Comparison of an alternative diagnostic sampling technique for *Tritrichomonas foetus* in cattle

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Introduction

Bovine trichomoniasis is emerging as a major concern in the beef industry. Standard breeding soundness exams may not include evaluation for venereal diseases. Recent advancements in PCR diagnostics have increased the ability to detect the disease in asymptomatic bulls. However, the greatest limitation is proper collection of an adequate sample. Furthermore, the low repeatability of most sample collection techniques can cause confusion and misdiagnosis. The aim of the study was to identify a technique that increased sensitivity and could easily be used during breeding soundness exams.

Materials and Methods

Eighty commercial bulls of unknown infection status were sampled for detection of *Tritrichomonas foetus* (TF) using 2 different collection methods: 1) traditional preputial/penile scraping with a dry insemination pipette (TPS) and 2) preputial/penile swabbing (PPS). TPS samples were taken by vigorously scraping preputial/penile mucosa using a rigid insemination pipette while applying negative pressure. PPS samples were obtained by briskly swabbing the preputial/penile mucosa with gauze during full extension of the penis. All samples were processed using InPouch™ TF media and submitted under similar conditions for PCR testing at the ISU Veterinary Diagnostic Laboratory.

Results

Positive PCR results were observed in 28/80 (35%) of bulls using TPS technique, however 31/80 (39%) were positive using PPS technique. Sensitivity was determined with web based application utilizing R software. The Newton-Raphson algorithm predicted the sensitivity of the TPS method was 0.897 (CI 0.637-0.978) and the sensitivity of the PPS was 0.962 (CI 0.774-0.995).

Significance

This data indicates that the PPS technique may be a more reliable alternative to the TPS method.

Assessment of colostrum quality in dairy cattle using digital and optical Brix refractometers

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Introduction

Colostrum contains a high concentration of immunoglobulins (particularly IgG1) that is an important source of immunity for newborn calves. Insufficient ingestion and absorption of colostral IgG results in failure of transfer of passive immunity (FTPI). FTPI increases the calf's risk of infection, morbidity and mortality. Therefore, measuring IgG concentration in colostrum prior to feeding and storage is a useful colostral management tool. Brix refractometers, either digital or optical have been used to estimate the colostral IgG concentration. The objectives of this study were to evaluate the performance of both digital and optical Brix refractometers for assessing colostrum quality in dairy cows, and to evaluate the agreement between the 2 types of Brix refractometers.

Materials and Methods

A cross-sectional study was designed to measure colostral IgG concentration by radial immunodiffusion (RID) assay and the digital and optical Brix refractometers. Colostrum samples (n=251) were collected from Holstein dairy cows on 7 commercial dairy farms. Of these, 168 samples were collected between June and October 2013, while the remaining 83 samples were collected between May and August 2014. The correlation between the 2 refractometers were plotted against each other and against the RID IgG concentrations.

A receiver operating characteristic (ROC) curve was created and used to identify the optimal cut-off for this dataset. The sensitivity (Se), specificity (Sp), and accuracy of the digital and optical Brix refractometers for assessing colostrum quality using optimal cut-offs were calculated. The level of agreement between results of 2 refractometers were assessed using McNemar's test for paired data to check for bias, followed by calculation of the kappa statistic.

Results

The mean RID IgG concentration was 47.6 g/L (SD ± 28.3), with a range from 4.2 to 144.2 g/L. The prevalence of poor colostrum (RID IgG <50 g/L) was 61%. The mean of % Brix concentration determined by the digital refractometer was 22.7% Brix (SD ± 4.2) with a range from 10.2 to 29.8% Brix, whereas, for the optical refractometer was 23.1% Brix (SD ± 3.9) with a range from 7.4 to 30% Brix. The spearman correlation between RID IgG concentration and Brix scores determined by the digital and optical refractometers were 0.59 and 0.57, respectively, whereas the correlation between Brix scores from both the digital and optical refractometers was 0.96. The area under the curve (AUC) for the receiver operating curve was 0.75 and 0.74 for the digital and optical refractometers, respectively. The best combination of Se (76%; 95% CI: 66 to 84%), Sp (69%; 95% CI: 61 to 77%) and accuracy (72%) for digital refractometer was at 23.7% Brix. For the optical refractometer the best combination of Se (72%; 95% CI: 61 to 80%), Sp (68%; 95% CI: 60 to 75%) and accuracy (69%) was at 24.2% Brix. The overall percent of agreement between results of the digital and optical refractometers was 93%, with a corresponding kappa-value of 0.85, which is in agreement with the McNemar's test that showed no significant difference (P>0.05) between proportions of colostrum samples classified as poor and good quality by the 2 refractometers.

Significance

Both refractometers exhibited moderate utility in assessing colostrum quality. There was strong agreement between the 2 refractometers; however, the optimal cut-offs for the digital (23.7% Brix) and optical (24.2% Brix) refractometers were slightly higher than previously recommended cut-offs.

Comparison of serum IgG half lives in dairy calves fed colostrum, colostrum replacer, or administered with intravenous plasma

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Introduction

The cotyledonary placenta allows minimal transfer of immunoglobulins from the cow to the fetus during pregnancy. Consequently calves are born hypogammaglobulinemic, thus making it essential to ingest and absorb colostral immunoglobulins to acquire passive immunity. Therefore, the half-life of maternally derived colostral immunoglobulin G (IgG) in dairy calves is important in the development of the calf immune system as well as determination of the age at which to vaccinate the calf without interference from the maternally derived IgG. Half-life of maternally derived colostral IgG is estimated to be 20 days in dairy calves. In clinical settings, bovine plasma is used as part of treatment of sick calves that require additional immunity via plasma administration. Currently, no studies have evaluated the half-life of colostrum replacer derived IgG or plasma derived IgG in dairy calves. We hypothesized that the half-life of maternally derived IgG has a significantly different half-life compared to colostrum replacer derived or plasma derived IgG in dairy calves. The aims of this study were to determine the half lives of IgG derived from colostrum, colostrum replacer or plasma in dairy calves.

Materials and Methods

Thirty Jersey calves randomly assigned to 3 groups of 10. Group 1 was fed 3 L colostrum within 2 hours after birth; Group 2 was fed colostrum replacer (equivalent to 200 g IgG) within 2 hours after birth according to the manufacturer's recommendations; and Group 3 was administered bovine plasma intravenously at 13.6 ml/lb (30 ml/kg) within 2 hours after birth. Serum samples were collected prior to feeding colostrum or colostrum replacer or intravenous plasma administration, and at 2, 5, 7, 10, 14, 21, 28 and 35 days of age. Serum, colostral, or plasma serum IgG concentrations were determined by radial immunodiffusion followed by calculation of serum IgG half life by non-linear regression using a commercial statistical software.