

Chronic hookworm (*Ancylostoma caninum*) is a not an uncommon problem in retired racing greyhounds & other occasional breeds. – MW Dryden (Kansas State University, Sept 2019)

There can several reasons these chronic cases are occurring or are being diagnosed.

1. Reinfection from contaminated yards or other areas outdoors these dogs have access. Remember that *A. caninum* has a development or prepatent period as short as 14 days. Therefore, a dog can be infected and shed eggs in as little as 2 weeks. So positive fecals between monthly dosing of broad-spectrum heartworm preventives may occur.
2. Some of these cases may not be truly infected dogs, but from coprophagy. These dogs eating feces of other animals, especially feces of large animals containing “strongyle type” eggs. We see this on occasion. These eggs are just passing through. This can be determined either by correct identification of eggs (typically much larger eggs than *Ancylostoma*) or boarding dogs for 2 days and rechecking fecals. Boarded dogs should clear (exit through G.I. tract) any large animal strongyle eggs within 48 hours.
3. In some retired greyhounds these dogs do appear to be chronically infected and the problem often appears to be due to “leak-back”. These dogs have large somatic tissue larvae burdens. Larvae are acquired throughout their lives while being raised and housed in sand runs and pens. Somatic larvae become reactivated overtime and migrate back to small intestine.
 - Various anthelmintics are commonly used in these cases and often appear ineffective (pyrantel, febantel (in Drontal plus) fenbendazole, & milbemycin oxime). Once adults are killed new larvae repopulate the small intestine from the somatic tissue burdens.
 - We have had success using transdermal moxidectin (Coraxis™ or Advantage® multi). The topical application and half-life of the formulation allow for sustained blood levels of moxidectin. As larvae are reactivated and repopulate the small intestine, we suspect the steady state systemic moxidectin is killing them, not the encysted larvae. We recommended to dose on day 0, then at 2, 4, and 6 weeks and then monthly. Eggs counts often drop within the first 30 days, but it can take 3 to 4 months for complete cessation of egg shedding. Many of these cases have been lost to follow-up so it is unclear if this has been successful in every case.
 - One particular case is of interest. A retired racing greyhound with chronic hookworm egg shedding, regardless of oral anthelmintic. Dog was placed on Advantage® multi and fecals were negative for hookworm eggs within 3 months. Dog was maintained on Advantage® multi for one year. Dog was taken off Multi and 2 months later fecals were once again positive for hookworm eggs. Dog placed back on Multi & eggs quickly disappeared from the fecal. So we are not sure how long it takes to eliminate the somatic burden, but in this one dog 12 months was not long enough. I now recommend keeping these dogs on topical (transdermal) moxidectin for life.
4. Finally, anthelmintic resistance has now been documented in *Ancylostoma caninum* in greyhounds and other breeds of dogs that likely have had contact with environments greyhounds have frequented.¹⁻⁴ Some of these nematodes appear to be multi-drug resistant. Resistance can be assessed by conducting a quantitative fecal exam (EPG), administering the correct dose of Drontal plus (febantel), Interceptor (milbemycin oxime) or Panacur (fenbendazole) and rechecking a quantitative fecal exam in 7 to 10 days. If the worms are susceptible the fecal should be negative or egg numbers should be reduced by $\geq 90\%$.
 - If post-treatment egg reduction is not at $\geq 90\%$ then resistance can be suspected.
 - One anthelmintic combination that appears to be (at least for now) effective in these cases is transdermal moxidectin (Coraxis™ or Advantage® multi) combined with Drontal® plus (febantel/pyrantel/praziquantel).²
 - Administer moxidectin topically (Coraxis™ or Advantage® multi - standard topical dose – 2.5 to 5.0 mg/kg every 2 weeks and Drontal® plus orally monthly until fecal exams are negative (check monthly). Once fecals are negative then use topical moxidectin monthly. Check fecals every 3 to 4 months. If fecals become positive for hookworms again, restart combo protocol.

1. Isolation and characterization of a naturally occurring multidrug-resistant strain of the canine hookworm, *Ancylostoma caninum*. Kitchen S, et al. Int J Parasitol. 2019 Apr;49(5):397-406.
2. Combination Anthelmintic Treatment for Persistent *Ancylostoma caninum* Ova Shedding in Greyhounds. Hess LB, et al. J Am Anim Hosp Assoc. 2019 May/Jun;55(3):160-166.
3. Evidence of multi drug resistance in *Ancylostoma caninum* confirmed by in vitro bioassay and in vivo trials. Jimenez-Castro PJ, et al. Proceedings AAVP 2018 Abstract 58 p93-94.
4. Multiple drug resistance in *Ancylostoma caninum*: an emerging threat to canine health. Kaplan R, et al. Proceedings AAVP 2018 Abstract 90 p115-116.