

Association between Serum Total Protein and Immunoglobulin G Measures in Calves Fed a Whole Colostrum Derived Colostrum Replacer

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Introduction

Use of refractometers to measure serum total protein (TP, g/dl) is a good method for monitoring passive transfer of IgG in groups of calves. Calloway and others (2002) reported that a serum TP concentrations of 5.0 or 5.2 g/dl most accurately predicted adequate passive transfer, defined as serum IgG of 10 mg/mL. The relationship between serum TP and IgG has been determined for calves fed maternal colostrum (MC), but not for calves fed whole colostrum derived colostrum replacers (CR). The objective of this study is to describe the relationship between serum TP (g/dl) and IgG concentrations (mg/mL) at 24 hours of age in calves fed whole colostrum derived CR vs calves fed raw MC.

Materials and Methods

This retrospective study used data previously generated from 187 calves from three separate studies conducted in 2006 and 2008, in which calves were fed either MC or whole colostrum derived CR. Enrollment criteria included: singleton birth, weight ≥ 69.7 lb (≥ 31.7 kg), calving ease score of ≤ 3 (on a scale of 1 to 5), and removed from the dam by 30 minutes and before suckling. After collecting a 0-1 hr (pre-colostrum) venous blood sample, calves were randomly assigned to be fed a colostrum treatment (CR or MC) using an esophageal tube feeder within 2 hrs of birth. Colostrum replacer treatments are defined for the separate studies: Study 1 (summer, 2006): CR was fed at 100 g or 200 g of IgG in 470 g or 940 g of powder, respectively (1 or 2 doses of Land O'Lakes Colostrum Replacer, Land O'Lakes, Inc.). Study 2 (summer, 2008): CR was fed at 200 g of IgG in 940 g of powder (2 doses of Land O'Lakes Colostrum Replacer, Land O'Lakes, Inc.). Study 3 (summer, 2008): CR was fed at 180 g of IgG in 675 g of powder (3 doses of Calf's Choice Total Gold Colostrum Replacer, Alta Genetics, Inc.). Calves assigned to MC treatment were fed 3.8 L of raw maternal colostrum in all studies. A venous blood sample was collected at 24 hrs for serum TP and IgG testing. Serum TP (g/dl) for 0 and 24 hr samples was measured on site using a hand-held refractometer (VET

360, Reichert Inc.). Frozen serum was then submitted to the Prairie Diagnostic Services Laboratory (University of Saskatchewan, Saskatoon, Canada) for IgG (mg/mL) using a RID method as described by Chelack *et al* (1993). Linear regression analysis (Proc Mixed, SAS version 9.2) described the relationship between serum IgG (mg/mL) (explanatory variable) and serum TP (g/dl) (dependent variable), with additional covariates offered into the model to describe type of colostrum fed (MC or CR) and study (1, 2 or 3).

Results

Mean birth weight and age at colostrum feeding was not different between calves fed MC (n=80, 91 lb [41.4 kg], 45.1 min) vs CR (n=107, 88 lb [39.9 kg], 46.7 min). Across all studies the mean serum TP and IgG concentrations at 24 hrs were 6.1 g/dl and 29.5 mg/mL, respectively, for MC calves and 5.3 g/dl and 16.0 mg/mL, respectively, for CR calves. The variable describing 'study' was not significant and did not modify the relationship between serum IgG and TP at 24 hours, so was removed from the final model. Similarly, the variable describing type of colostrum fed (MC or CR) was not significant and did not modify the relationship between serum IgG and TP at 24 hours, and so was also removed from the final model. The final model estimated that for a serum IgG value of 10.0 mg/mL, the predicted serum TP value would be 4.97 g/dl ($P < 0.05$). This relationship did not differ between MC calves (predicted serum TP = 4.88 g/dl) vs CR calves (predicted serum TP = 4.97 g/dl). The overall correlation (R^2) between serum TP and IgG for all calves was 0.87 ($P < 0.0001$).

Significance

Producers can use the same serum TP cutpoint of 5.0 g/dl to estimate passive transfer (IgG of 10 mg/mL) whether calves are fed a whole colostrum derived CR or MC. This study did not assess the relationship between serum TP and IgG measures for calves fed plasma derived colostrum replacers. The latter relationship requires further investigation.