



Minnesota Dairy Health Conference

UNIVERSITY OF MINNESOTA

College of Veterinary Medicine

VETERINARY CONTINUING EDUCATION

May 19-20, 2010
St. Paul, Minnesota



Effect of feeding Bovamine® probiotic on passive transfer of immunoglobulin G in newborn calves

K. Brakefield 1, S. Godden 1, J. Fetrow1, P. Rapnicki1, C. Jones1, R. Bey2 D. Haines3

1 Department of Veterinary Population Medicine, University of Minnesota

2Department of Veterinary Biological Sciences, University of Minnesota

3Department of Veterinary Microbiology, University of Saskatchewan

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 10⁹ cfu/1 g dose) and *Propionibacterium freudenreichii* (2 x 10⁹ 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 June-Aug., 2009 at 6000 cow Jersey dairy in MN. 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 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 2 hrs of delivery via esophageal tube feeder. After the colostrum feeding calves were fed 1.9 L of milk replacer twice daily. Two-10ml jugular blood samples were taken from each calf; one pre-feeding (T0) and one 24 hours post-feeding (T24). Serum was frozen at -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 hrs.

Results

Lactobacillus counts were higher in CR samples from the DFM-Live treatment group ($\log_{10} = 4.7$) as compared to the Ctrl group ($\log_{10} = 4.0$) or the DFM-Dead group ($\log_{10} = 4.0$) ($P < 0.0001$). 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 hrs 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.

Acknowledgements

The authors thank the farm management and staff at New Sweden Dairy for support of this project. Funding and in-kind support for this study was provided by Nutrition Physiology Company, LLC. (Overland Park, KS), Pfizer Animal Health Inc. (Simpsonville, KY), and the Saskatoon Colostrum (Saskatoon, Saskatchewan).

References

- Donahue, M., S. Godden, R. Bey, S. Wells, J. Fetrow, J. Stabel. Effect of feeding raw versus heat-treated colostrums on colostrums characteristics and passive transfer of immunoglobulin G in newborn dairy calves. 41st Annual Convention of the AABP in Charlotte; Proc. 41st AABP, Sept. 25-27, 2008. Charlotte, NC. Pg 249.
- Elizondo-Salazar, J.A. and Heinrichs, A.J. 2009a. Feeding heat-treated colostrum to neonatal dairy heifers: Effects on growth characteristics and blood parameters. *J. Dairy Sci.* 92:3265-3273.
- Elizondo-Salazar, J.A. and Heinrichs, A.J. 2009b. Feeding heat-treated colostrum or unheated colostrum with two different bacterial concentrations to neonatal dairy calves. *J. Dairy Sci.* 92:3265-3273.
- James, R.E., C.E. Polan and K.A. Cummins. 1981. Influence of administered indigenous microorganisms on uptake of [iodine-125] gamma-globulin in vivo by intestinal segments of neonatal calves. *J. Dairy Sci.* 64:52-61.
- Johnson, J., S. Godden, T. Molitor, T. Ames, and D. Hagman. 2007. The effect of feeding heat treated colostrum on passive transfer of immune and nutritional parameters in dairy calves. *J. Dairy Sci.* 90: 5189-5198.
- Poulson, K.P., F.A. Hartmann, and S.M. McGuirk. 2002. Bacteria in colostrum: impact on calf health. Abstr. 52 in Proc. 20th American College of Internal Veterinary Medicine. Dallas, TX. Pp. 773.