

Relationship between serum total proteins and immunoglobulin G for calves fed either First Day Formula® CR or maternal colostrum

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Introduction

Total serum proteins concentration (TP) is frequently measured in calves to evaluate adequacy of passive transfer of immunoglobulin G (IgG) from colostrum. However, calves fed some commercially available colostrum-derived colostrum replacers (CR) may have lower serum TP at equal IgG concentrations as compared to calves fed maternal colostrum (MC). This can be due to removal of some proteins during manufacturing of CR. The objective of this study was to determine the linear relationship between TP and IgG at 22 to 28 h after birth for CR and MC.

Materials and Methods

Serum IgG and TP measurements were available from 299 calves fed CR (First Day Formula® CR, Accelerated Genetics, Baraboo, WI) and 292 calves fed MC. Blood samples were centrifuged to separate serum from the clot. Concentration of IgG was determined using a radial immunodiffusion kit (Triple J Farms, Bellingham, WA) and TP using a digital refractometer (Misco, Model DD-2, Solon, OH).

Results

The following are the linear relationships between IgG and TP in serum for the CR (IgG mg/mL = $-2.15(1.62) + 4.22(0.31) \times \text{TP g/dL}$) and MC (IgG mg/mL = $-13.23(2.03) + 6.25(0.37) \times \text{TP g/dL}$). For both CR and MC, a linear relationship between TP and IgG was observed ($P < 0.01$). However, for CR, a smaller percentage of the variability in IgG was accounted by TP ($R^2 = 0.390$ for CR and $R^2 = 0.605$ for MC). The TP value that resulted in IgG equal to 10 mg/mL (90% CI) was 3.44 g/dL (2.48, 4.38) for CR and 4.44 g/dL (3.65, 5.23) for MC. The 90% CI for MC includes the classical reference value of 5.2 g/dL indicating that the value estimated in the present study is not significantly different from the classical reference. Only 1 calf fed CR and one calf fed MC had a serum IgG value less than 10 mg/mL, making the estimation of the TP cut point for failure of passive transfer potentially inaccurate.

Significance

In conclusion, lower serum TP values at equal IgG concentrations were found when feeding CR compared to MC. Therefore, a lower TP cut point indicative of successful passive transfer of IgG should be used when using CR.