning body weight measurements were collected from the heifers at approximately 8 mo of age. Postweaning body weight and carcass grading information was collected from the veal calves at slaughter once a live weight between 300 and 350 kg had been achieved. The odds of ACD calves being treated for a preweaning disease event tended to be lower than that of the RES calves (1.2 vs. 5.2%, respectively). Preweaning mortality, postweaning disease treatment, and postweaning mortality did not differ between feeding treatments. The ACD feeding treatment supported greater preweaning average daily gain (0.59 vs. 0.43 kg/d) and structural growth than RES feeding. Postweaning average daily gain and carcass characteristics were similar for ACD and RES calves. These results indicate that free-access acidified milk replacer feeding tended to support improved health, and greater body weight gain and structural growth during the preweaning period; these effects did not persist in the postweaning period. The growth advantage observed before weaning in the ACD calves likely disappeared due to the weaning methods used.
Key words: acidified milk, free-access milk feeding, growth, health, calf

INTRODUCTION

Calves on North American dairy and veal farms are generally reared on either a traditional or an enhanced milk feeding program (Drackley, 2008; Khan et al., 2011a). Traditional feeding programs restrict daily intake of fluid milk to a rate of 8 to 10% of birth BW, with the aim of encouraging solid feed consumption and facilitating earlier weaning (Drackley, 2008). In contrast, enhanced milk feeding strategies allow calves to consume larger quantities of whole milk or high protein milk replacer, which better reflect natural feeding conditions, result in fewer behavioral signs of hunger (De Paula Vieira et al., 2008; Khan et al., 2011a), and support improved growth performance (Diaz et al., 2001; Jasper and Weary, 2002; Quigley et al., 2006; Khan et al., 2007a; Miller-Cushon et al., 2013). Moreover, it has been documented that increased nutrient intake from milk or milk replacer during the preweaning period and

Received May 4, 2016.
Accepted September 17, 2016.
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greater preweaning ADG are positively associated with lactation milk yield (Soberon et al., 2012; Soberon and Van Amburgh, 2013).

Anecdotal reports indicate that free-access acidified milk feeding is an enhanced nutritional program that has been adopted by many dairy and veal calf producers in Canada (Anderson, 2008, 2011). In addition, it has recently been reported that acidified milk is fed to calves on 1.7% of farms in the United States (NAHMS, 2016). This feeding system aims to achieve ad libitum consumption by using an organic acid to preserve milk so that it can be fed to calves at ambient temperatures in the summer, and at approximately 20 to 24°C in cold housing. Several commercial acidified milk replacers have been developed and evaluated for ad libitum feeding, with a typical target pH between 5.0 and 5.5 after reconstitution (Stobo, 1983; Davis and Drackley, 1998). It has been demonstrated that these commercial acidified milk replacers are associated with improved DMI and greater ADG when offered to calves ad libitum, as compared with traditional feeding (Nocek and Braund, 1986; Woodford et al., 1987). Nocek and Braund (1986) reported that calves fed ad libitum commercial acidified milk replacer had softer manure, likely as a result of consuming a greater proportion of their daily DMI from milk replacer. However, these calves also had a lower incidence of neonatal calf diarrhea complex and required less veterinary care than traditionally fed calves. More recently, a recommended target pH range between 4.0 and 4.5 for the preparation of acidified milk has been proposed (Anderson, 2008, 2011). Further research, under field conditions, is needed to determine health and performance effects of feeding acidified milk at this lower recommended target pH.

The primary objective of this study was to evaluate the effects of free-access acidified milk replacer feeding on the pre- and postweaning health of dairy and veal calves, under field conditions. The secondary objective was to assess the effects of free-access acidified milk replacer feeding on the preweaning and postweaning growth of dairy and veal calves, and on veal carcass quality. It was hypothesized that calves reared on a free-access acidified milk replacer program would experience fewer disease events, have a lower mortality risk, and show improved BW gain, structural growth, and carcass characteristics when compared with restricted-fed calves.

MATERIALS AND METHODS

Animals, Housing, and Management

The University of Guelph Animal Care Committee reviewed and approved all study procedures. This clinical trial was conducted on a commercial dairy farm in Ontario, Canada. The lactating herd included approximately 450 Holstein cows (average 305-d milk = 9,750 kg; fat = 3.8%; protein = 3.2%). All calves born on the farm were retained as replacement heifers or reared as grain-fed veal calves. Every calf that was born between March 21 and December 31, 2008, and survived the first 24 h of life, was eligible for enrollment in the study.

All calves were separated from their dams at first discovery, moved to individual housing in the calf nursery, and fed colostrum. In the nursery, calves were placed in 1 of 24 individual pens constructed with 2 solid plastic dividers and a front gate. The nursery pens were located on concrete flooring and bedded with wood shavings. Each pen was cleaned of all bedding material and washed after every use. Calves in neighboring pens did not have physical contact with each other. The nursery was ventilated using a negative pressure mechanical system, and in-floor heating was used to maintain the room temperature at approximately 20°C. According to the standard farm protocol, all calves were hand-fed colostrum as soon as possible after movement to the calf nursery. Details about colostrum management, including feeding time, source, route of administration, number of feedings, and volume of colostrum fed to each calf were recorded by farm personnel. As per standard farm protocol, on the day of birth, calves were uniquely identified with ear tags, the umbilicus was disinfected with iodine, and calves were injected with vitamins A, D, and E, selenium, and iron.

Newborn calves (both replacement heifers and bulls for veal production) were continuously introduced to the nursery room until a block of 14 animals was assembled. Once the youngest calf in the block spent a minimum of 2 d in the nursery, calves were comingled on a livestock trailer and transported approximately 0.5 km to the preweaning barn. Each new block of calves was moved into 1 of 5 rooms in the preweaning barn, with each room consisting of 2 rows of 7 individual elevated stalls. Each calf was assigned to a stall in the room according to exit order from the trailer. Stall-side partitions were fabricated out of spindle-style metal that permitted nose-to-nose contact between neighboring calves. Grated flooring allowed manure and urine to drop to the floor and collect in a shallow gutter below the row of stalls. Rooms were managed in an all-in/all-out manner, such that calves from the same block entered and exited the room together. After each use, rooms were cleaned using a high-pressure washer with disinfectant, followed by approximately 1-wk drying time before the next block of calves entered. Mechanical blender systems consisting of variable speed exhaust fans and dampers were used to ventilate the preweaning rooms. Rooms were maintained at ambient temperature during