

# Evaluation of composite vs individual fecal egg counts: Helping producers save money while accurately monitoring the resistance status of their parasites

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## Introduction

Numerous studies have demonstrated that anthelmintic resistance in gastrointestinal nematodes (GIN) of cattle is an increasing problem worldwide. Currently, the only method of identifying resistance in GIN of cattle is through fecal egg count reduction tests (FECRT). Depending on the number of cattle on a farm, cost for individual fecal egg counts (FEC) can become prohibitive to producers. Consequently, there is a need to evaluate lower-cost methods for diagnosing anthelmintic resistance in a herd. The objective of this study was to evaluate the ability of composite FEC to accurately identify the efficacy of a given treatment.

## Materials and Methods

On each of 10 cow-calf farms in Georgia, we performed fecal egg count reduction tests (FECRT), using 3 different treatments: eprinomectin pour-on (Eprinex®, Boehringer-Ingelheim), doramectin injectable (Dectomax®, Zoetis), and a concurrent therapy of doramectin injectable and oral fenbendazole (Safeguard®, Merck). This study design yielded 30 groups for analysis. Samples for FEC are collected both at time of treatment and again 14 days post-treatment, with the same animals being sampled at both times. Individual and composite FEC were performed using the Mini-FLOTAC® method with 5 eggs per gram detection sensitivity. For individual testing, 1 Mini-FLOTAC® was performed per calf both pre and post-treatment. For each composite sample, 1 g of feces from each calf in a group was weighed, homogenized, and 5 g of the pooled sample was used for the Mini-FLOTAC®. For composite samples, multiple Mini-FLOTAC® disks were read until at least 200 eggs were counted in the pre-treatment, the number which was determined necessary for statistically accurate assessment of FECRT. The same number of FEC required to reach 200 eggs pre-treatment were counted post-treatment. Criteria used for establishing resistance status are: susceptible when FEC reduction (FECR) is  $\geq 95\%$  and 95% lower confidence interval (LCI) is  $\geq 90\%$ ; resistant when FECR reduction is  $< 95\%$  and 95% LCI  $< 90\%$ ; and suspected resistant when only 1 of the 2 criteria are met.

## Results

Group size for individual FEC ranged from 17 to 24 calves while the number of composite Mini-FLOTAC® disks required to reach 200 eggs ranged from 1 to 21, with a median of 6. FECR varied from 25.84% to 100%, providing a wide range for analysis. There was a high level of agreement between individual and composite samples (concordance correlation coefficient = 0.94; 95% CI=0.89-0.97). Importantly, we found no groups where there was a discrepancy between the individual and composite FEC results in terms of assigning a resistant or susceptible status, meaning that even when agreement was not perfect, we were still able to accurately assess the resistance status for a drug using the composite FEC.

## Significance

These and previous data from our laboratory demonstrate that when performing a FECRT on cattle, the use of composite FEC is an accurate method for assessing resistance status of a parasite population on a farm. Overall, using the composite approach the number of FEC required was decreased by 65% as compared to individual FEC, and additional analyses may permit a further decrease. Our results should encourage producers and veterinarians to more readily utilize FECRT for assessing efficacy of anthelmintics on cattle farms. The wide-range in the mean FEC and the variability in FECR across farms and treatments is indicative of the diversity in both egg counts of calves and resistance in GIN on different farms. These data indicate that this composite system can be applied broadly across farms with varying parasite intensity and resistance status. Two caveats to the composite FEC approach is that information gained from it is limited to the group level; it is not possible to learn about egg shedding from an individual animal using this methodology, and 95% confidence intervals cannot be calculated, limiting the certainty of results when near the threshold cutoff for resistance.