

# Spiking colostrum replacement powder directly into maternal colostrum II: Impacts on behavior and well-being of neonatal dairy calves

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## Introduction

Mixing unreconstituted (dry) colostrum replacer (CR) powder directly into maternal colostrum (MC) prior to feeding could be problematic if the final mixture has an excessively high osmolality, resulting in a decreased abomasal emptying rate. A possibly safer alternative may be to first reconstitute CR powder in water according to label directions, prior to feeding with MC, though this would result in having to deliver a larger volume. Our objective was to describe the effect of first reconstituting CR with water before feeding with MC, as compared to spiking unreconstituted CR powder directly into MC, on measures of calf wellbeing and appetite. We hypothesized that neither a larger volume nor an increase in osmolality of a CR-MC mixture would result in changes to calf behavior or appetite during or following colostrum feeding.

## Materials and methods

This study was conducted on a MN dairy in summer, 2023. Eligible newborn calves were removed from the dam within 45 min of birth and weighed. Calves in both small (60-85 lb) and large (85.1-115 lb) birth weight categories were randomly assigned to one of 4 treatment groups (MC60, MC90, CR-MC60, CR-H2O-MC60), where MC60 was moderate quality MC (60 g/L IgG; 349 Mosm/kg), MC90 was high quality MC (90 g/L IgG; 361 Mosm/kg), CR-MC60 was dry CR powder mixed directly into MC60 (540 Mosm/kg), and CR-H2O-MC60 was CR reconstituted in water and then mixed into MC60 (372 Mosm/kg). CR-H2O-MC60 was fed at approximately 12.5% birth weight (BW), while MC60, MC90, and CR-MC60 were fed at approximately 10% BW. The CR used was Premolac® (Zinpro Corp., Eden Valley, MN). The assigned colostrum mixture was delivered via esophageal tube within 2 hrs of birth.

Of 132 calves enrolled (33 per group), a convenience sample subset of calves were videotaped to evaluate behavior both during tubing and in the 1 hour post colostrum feeding. A trained observer evaluated the video using an ethogram to describe the behaviors during (vocalize, chew, time spent chewing, stand, lay, fall down, stand up, vocalize, regurgitate, struggle and defecate) and during the 1 hour after colostrum feeding (time standing, time lying, vocalize, headbutt, reposition, standing bouts, laying bouts, oral explore bouts). Appetite at the next milk feeding, and at subsequent morning milk feeding for 3 days, was evaluated for all 132 calves (0 - 3 scale, scores of 2 and 3 indicated some refusal of milk). Univariable models accounting for multiple comparisons were used to evaluate differences in behaviors and calf appetite by treatment group.

## Results

Forty-7 calves were videotaped (MC60 n = 12; MC90 n = 15; CR-MC60 n = 11; CR-H2O-MC60, n = 7). The mean time to tube feed was 123, 122, 172, and 166s for the MC60, MC90, CR-H2O-MC60 and CR-MC60 groups, respectively ( $P = 0.004$ ). As a result, calves in the CR-H2O-MC60 and CR-MC60 groups spent more absolute time (s), but no difference in proportion of time (%), chewing the tube while feeding, as compared to the MC60 and MC90 groups ( $P = 0.005$ ). We observed no effect of treatment on any other behavioral outcome evaluated. However, there were numerically fewer leg repositions in the MC60 group versus the other 3 groups. A novel finding, we observed 2 calves hiccupping (MC90 n = 1; MC60 n = 1) post feeding. Numerical, but not statistical, differences existed in appetite, with 21.9, 16.3, 40.4 and 30.5% refusing some portion of the milk offered at the first milk feeding in the MC60, MC90, CR-H2O-MC60 and CR-MC60 groups, respectively ( $P = 0.17$ ). Only 2 calves (MC90 = 1; CR-H2O-MC60 = 1) refused some portion of milk on the second morning.

## Significance

Under the conditions of this study, we conclude that feeding neither a larger volume (CR-H2O-MC60), nor a higher osmolality (CR-MC60) CR-colostrum mixture, impacted behavior or appetite of newborn calves. However, results should not be generalized to other CR products, and future studies should aim to evaluate calf behavior on a larger scale.

