Field trial to evaluate the efficacy of ivermectin in the treatment of small ruminants with presumptive *Parelaphostrongylus tenuis* infections

M.C. Smith, *BS, DVM* [1] ; **S.M. Buckner**, *BA, DVM, MPH* [1] ; **K. Roberts**, *BS* [1] ; **T.L. Stanton**, *BS, MS, PhD* [2] ; **M.L. Thonney**, *BS, MS, PhD* [2] ;
[1]*Ambulatory and Production Medicine, Cornell University College of Veterinary Medicine, Ithaca, New York, 14853*
[2]*Department of Animal Science, Cornell University College of Agriculture and Life Sciences, Ithaca NY 14853*

Introduction:

Parelaphostrongylus tenuis, also known as the meningeal worm of the white-tailed deer, causes neurologic disease when it migrates through the central nervous system of aberrant hosts. The objective of this study was to determine if ivermectin improves the outcome of treatment of spinal cord disease attributed to *Parelaphostrongylus tenuis* in small ruminants. A current recommendation is to treat animals with *P. tenuis* using fenbendazole, ivermectin, and dexamethasone for 5 days. No studies have shown that ivermectin increases recovery rates in sheep and goats and it dramatically increases the withdrawal times.

Materials and Methods:

Sheep and goats from 10 farms in central New York were identified with spinal cord deficits by their owners and diagnosed by a veterinarian as having a presumptive *P. tenuis* infestation based on clinical signs alone. Laboratory confirmation was not attempted. The animals were randomly assigned within herd to a treatment or control group. The treatment group received 5 days of oral fenbendazole (25 mg/kg), intramuscular dexamethasone (0.2 mg/kg for 3 days followed by 0.1 mg/kg for 2 days) and subcutaneous ivermectin (0.5 mg/kg); the control group received the same 5 day course of fenbendazole and dexamethasone with a similar volume of placebo vehicle subcutaneously. The clients and study veterinarian were blinded to treatment. Neurologic examinations were conducted on all animals at time of enrollment and after treatment to permit evaluation of severity of clinical signs and changes in neurologic status. Animals were scored initially and after treatment on a 1 (unable to stand) to 5 (no detectable neurologic deficits or only an expert

would notice) scale, with a score of 4 indicating likely to function in the herd for breeding though noticeably impaired. Animals were classified as recovered if they required no further treatment to potentially remain in the breeding herd after the 5-day treatment period. Owners were contacted at least annually over the three year study regarding the status or disposition of their animals. A binary logistic regression model was developed to determine if ivermectin had an effect. The statistical model included the effect of animal species with pretreatment neurological score from 1 (unable to stand) to 4 (likely to function for breeding but noticeably impaired) as a continuous variable.

Results:

Thirty-eight animals (n=20 goats, n=18 sheep) were enrolled in the trial with 18 animals (9 goats, 9 sheep) in the control group and 20 animals (11 goats, 9 sheep) in the treatment group. Higher pretreatment scores improved outcome ($P = 0.002$). Because all 11 goats treated with ivermectin were categorized as recovered, differences between species on the effect of ivermectin ($P = 0.073$) could not be tested with binary logistic regression. Species differences were not significant. Six of 9 sheep treated with ivermectin recovered without further treatment, but 3 had to be euthanized. Five of 9 sheep treated with the placebo recovered without further treatment; 2 required additional treatment, and 2 had to be euthanized. All 11 of the goats treated with the ivermectin recovered, while six of the nine treated with the placebo recovered without further treatment, and 3 required additional treatment. These better outcomes for goats are probably explained by closer observation of goats which resulted in higher pre-treatment neurological scores.

Significance:

Given the importance of pretreatment score on the odds of recovery, close observation of animals at high risk for *P. tenuis* infestation is warranted for timely treatment. Studies with larger numbers of animals are needed to definitively state whether including ivermectin in the treatment protocol improves outcome. Inclusion of ivermectin increases the drug withdrawal period for the standard protocol to 96 days according to FARAD, the Food Animal Residue Avoidance Databank. If there is no concern about the withdrawal period, we cannot rule out the possibility that ivermectin may be beneficial in the treatment of highly valuable animals.