

# Passive Transfer of Immunity, Preweaning Health, and Growth in Holstein Calves Fed a Bovine Lacteal-Derived Colostrum Replacer or Raw Pooled Colostrum

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## Introduction

Pooling raw colostrum from multiple cow sources for feeding calves is a well-recognized risk factor for both the transmission of *Mycobacterium avium* subsp *paratuberculosis* and occurrence of failure of passive transfer (FPT) of immunity in calves. Pooled colostrum-related failure of passive transfer (FPT) in calves can be prevented by feeding alternative sources of IgG in the form of colostrum replacement products. The objective of this study was to complete a randomized controlled clinical trial (RCT) to evaluate the effect of feeding a bovine lacteal-derived colostrum replacer (LCR) versus raw pooled colostrum (RPC) on passive transfer of immunity, growth rates, and preweaning calf health.

## Materials and Methods

Upon birth, calves were immediately separated from their dams at the earliest time possible and denied the opportunity to nurse or to be fostered by any other alien cows present in the maternity pen. Eligible calves were then randomly assigned to be fed 4 L of RPC (control group,  $n = 273$ ) or two doses of LCR (Land O' Lakes<sup>®</sup> Bovine IgG Colostrum Replacement, Land O' Lakes Inc., Arden Hills, MN) containing  $\geq 100$  g of IgG/dose (treatment group,  $n=295$ ) within one to six hours of birth. Colostrum feeding protocols were adapted to the practice on the study farm. Pre- and post-colostral blood samples were collected via the jugular vein using a 10 mL Vacutainer<sup>®</sup> blood collection tube (Becton, Dickinson and Co., Franklin Lakes, NJ), centrifuged for 15 minutes at 1,000 X  $g$  (Model # E8F, LW Scientific, Lawrenceville, GA) and shipped on dry ice to the Prairie Diagnostic Services Laboratory (University of Saskatchewan, Saskatoon, SK, Canada) for analysis. Serum total protein (TP, g/dL) and IgG (mg/mL) concentrations in pre- and post-colostral samples were measured using a

hand-held refractometer (J-351, Jorgensen Laboratories, Inc. Loveland, CO) and radial immunodiffusion assay (RIA), respectively. Data on birth and weaning weights (kg), preweaning morbidity, treatments, and mortality events were recorded. Differences in means for pre- and post-colostral serum TP and IgG concentrations, plus mean birth and weaning weights between groups (LCR vs RPC), were determined using the Students  $t$ -test. Simple  $\chi^2$  analyses were undertaken to determine differences in proportion of calves with FPT and preweaning disease events between groups (LCR vs RPC).

## Results

Even though FPT was significantly ( $P < 0.001$ ) higher in calves fed RPC (vs LCR), preweaning health outcomes were not different between groups. In addition, although there were no differences in birth weight between groups, calves fed LCR were  $\leq 2.2$  lb (1 kg) heavier at weaning than those fed RPC, a difference that was marginally significant ( $P = 0.05$ ). Findings also indicate that mean serum TP was significantly ( $P < 0.0001$ ) higher for calves fed LCR (mean  $\pm$  SD,  $5.51 \pm 0.52$  g/dL) vs calves fed RPC (mean  $\pm$  SD,  $4.77 \pm 0.55$  g/dL). Similarly, mean serum IgG was significantly ( $P < 0.0001$ ) higher for calves fed LCR (mean  $\pm$  SD,  $15.18 \pm 4.77$  mg/mL) vs calves fed RPC (mean  $\pm$  SD,  $7.5 \pm 5.01$  mg/mL).

## Significance

Results from this analysis indicate that feeding RPC significantly increases the risk of FPT in calves, while feeding  $\geq 200$  g of IgG contained in two doses of LCR enhances passive transfer of IgG, decreasing the risk of FPT. Bovine lacteal-derived colostrum replacer is a viable alternative for preventing FPT in herds that feed RPC to calves after birth.