

# Randomized clinical trial investigating the effect of a more liberal milk allowance in the days after birth on the health and growth of pre-weaned dairy calves

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## Introduction

While the level of milk intake from birth to weaning is positively associated with pre-weaning health, growth, and improved milk production in the adult dairy cow, producers are still reluctant to offer large volumes of milk during the first week or two of life due to concerns that increasing the daily allowance too quickly may cause nutritional (milk) scours. However, recent observational studies have reported a positive association between levels of milk consumption in the first days of life and future health events. The objective of this study was to describe the effect of offering a more liberal volume of milk immediately from day 1 of life, as compared to a traditional ramp-up program. We hypothesized that calves offered more milk early in life would not experience more scours, but rather would experience improved health and growth as compared to calves that were slowly ramped up in their daily milk allowance over a period of 7 – 14 days.

## Materials and Methods

This randomized clinical trial was conducted on 5 MN dairy farms from June – Aug 2016 and Dec – Feb 2017. Farms must have been feeding at least 7 L/d of milk at peak feeding level, gradually increase milk offered over at least 7 days, and house calves individually. Heifer calves were enrolled at birth, weighed, and then systematically assigned by birth order to either “ramp-up” (RU) control group or “liberal allowance” (LIB) treatment group by farm personnel. Calves assigned to the RU group were slowly ramped up over a 7-14 day period, depending on the program already in use by the farm, while calves assigned to the LIB group were offered the full peak milk allowance (L/d) beginning on day 1 after birth. Study technicians visited the farms weekly to collect performance data including hip height (HH) (cm) at wk 1, wk 3, and wk 7, and calf weight (kg) at 3 wks of age. Fecal scores (FS), respiratory scores (RS), and overall health score were also measured at 1, 2, and 3 wks of age and producer reported treatment records collected. A venous blood sample was collected from each calf from 24 hr to 7 d of age to test for

serum total protein (g/dL). Calves exited the study at weaning. Multivariable mixed models were developed to describe the effect of treatment (RU/LIB) on 3wk ADG (kg/d), 3wk weight (kg), and HH at wks 1, 3, and 7 while controlling for the effect of season, birth weight, and the random effect of calf within farm. Health score data was dichotomized for diarrhea (DIA; FS  $\geq$  2) and respiratory disease (RESP; RS  $\geq$  4). However, there were very few RESP scores, so RESP and DIA were combined to describe a calf as SICK (Y/N). Multivariable logistic regression models were developed to describe the effect of treatment on odds of SICK for wks 1, 2, and 3, and to describe the effect of treatment on producer reported illness events. Significance for all models was determined at  $p < 0.05$ .

## Results

One thousand two hundred sixty-four heifer calves were enrolled (LIB n=641; RU n=623) with no difference in enrollment weight ( $P=0.92$ ), STP ( $P=0.55$ ), or HH1 ( $P=0.96$ ) between groups. By 3 wks of age, LIB calves weighed 1.99 (0.51) kg more than RU calves ( $P < 0.0001$ ), though the magnitude of this difference varied depending on the duration of the ramp up period used in the RU group in the herd. For example, at 3 wks of age, LIB calves weighed 0.56 (0.28) kg more than RU calves on farms that ramped up over a 7 d period ( $P = 0.06$ ), while LIB calves weighed 2.03 (0.54) kg more than RU calves on farms that ramped up over a 14 d period ( $P = 0.0002$ ). Calves in the LIB group also grew 0.1 kg/d faster ( $P < 0.0001$ ) and were taller at wk 3 ( $0.3 \pm 0.15$  cm;  $P=0.048$ ), though this height advantage did not persist to wk 7. Forty-two percent (536/1264) of all enrolled calves had a first treatment event, with no effect of treatment on health scores or producer reported disease.

## Significance

Under the conditions of this study, a more liberal milk allowance from day 1 of life was advantageous to calf growth with no detrimental effect on calf health.