J. Dairy Sci. 98:1127–1135
http://dx.doi.org/10.3168/jds.2014-8567
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Effect of supplementing pasteurized milk balancer products to heat-treated whole milk on the growth and health of dairy calves

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ABSTRACT

Two experiments were conducted to determine the growth and health effects of supplementing heat-treated whole milk with pasteurized milk balancer products in calf-feeding programs. All calves were removed from their dams at birth (d 0), fed 3.8 L of heat-treated colostrum, and received assigned treatments from d 1 until weaning at d 56. Calves were weighed and skeletal measurements taken every 7 d from d 0 until 56. Average daily gain (ADG) and feed efficiency (FE) were calculated. In experiment 1, 80 Holstein heifer calves were used to investigate the effects of supplementing 2 levels of heat-treated whole milk with or without a pasteurized all-milk balancer. Four dietary treatments (n = 20) were used. Calves receiving milk (M) and milk plus balancer (M+B) were fed 3.8 L of milk divided into 2 equal feedings daily. Calves fed increased milk (IM) and increased milk plus balancer (IM+B) received 3.8 L of milk divided into 2 equal feedings from d 1 to 14, 5.7 L from d 15 to 42, and 2.85 L fed once daily from d 43 to 56. Treatments M+B and IM+B included pasteurized all-milk balancer fed at a rate of 0.23 kg per 3.8 L of milk. In experiment 2, 72 Holstein heifer calves were used to investigate the effects of supplementing either a pasteurized all-milk balancer or a pasteurized protein-blend milk balancer. Three dietary treatments (n = 24) were used. Calves were fed 3.8 L of milk divided into 2 equal feedings from d 1 to 14 and 5.7 L from d 15 to 56. Treatment IM did not include any supplements. Balancer was added to IM+B and increased milk plus protein-blend balancer (IM+PB). Balancer was supplemented at a rate of 0.23 kg per 3.8 L of milk. In experiment 1, calves fed IM+B had greater average body weight (BW) and average daily gain compared with calves given other treatments. Calves fed 5.7 L of milk had greater FE than those fed 3.8 L regardless of balancer added. In experiment 2, calves fed IM+B and IM+PB had greater BW when compared with calves given M. Calves fed IM+PB had comparable BW and FE to calves given IM+B. The enhanced calf-feeding programs evaluated in this study were successful in increasing growth in preweaned calves when supplementing milk balancer product to heat-treated whole milk. Health scores of fecal, respiratory, and attitude determined illness. Feces were looser for calves receiving IM+B and IM+PB, but attitude scores did not confirm an illness and so overall health was not different between treatments.
Key words: dairy calf, milk balancer

INTRODUCTION

Enhanced calf feeding is not a new concept, but many different techniques exist for producers to use to optimize the growth and health of preweaned dairy calves. Early management of preweaned calves, including nutrition, feeding frequencies, and weaning ages, may also have long-term effects on their subsequent performance as milking cows (Kehoe et al., 2007; Drackley, 2008; Soberon et al., 2012). Those long-term effects are thought to be linked to the effect of preweaning nutrition on allometric mammary growth (Brown et al., 2005; Daniels et al., 2006). However, increased nutrition after weaning does not have the same effect on allometric mammary growth (Brown et al., 2005; Meyer et al., 2006). Whereas many management approaches are available for rearing calves, the goal of producing a healthy, productive replacement heifer remains the same. Calf-feeding programs can use whole milk or milk replacers that include unique advantages and disadvantages. On-farm whole milk can be used as a low-cost option for providing high-quality nutrients, but nutrient content can fluctuate greatly and is limited to what the herd produces. On-farm batch pasteurizers can also be used to decrease the bacterial load and to destroy any high-risk disease organisms associated with feeding raw fluid milk, shown as effective by previous studies (Godden et al., 2006; Elizondo-Salazar et al., 2010). Conversely, milk replacers are an out-of-pocket

Received July 3, 2014.
Accepted October 25, 2014.
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expense but can provide a more concentrated, consistent source of nutrients depending on the product. Use of milk balancer products combined with whole milk has the potential to increase the DM of whole milk without increasing the volume of whole milk offered, allowing producers to extend the supply of whole milk available for preweaning calf management.

Milk replacers and milk balancers can also contain alternative protein products to further reduce expenses by substituting milk proteins with a mixture of plant proteins and other animal proteins. Those alternative protein sources can reduce feeding costs, but could decrease digestibility and increase digesta movement through the gastrointestinal tract resulting in decreased growth rates (Montagne et al., 1999; Drackley, 2008). Alternative animal proteins, such as plasma protein, have been shown to be more effectively digested by the calf, but are not as appealing as the lower-cost plant proteins (Morrill et al., 1995; Quigley and Wolf, 2003).

The objective of experiment 1 was to determine the effects of supplementing 2 levels of heat-treated whole milk with or without an added balancer product on the growth and health of dairy calves. The objective of experiment 2 was to determine the effect of feeding 5.7 L of heat-treated whole milk, supplemented with or without an all-milk pasteurized milk balancer or a protein-blend pasteurized milk balancer on the growth and health of dairy calves.

MATERIALS AND METHODS

Animals and Treatment Assignments (Experiment 1)

Holstein heifer calves (n = 80) including 40 calves from the North Carolina Department of Agriculture Piedmont Research Station (**PRS**) and 40 calves from the North Carolina State University Lake Wheeler Road Dairy Educational Unit (**LWD**), were randomly assigned to 4 treatment groups. Twenty heifer calves were assigned at birth to each of the 4 treatments with 10 calves at each location. Calves were blocked by date of birth and location so that all treatments were represented in every 4 calves born at 1 location. No Holstein heifer calves were excluded from the trial.

In treatment 1, milk only (**M**), calves were fed 3.8 L of heat-treated whole milk divided into 2 equal feedings daily until weaning at 56 d of age. This treatment supplied the calf with an approximate milk DM of 0.45 kg/d, consisting of only whole milk (12.5% DM, 25.6% CP, and 28% fat).

In treatment 2, milk plus balancer (**M+B**), calves were fed 3.8 L of heat-treated whole milk with 0.23 kg of an all-milk balancer added per 3.8 L. This was divided into 2 equal feedings daily, 0.115 kg of milk balancer per feeding, until weaning at 56 d of age. This treatment supplied the calf with an approximate milk DM of 0.68 kg/d, consisting of whole milk and pasteurized milk balancer (17.6% DM, 35.8% CP, and 31.0% fat).

In treatment 3, increased milk (**IM**), calves were fed 3.8 L of heat-treated whole milk divided into 2 equal feedings daily for the first 14 d after birth, then fed 5.7 L of heat-treated whole milk divided into 2 equal feedings daily for 35 d (until 49 d of age), and then fed 2.85 L once daily in the morning feedings for 7 d until weaning at 56 d of age. This treatment supplied the calf with an approximate milk DM of 0.45 kg/d, consisting of only whole milk (12.5% DM, 25.6% CP, and 28% fat), from 1 to 14 d of age, 0.68 kg of milk DM/d from 15 to 49 d of age, and 0.34 kg of milk DM/d from 50 to 56 d of age.

In treatment 4, increased milk plus balancer (**IM+B**), calves were fed 3.8 L of heat-treated whole milk, with 0.23 kg of an all-milk balancer added per 3.8 L or 0.115 kg/feeding, divided into 2 equal feedings for the first 14 d after birth. Calves were then fed 5.7 L of heat-treated whole milk divided into 2 equal feedings daily for 35 d (until 49 d of age), with 0.23 kg of supplemented all-milk balancer per 3.8 L or 0.172 kg per feeding, and then fed 2.85 L once daily in the morning feeding for 7 d until weaning at 56 d of age, with 0.23 kg of supplemented all-milk balancer per 3.8 L or 0.172 kg/d. This treatment supplied the calf with an approximate milk DM of 0.68 kg/d, consisting of whole milk and pasteurized milk balancer (17.6% DM, 35.8% CP, and 31.0% fat), from 1 to 14 d of age; 1.02 kg of milk DM/d from 15 to 49 d of age; and 0.51 kg of milk DM/d from 50 to 56 d of age.

Animals and Treatment Assignments (Experiment 2)

Holstein heifer calves (n = 72), including 36 calves from PRS and 36 calves from LWD, were randomly assigned to 3 treatment groups. Twenty-four heifer calves were assigned at birth to each of the 3 treatments, with 12 calves at each location. Calves were blocked by date of birth and location so that all treatments were represented in every 3 calves born at 1 location. No Holstein heifer calves were excluded from the trial.

In treatment 1, IM, calves were fed 3.8 L of heat-treated whole milk divided into 2 equal feedings daily for the first 14 d after birth, then fed 5.7 L of heat-treated whole milk divided into 2 equal feedings daily for 35 d (until 49 d of age), and then fed 2.85 L once daily in the morning feedings for 7 d until weaning at 56 d of age. This treatment supplied the calf with an approximate milk DM of 0.45 kg/d, consisting of only whole milk (12.5% DM, 25.6% CP, and 28% fat), from

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