

YES, CATS DO GET HEARTWORMS!
FELINE HEARTWORM DISEASE
Nancy Shaffran CVT, VTS (ECC)

Feline heartworm disease is more common than previously believed, often fatal and completely preventable. It is now estimated that 26% of cats may be infected with heartworm disease. This is very significant especially when compared to 5% who are FeLV positive and 6% who have FIV. Cats get heartworm (HW) disease at a rate of about 15% of that of dogs wherever HW is prevalent. Currently 59% of American households regularly administer HW preventative to dogs but only 5% to cats.

Mechanism of Feline HW disease

The feline HW life cycle begins when a microfilaria infected mosquito bites the host injecting stage 3 (L3) larvae into the skin. Within a few days the larvae develop into L4 which set up housekeeping over the next 2-3 months in the SQ connective tissue of the abdomen or thorax. The 5th stage, L5 larvae migrate to the pulmonary circulation where damage begins. Initially the larvae are attacked by pulmonary intravascular macrophages (PIMs) in a phagocytic process that results in significant bronchopulmonary inflammation. Some larvae will be killed in this process inducing further inflammatory response. Acute lung pathology and even death can occur at this stage. Cats with acute heartworm associated pulmonary signs are often misdiagnosed as asthmatic or allergic. Parasiticides like selamectin (Revolution®, Pfizer Animal Health) prevent the development of larvae to stage 5.

After this initial phase some cats will appear to “self cure”. That is, their symptoms abate and immune response is suppressed allowing cats to tolerate their HW infection. However in the second phase which can occur up to 2 years later when the heartworms begin to die devastating pulmonary injury can occur. At the second phase pulmonary thromboembolism and sudden death are not uncommon. Cats that die suddenly may appear clinically normal up to 1 hour before death. Postmortem examination has revealed as few as two worms in cats that have died suddenly.

Why we have missed it

There are a number of reasons cat heartworm disease has eluded the veterinary community and the public. We know that HW disease in dogs is caused by adult heartworms. Cats are resistant but susceptible hosts for adult heartworms. Feline immune systems are frequently able to kill and remove heartworm larvae before they reach adulthood therefore it seemed unlikely that cats would develop symptoms of disease. Only recently has it been unquestionably proven that the major cause of HW disease in cats occurs from the larval stage. Furthermore feline HW disease significantly affects the pulmonary rather than the cardiac system.

Heartworm disease has been considered regional; thought to occur only in limited areas in the United States. Recently and especially after the redistribution of HW positive dogs following Hurricane Katrina, HW disease has been seen in 49 states with Alaska as the only exception.

Five myths persist that continue to inhibit our ability to convince veterinarians, technicians and pet owners that feline heartworm exists at all or that it is as prevalent as we now realize.

Myth #1 Heartworm is a disease of dogs only

Heartworm disease is transmitted by a mosquito that has bitten a HW positive dog. While cats are not direct hosts for HW disease, they need only to be bitten to contract HW disease. Many types of mosquitoes feed happily on both dogs and cats. In any area where HW preventative is thought appropriate for dogs it is equally if not more appropriate for cats as HW disease in cats is potentially more serious than in dogs.

Myth # 2 Heartworm can not affect indoor only cats

Heartworm is carried by mosquitoes. *Culex pipiens*, or northern house mosquito is the most common species of mosquito found in urban areas. *Culex* mosquitoes are painful and persistent biters which prefer to attack at dusk and after dark, and readily enter dwellings for blood meals. They prefer to feed on domestic animals over man. The culex is considered a weak flyer but still easily covers 2 miles (some mosquitoes can fly 20 miles). Since mosquitoes do get indoors quite frequently indoor cats are at risk as well as outdoor cats. A recent study in North Carolina showed that 28% of cats diagnosed with HW were described by owners as indoor only.

Myth #3 Heartworm is a disease of the heart only

In the cat HW disease presents as a pulmonary disease rather than a heart disease. The American Heartworm Society (AHS) has coined the acronym H.A.R.D. to describe the syndrome Heartworm Associated Respiratory Distress. HW positive cats appear identically to cats that have been historically diagnosed with feline asthma or allergic bronchitis. It is more than likely that a significant percentage of this cat population in fact has HW disease. The symptoms of HW disease in cats include anorexia, blindness, fainting, lethargy, tachycardia, collapse, seizures, coughing, diarrhea, dyspnea, vomiting, weight loss, chylothorax and sudden death.

Myth # 4 Adult heartworms are required to create disease.

Cats do not need to have adult heartworms to develop clinical signs. In fact, HW larvae are the main culprits in causing disease in cats. HW larvae migrate to the pulmonary arteries where they cause obstruction and profound inflammation. Complete obstruction of the arterioles and subsequent inability to exchange gas resulting from the larval stage alone is not uncommon. Studies have recently proven that cats with HW antibodies but no adult worms had severe pulmonary disease. Furthermore, even transient HW infections can cause serious and permanent pulmonary changes

Myth # 5 Diagnostic tests prove it does not exist

The diagnostic tests currently available are inadequate to diagnose feline HW disease. This is because of the unique pathophysiology of HW in cats. There are 3 types of tests currently available; microfilaria (Knott's test), antibody (HESKA and Synbiotics) and antigen (SNAP[®]). For several reasons none of these tests are reliable in the cat.

- 1) Microfilaria. Cats typically get very low adult heartworm burdens with many cats only having one adult heartworm. This makes same sex burden quite likely. One sex, no microfilaria. Cats that do produce microfilaria produce very small numbers and for very brief periods making detection unlikely.

- 2) Antibody. This test shows exposure only. Since many cats “self kill” after exposure and do not develop adult heartworms a positive antibody alone is not indicative of disease although it does raise suspicion in cats with clinical signs
- 3) Antigen. The antigen tests for the presence of uterine protein from adult female HW. If the cat has not developed adult heartworms or has a low male only burden it will test antigen negative despite having heartworm disease. Even cats with female heartworms can test antigen negative during the early stages of infection after pulmonary signs have developed but before heartworms are mature enough to release antigen.

Two Studies recently prove the facts

Browne et al Study (Florida) Pulmonary disease in cats seropositive for *Dirofilaria immitis* but lacking adult heartworms in the heart and lungs. *AJVR*. 2005;66:1544-1549

630 cats from a Florida shelter were necropsied. Thirty one cats had adult heartworms and evidence of pulmonary disease. Sixty one antibody only positive cats also had significant pulmonary changes despite being negative for adult heartworms. This proves that adult heartworms are not required to produce severe disease in cats. It also demonstrates the prevalence of HW disease (approximately 20%) in randomly selected cats.

Dillon et al Study (Auburn) Feline D. Immitis Infection related to acute chronic pulmonary disease. January 2007

This study looked primarily at the effect of prevention with selamectin. (Revolution®). 65 cats were infected with 100 larvae SQ. All cats treated with Revolution remained disease free. All untreated control cats developed adult heartworms. The cats that were infected with HW larvae but treated with ivermectin before the larvae could develop into adult HW still developed severe pulmonary disease. This study demonstrates that selamectin prevents the development of L5 heartworm larvae and that these larvae are responsible for pulmonary clinical signs of HW disease in cats.

Treatment for feline heartworm disease

Currently there is no curative treatment for feline HW disease. Adulticide therapy is not possible and would result in death. Surgical retrieval of adult HW is possible but impractical since most disease is caused by larvae and exists even without the presence of adult HW. Palliative care including steroids, bronchodilators, and supplemental oxygen is all that is available. The future may hold options to treat HW infection by administering Doxycycline to treat Wolbachia, the gram negative pathogen that lives in heartworms. This pathogen may prove to be an important cause of the inflammatory response seen with HW disease.

Prevention is the only approved approach for feline HW disease. Oral and topical parasiticides are extremely effective in preventing HW disease in cats. Chemoprophylaxis using topical parasiticides such as selamectin (Revolution®, Pfizer Animal Health) is extremely easy and efficacious and is considerably less challenging than diagnosing feline HW disease. The current recommendation from the AHS is for year round protection for cats.

Summary of the differences between canine and feline heartworm disease

	Feline	Canine
Parasite	<i>D. immitis</i>	<i>D. immitis</i>
Transmission	Mosquito	Mosquito
Susceptibility	Lower than dogs	Very high
Longevity of adult worms	2-3 years	5-7 years
Worm burden	<6 (1-2 most common)	Not uncommon to find >30
Spontaneous clearing of infection	Common	Rare
Single sex infection	Common	Rare
Microfilaremia	Rare (<20%; very transient)	Common
Organ with greatest damage	Lung	Heart/lung
Significance of low worm burden	Potentially fatal	Little clinical importance
Asthma-Chronic Resp Signs	Common	Rare
Acute death	Common	Rare
Diagnosis	Complex	Relatively simple
Treatment	None approved; high-risk	2 approved compounds

Additional Resources

www.knowheartworms.org

www.heartwormsociety.org

www.aafp.org