

Prevalence of gastrointestinal nematode resistance to avermectin anthelmintics on beef cattle operations in Georgia

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Introduction

Anthelmintic resistance is a worldwide problem in all livestock systems, with most reports of resistance in cattle parasites being to the macrocyclic lactone (ML) drug class. Several prevalence studies performed internationally demonstrate that anthelmintic resistance in cattle parasites is a growing problem, however, no similar studies have been performed in the US. The primary objective of this study was to gain data on the prevalence of ML resistance in gastrointestinal nematode (GIN) parasites on beef cattle farms in Georgia. We also wanted to test the efficacy of combination anthelmintic therapy in these same herds, and use these data as a basis for educational outreach programs for beef producers in Georgia.

Materials and Methods

Twelve cow-calf farms, three from each quadrant of Georgia are planned for inclusion in the study, and to date, 6 farms are completed. On each farm we performed fecal egg count reduction tests (FECRT), using three different treatments: eprinomectin (EPR) pour-on (Eprinex®, Merial, Duluth, GA, USA), doramectin (DRM) injectable (Dectomax®, Zoetis, Kalamazoo, MI, USA), and a combination of doramectin injectable and oral fenbendazole (Safe-guard®, Merck, Madison, NJ, USA) (DRM-FBZ). Inclusion criteria for farms are: availability of at least 60 head of cattle <1 year of age, adequate cattle handling facilities, and cooperation of the operator. Cattle are weighed prior to treatment, and study personnel administered all treatments. Samples for fecal egg counts (FEC) and coproculture are collected both at the time of treatment and again 14 days post-treatment. FEC were performed using the Mini-FLOTAC® method with 5 eggs per gram detection. We included the anthelmintic combination because recent research indicates that the increased efficacy resulting from the combination delays the development of resistance. Criteria used for establishing resistance status are as follows: susceptible when FEC reduction (FEER) is ≥95% and 95% lower confidence interval (LCI) is ≥90%; resistant when FEER reduction is <95% and 95% LCI <90%;

and suspected resistant when only one of the two criteria are met. It is not possible to differentiate trichostrongyle eggs to species based on egg morphologically, therefore, we proportionally assigned eggs to parasite genus based on the larval identifications and then calculated FEER for each genus.

Results

FEER ranged from 31.3-96.7% (mean=70%) for EPR, and 47.8-97.9% (mean=75.3%) for DRM; these results were not significantly different ($p=0.21$). Four of the six farms exhibited resistance to both EPR pour-on and DRM injectable, one had resistance to EPR and suspected resistance to DRM, and one farm had GIN susceptible to both individual treatments. Combination therapy (DRM-FBZ) yielded ≥95% reduction in FEC with 95% LCI ≥90% on all farms (mean=98.5%), and this was significantly higher than for both EPR and DRM ($p=0.029, 0.04$). Examination of coprocultures provided additional genus-specific insights into which genera were resistant on each farm. ML-resistant *Cooperia* were present on 5 of the 6 farms, and ML-resistant *Ostertagia* and *Haemonchus* each were present on one farm. Interestingly, the farm with the lowest efficacy against *Cooperia* (0% for both EPR and DRM) was the farm that also demonstrated resistance to both *Haemonchus* (FEER= 16.3% and 45%), and *Ostertagia* (FEER = 84.7% and 90%), for EPR and DRM respectively.

Significance

These data demonstrate that resistance to ML drugs is highly prevalent in *Cooperia* on beef farms in Georgia. Furthermore, the diagnosis of resistance in *Cooperia*, *Ostertagia* and *Haemonchus* all on the same farm is a clear indication that anthelmintic resistance is reaching important levels that threaten the health and productivity of cattle. Although this study spanned a narrow geographic range, results likely are representative of cattle farms in the southern US. Additional studies in other geographic regions are needed to gain a better picture of the problem on a national level.