K-STATE Research and Extension

CATTLEMEN'S DAY 2026

KANSAS STATE UNIVERSITY CATTLEMEN'S DAY

Field Validation of a Mob Composite Sampling Protocol to Estimate Herd Parasitism in Cattle

A. Gibbons, G.I. Crawford,[1] J. Slightom,[1] and H.E. Larson

Abstract

Field detection of parasite loads and their potential resistance to anthelmintic drugs often involves fecal egg count tests. The project's objective was to evaluate the industry standard fecal sampling protocol of individual samples (IDV) against a mob composite sampling approach (MOB) that would reduce the number of samples needed to identify nematode fecal egg count rates in beef cattle. Fecal samples (n = 1,060) were collected from cattle (both calf-fed and yearling) upon arrival in commercial feedlots (n = 12) and sale barns (n = 1). Sample sets were collected by pen (n = 53), with pen sizes varying from 64 to 225 animals depending on the commercial operation. Samples were collected from 20 different individual fresh fecal pats deposited on the floor of each pen (IDV). The MOB samples (n = 106) were further processed to yield two composite samples, each representing 10 of the original pen-collected samples. The IDV (n = 20 per pen) and MOB samples (n = 2 per pen) were analyzed by microscope to determine eggs/3 g (ep3g) count value. IDV and MOB samples were averaged by pen and then compared using Lin's concordance correlation. Analysis revealed a 91.7% agreement in mean fecal egg counts (ep3g) between the MOB and IDV methods, with a 95% confidence interval ranging from 86.4% to 95.0%. Results suggest that the average of two 10-sample MOB samples offers an acceptable method for assessing parasite loads in commercial feedlot operations. This mob sampling approach has the potential to enhance the number of parasite load evaluations conducted in newly received cattle by requiring fewer samples, thereby decreasing the time and diagnostic costs. This will allow producers the chance to evaluate their current deworming protocol in their operation efficiently, at a reduced cost.

Introduction

Cattle placed in feedlots frequently carry a high internal parasite load, which can lead to poor growth, suppressed immune function, and significant economic loss. Fecal egg count reduction tests (FECRT) are the preferred field assay for detecting the presence of herd-level gastrointestinal nematodes in ruminants (Coles et al., 1992; Coles et al., 2006) and the effectiveness of anthelmintic drugs used to treat them. The diagnostic practice is conducted by examining fecal samples under a microscope, which allows for the identification of nematodes, roundworms, mites, and protozoa based on egg size and shape. Fecal egg count tests involve sampling fecal pats from about 15-20 individual

[1] Merck Animal Health, Rahway, NJ

animals to represent a larger cattle herd (Coles et al., 1992). When testing for drug efficacy, FECRT require sample collections before anthelmintic treatment to provide a baseline infection level of the herd prior to drug application. Sample collection is repeated 10-14 days after anthelmintic drug application for evidence of drug effectiveness in reducing fecal egg counts.

Industry insights estimate that less than 1% of cattle on feed are surveyed for nematodes. Full FECRT were not reported in this trial as all cattle had 100% drug efficacy after 10-14 days. Instead, the results presented represent samples collected prior to anthelmintic drug application. The trial was performed with the goal of evaluating the efficacy of a mob composite sampling approach against existing industry fecal sampling protocols for estimation of herd fecal egg counts. The goal of the trial was to develop a methodology that would simplify sampling requirements, increasing the number of cattle sampled for identification of nematode fecal egg counts.

Experimental Procedures

Seven individuals collected fecal pat samples (n = 1,060) from selected individual cattle from known regions with a high prevalence of internal parasites, which were placed at feedyard (n = 12) or sale barn (n = 1) locations. Samples were collected from 53 pens ranging from 64 to 225 head per pen of either calf-fed or yearling cattle. After collection, samples were brought to one of the two locations for analysis: 1) Merck Animal Health Diagnostic Laboratory, Lawrence, KS, or 2) Kansas State University, Olathe, KS.

When collecting individual fecal pat samples, 0.5 fluid oz of fecal material was collected from three different locations on a fecal pat and then combined. The 1.5 fluid oz of combined sample represents one fecal pat within one pen. The process was repeated 20 times per pen, resulting in 20 individual samples per pen. Industry standard sample (IDV) processing began with the 20 fecal pat samples collected per pen. After thorough mixing, 3 g from each fecal pat sample were separated into a smooth-sided cup and prepared for microscopy using the modified Wisconsin procedure (Bliss and Kvasnicka, 1997). The process was repeated for each sample collected in each pen.

The MOB sample processing began by splitting the 20 fecal pat samples collected per pen into two groups of 10. To create a composite of the two 10-sample groups, 3 g from each sample were separated into a smooth-sided cup, resulting in two 30-g composite samples, which were prepared for microscopy using the same procedure as described for IDV samples. Individual eggs were identified by size and shape in each sample using microscopic techniques. Total nematode presence in the fecal material was recorded as the sum of eggs identified (ep3g). The IDV and MOB samples were averaged by pen for each sampling method.

The correlation between pen average fecal egg count values for the MOB method and pen average fecal egg count values for IDV method was analyzed with Lin's Concordance Correlation Coefficient (CCC) using the epiR package in R. To assess the limits of agreement between MOB and IDV, a Bland-Altman plot was used. Before Bland-Altman test analysis, a log transformation was applied to the raw data due to the positive nature of fecal egg counts.

Results and Discussion

The infection rates of the samples evaluated in this study ranged from three to 390 eggs/3 g of fecal material (ep3g) based on IDV techniques, and two to 444 ep3g for MOB techniques. Lin's CCC correlation analysis determined 91.7% agreement between the IDV method and the MOB method, with a 95% confidence interval ranging from 86.4% to 95%. This correlation indicates good agreement between the field detection methods, allowing for a high degree of confidence in herd fecal egg count identification using this MOB sampling technique compared to the IDV method. The Bland-Altman analysis determined that MOB method counts reported 6 eggs/3 g less than IDV count values. This difference is estimated to minimally impact the effectiveness of fecal egg count tests, which are typically used to make anthelmintic treatment decisions based on the presence of parasites or not. The IDV and MOB methods have flaws and variability, so some differences between methods were expected when analyzing the results.

Decreasing sample analysis from 20 samples to two samples has the potential to significantly decrease diagnostic costs, which could be an encouragement to increase samples collected for nematode infection estimation in U.S. cattle herds. Increasing the number of herds sampled for nematodes would create an opportunity to increase the overall understanding of drug efficacy and support the responsible use of anthelmintic drugs for treating nematode infections in U.S. beef cattle populations.

Implications

Results indicate that a mob sampling method using two composite samples, each representing 10 fecal pats, can evaluate parasite loads with 91.7% confidence in received cattle, thereby decreasing processing time and analysis costs of herd parasitism diagnostics.

Acknowledgments

This research was funded by Merck Animal Health. The authors would like to extend a thank you to those who assisted in sample and data collection.

References

Bliss, D.H. and W.G. Kvasnicks. 1997. The fecal examination: a missing link in food animal practice. Compendium on Continuing Education for the Practicing Veterinarian 19(4): S104–S109.

Coles, G.C., C. Bauer, F.H. Borgsteede, S. Geerts, T.R. Klei, M.A. Taylor, and P.J. Waller. 1992. World Association for the Advancement of Veterinary Parasitology (W.A.A.V.P.) methods for the detection of anthelmintic resistance in nematodes of veterinary importance. Veterinary Parasitology 44(1-2):35–44. *https://doi.org/10.1016/0304-4017(92)90141-u*

Coles, G.C., F. Jackson, W.E. Pomroy, R.K. Prichard, G. von Samson-Himmelstjerna, A. Silvestre, M.A. Taylor, and J. Vercruysse. 2006. The detection of anthelmintic resistance in nematodes of veterinary importance. Veterinary Parasitology 136(3-4):167-185. *doi:10.1016/j.vetpar.2005.11.019*

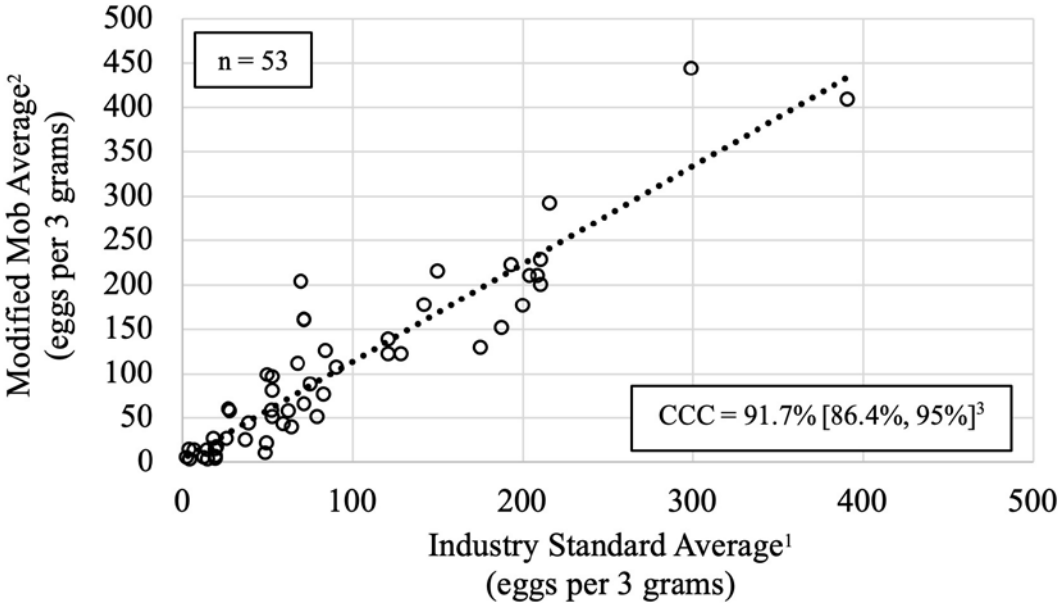

Figure 1. Correlation between Industry Standard Average and Modified Mob Average
[1]Industry standard (IDV) = average of 20 fecal pat samples collected per pen.
[2]Modified mob (MOB) = average of 2 composite samples each comprised of 10 of the original pen samples.
[3]Lin's concordance correlation coefficient (CCC) analysis for agreement between IDV and MOB methods with a 95% confidence interval.