

HEARTWORM PREVENTION: WHY SHOULD ALL DOGS & CATS BE ON PREVENTIVE? CAPC Dwight D. Bowman, MS, PhD

CAPC recommends year-round heartworm prevention with internal and external parasite control for dogs and cats. It is difficult to comprehend why there is resistance from so many practitioners and their clients as to the need for such control, as this seems the logical means of easily preventing a number of pathogens from dwelling in or on a pet or feeding on a pet and inoculating it with dangerous microbes. The cost is minimal compared to the cost of treating the diseases and the morbidity (and sometimes mortality) induced, the concern of clients faced with an infected pet, and the potential of pets being the reservoir of zoonotic agents.

Heartworm (*Dirofilaria immitis*) infection in dogs is the basis for much of parasite prevention. Dogs that are not on prevention are at risk of being infected with worms that live in the pulmonary arteries and induce right heart disease and death. Convincing clients to be on year-round preventive therapy is easy in Florida or Houston, but the farther one gets from the southeastern United States, the more difficult it is to convince people that there is any need for prevention. The people who don't think it is necessary in areas other than the southeastern United States are people who are not paying attention. The American Heartworm Society has reported for years on the continued spread of heartworm into new areas, has reported on some 250,000 dogs being found infected each year in the United States, and basically has mapped it to each of the lower 48 states (Guerrero et al. 2006). In an IDEXX-sponsored survey of clinics that included some 3 million data points for dogs, the map was basically the same as that generated by the AHS (Bowman et al. in press). Similarly, a clinic survey done by Novartis in the western United States showed a similar pattern of infection (Bowman et al. 2007). Heartworm now represents the genie out of its bottle. Also, the genie has now entered the coyote population with very high densities (even in California, per Sacks et al. 2004), so without a new trick or some new magic, it is going to be very difficult to get the genie corked up again in the bottle of the few southeastern states.

Cats get heartworm as well. Agreed, cats do not support a large number of mature adult worms like a dog or a ferret, but you are not going to find any parasitologist who has looked at the feline heartworm literature who says that the worms cannot develop to some extent in cats. Surveys have shown that the rate of heartworm-specific immunoglobulin G in cats can be remarkably high in the southeastern United States, midwestern United States, and even in 35.5% of the samples from California (Miller et al. 1998). Also, there is very little argument that heartworms cause severe disease in cats when present (Litster and Atwell 2007). People do argue as to whether the respiratory disease associated with early migratory stages of heartworm in cats (HARD—Heartworm Associated Respiratory Disease) (Dillon 2007) is significant compared to other feline respiratory conditions. In any event, the worms making their way to the pulmonary arteries are about an inch long (McCall et al. 2007), so how many inch-long worms entering and dying in the pulmonary arteries does it take to make an impact? The answer should be based on the knowledge that cats may live in an area where 35.5% get infected on the basis of serum IgG, infection is passed by the bite of a mosquito (a fairly common event), and infection means that inch-long worms are likely to be migrating into the cat's lungs and dying there. The answer seems very uncomplicated: HARD has to be bad.

Other parasites of concern are the common intestinal parasites of dogs and cats. In a national survey of shelter dogs in 1996, it was shown that out of 6,458 fecal samples, 14.5% contained *Toxocara canis*, 19.2% *Ancylostoma caninum*, and 14.3% *Trichuris vulpis* eggs (Blagburn et al. 1996); Dr. Blagburn is performing another similar study with shelter dogs right now and is finding very similar levels of infection (Blagburn, personal communication). A survey of shelter cats in New York revealed that 17.6% were infected with *Toxocara cati* (Lucio-Forster & Bowman 2007). When one looks at household pets, the numbers are not all that different. Of 8,077 medical records from well-cared-for dogs seen at the University of Pennsylvania School of Veterinary Medicine, 9.7% had hookworms and 5.7% had ascarids (Nolan & Smith 1995). Looking at 1,199,293 canine fecal results from samples examined in the Antech Diagnostic Laboratories in 2006, 2.2% had ascarids, 2.5% had hookworms, and 1.2% had whipworms (Little 2008). Moore et al. (2007) reported on the results of fecal flotation examination of 211,105 feline samples submitted to > 350 Banfield hospitals during 2003–2004; 2.92% had roundworms and 0.63% had hookworms. Thus, internal parasites are present in dogs and cats throughout the United States, even in “well-cared-for” pets.

There is other evidence besides canine and feline fecal examinations that shows that these parasites remain common in our pet population. We can look at the prevalence of infection in people. It seems that larval toxocariasis in people is just about as common as intestinal toxocariasis in dogs and cats. Anti-*Toxocara* antibodies among people in the United States was 13.9%; this survey examined the sera from the Third National Health and Nutrition

Examination Survey for the presence of *Toxocara*-specific immunoglobulin G (Won et al. in press). There was not a marked difference in the seroprevalences in people from different regions; the percentages by region were South 17.4%, Northeast 15.6%, Midwest 11.4%, and West 9.4%. The prevalence in people very closely mirrored what Blagburn et al. (1996) reported for fecal samples from shelter dogs: South 17.8%, Northeast 12.6%, Midwest 15.5%, and West 11.0%. Also, we know that people are being infected by the ingestion of infective eggs in the environment; therefore, dogs and people are both at risk from this source.

Also, the fact that heartworms infect people allows humans to serve as indicators of where heartworms are being transmitted. Theis (2005) summarized in a comprehensive review the 110 reported cases of human heartworm infection. The states with the largest numbers of cases were as suspected: Texas (23), Florida (16), Louisiana (10), and South Carolina (8). Also, other states where cases occurred were places one would expect them: North Carolina (4), Tennessee (4), Georgia (3), Alabama (1), Maryland (1), Virginia (1), and somewhere in the southeast (1). But there are also cases from Connecticut (6), Massachusetts (6), Pennsylvania (5), California (4), Indiana (4), New England (4), Illinois (2), Mississippi (2), New York (2), Wisconsin (2), and Michigan (1). Of the four cases from California, three occurred in individuals who had never traveled outside of their county, meaning that the transmission was autochthonous, i.e., local. These are people who had lesions that were detected; imagine if we were to serologically examine the human population as we have the cat population, and there could be a very loud clamor for better heartworm control.

But why be on a preventive year-round? Why not? The drugs are safe and tested with the understanding that they are going to be used throughout the life of an animal. One can make the argument that there are months during the year when mosquitoes do not fly, but it is hard to make the same argument for much of the United States relative to the infectivity of roundworms. Eggs containing infective larvae can persist in the soil for years, and if the host can get to them, they are just as infectious in January as they are in March or July. There simply has to be a means of getting the soil from the ground to the mouth. For those of us living in New York, we often find ticks active during those warm days in January. People are often startled, but those of us familiar with ticks are not. They warm up and are immediately ready to find a host and feed.

The resistance that people feel toward year-round prevention may simply be a matter of not understanding the risk that pets face from their environment. The reason for the lack of understanding may be that these risks are no longer shared with the majority of the human beings in the United States. In the United States, we no longer have intestinal worms, and we do not worry about our children developing these infections. Also, we no longer have any serious threats from mosquito-borne diseases like Dengue fever and malaria. However, one-sixth of the world's population is still beset with intestinal roundworms, *Ascaris lumbricoides*, and millions with human hookworms and whipworms. One-sixth of a population is 16.7%. About one-sixth of the dogs in the United States that are not on prevention have ascarids. Dogs (and cats) are also faced with heartworm, a serious mosquito-transmitted threat. Our pets deserve maximal protection until we can make them parasite-free like we are.

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