

# Effect of Feeding Bovamine® Probiotic on Passive Transfer of Immunoglobulin G in Newborn Calves

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## Introduction

Early studies have suggested that bacteria in colostrum may interfere with passive absorption of immunoglobulins (Ig) in newborn calves (James *et al.*, 1981), and recent studies reported that calves fed pasteurized colostrum had improved passive transfer of IgG versus calves fed fresh colostrum (Johnson *et al.*, 2007; Heinrichs *et al.*, 2009a). However, a recent study reported that colostrum bacteria counts were not associated with IgG absorption (Heinrichs *et al.*, 2009b). Do pathogenic or non-pathogenic bacteria, living or dead, truly interfere with Ig absorption? Bovamine® (Nutrition Physiology Company, LLC, Overland Park, KS) is a direct-fed microbial (DFM or probiotic) containing a patented combination of living *Lactobacillus acidophilus* (1 x 10<sup>9</sup> cfu/1 g dose) and *Propionibacterium freudenreichii* (2 x 10<sup>9</sup> cfu/1 g dose). The study objective was to describe the effect of supplementing colostrum with living or dead DFM on serum total protein (STP) and IgG levels, and apparent efficiency of absorption of IgG (AEA %).

## Materials and Methods

The study was conducted from June-August, 2009 at a 6,000-cow Jersey dairy in Minnesota. Newborn calves were removed from the maternity pen within 30-45 minutes of birth and weight recorded. Male calves meeting study eligibility criteria were randomly assigned to one of three colostrum treatment groups. Calves in all three groups were fed a standardized dose of a commercially available colostrum replacer (CR) (Calf's Choice Total® Bronze, Saskatoon Colostrum Company, Saskatoon, SK) providing 200 g IgG. The control group (Ctrl, n = 27) received CR only, while the second treatment group (DFM-Live; n = 28) was given CR inoculated with a 1 g dose of live Bovamine®, and the third treatment group (DFM-Dead; n = 26) was given CR inoculated with a 1 g dose of dead Bovamine®. For the third group, the DFM had been killed by baking at

200°F (93.3°C) for 20 minutes. A 20 mL post-inoculation sample of CR was collected and frozen for each calf for bacterial culture. Colostrum was fed within two hours of delivery via esophageal tube feeder. After the colostrum feeding, calves were fed 1.9 L of milk replacer twice daily. Two-10 mL jugular blood samples were taken from each calf; one pre-feeding (T0) and one 24 hours post-feeding (T24). Serum was frozen at -4°F (-20°C), then shipped to the Prairie Diagnostic Services Laboratory (University of Saskatchewan, Saskatoon, SK) for determination of STP (g/dl) by digital refractometry (Sper Scientific, Scottsdale, AZ) and IgG (mg/mL) by RID. Analysis of variance was used to describe the relationship between treatment and the three outcomes: AEA %, serum IgG, and STP at 24 hours.

## Results

*Lactobacillus* counts were higher in CR samples from the DFM-Live treatment group (log<sub>10</sub> = 4.7) as compared to the Ctrl group (log<sub>10</sub> = 4.0) or the DFM-Dead group (log<sub>10</sub> = 4.0) ( $P < 0.0001$ ). There was no effect of treatment on mean serum IgG (mg/mL) (Ctrl = 20.0; DFM-Live = 20.1; DFM-Dead = 20.9;  $P = 0.63$ ), STP (g/dl) (Ctrl = 5.6; DFM-Live = 5.6; DFM-Dead = 5.7;  $P = 0.79$ ), or AEA IgG (%) (Ctrl = 29.8; DFM-Live = 28.6; DFM-Dead = 29.1,  $P = 0.58$ ) at 24 hours post-feeding.

## Significance

Supplementation of CR with non-pathogenic bacteria, added as either a live or dead DFM, and at the levels studied, did not affect passive transfer of IgG. More research is needed to investigate the hypothesis that passive transfer of IgG may be impeded by pathogenic bacteria in colostrum. Also, studies are needed to determine if supplementing colostrum with DFM will improve calf health. Producers should still strive to feed colostrum low in concentrations of pathogenic bacteria (e.g. *E. coli*) to reduce the risk of disease in calves.