

# Feline Heartworm Infection

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## P Profile

### Definition

- Disease of the pulmonary vasculature and pulmonary parenchyma of cats caused by *Dirofilaria immitis* (Figure 1)

### Geographic Distribution

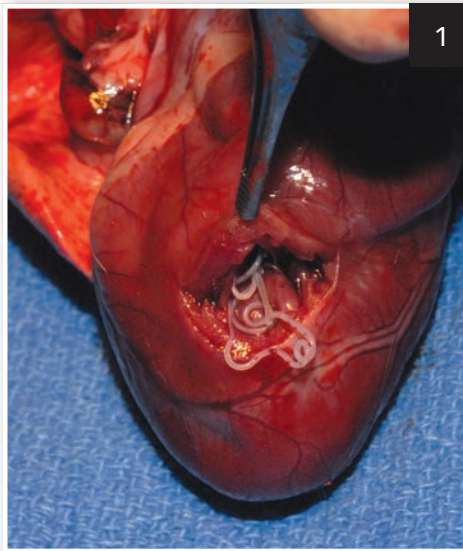
- Infection in cats is found in all 50 states, with greater prevalence in warmer climates.

### Prevalence

- Because cats are not the natural host of *D immitis* and clearance of third-stage through fifth-stage infective larvae (ie, L3-L5, immature) can occur, prevalence of feline heartworm infection in endemic areas is ~10% that of infection in dogs<sup>1,2</sup> (Table, next page).
- Approximately 25% of feline heartworm cases occur in purely indoor cats.<sup>3</sup>

### Transmission

- Mosquitoes extract the L1 microfilarial stage of *D immitis* from an infected dog, cat (unlikely), or other host.
  - L1-L3 molting occurs within the mosquito.
- Once *D immitis* reaches L3, the host mosquito can transfer it into a cat's bloodstream via a bite.
  - L3-L5 (adult) molting may occur, although larvae often fail to mature.



1  
A single female heartworm in right ventricle of a cat. No other worms or fragments found. Diffuse lung disease was demonstrated. Photo courtesy of Dr. Ray Dillon

### Risk Factors

- Any cat not receiving prevention is at risk for heartworm infection.
- Risk for infection is higher in endemic areas.

### Pathophysiology

#### Stage 1

- Inflammation caused by presence of immature worms
  - Occlusive hypertrophy of small pulmonary arterioles occurs within 3–4 months of infection.
    - Pulmonary inflammatory response is called *heartworm-associated respiratory disease* (HARD); signs appear similar to asthma.

Occlusive hypertrophy of small pulmonary arterioles occurs within 3–4 months of infection.

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**Table Heartworm Infection: Cats vs Dogs**

Cats	Dogs
<ul style="list-style-type: none"> <li>• 1%–10% of L3 survive</li> <li>• Low maturation rate</li> <li>• Microfilariae uncommon</li> <li>• Worms survive 2–4 years</li> <li>• 1–5 worms present</li> <li>• Smaller adult worms</li> </ul>	<ul style="list-style-type: none"> <li>• 75% of L3 survive</li> <li>• High maturation rate</li> <li>• Microfilariae common</li> <li>• Worms survive 5 years</li> <li>• Many worms present</li> <li>• Larger adult worms</li> </ul>

- ❑ Substantial lesions are noted in arterioles, arteries, alveoli, and bronchioles.
- ❑ Heartworm infection can be arrested at this stage, but histologic changes (Figure 2) and clinical signs may persist.
- ❑ Live heartworms can suppress immune function, allowing cats to better tolerate infection.

**Stage 2**

- Mature worms die and degenerate.
  - ❑ The process incites more pulmonary inflammation.
  - ❑ Thromboembolism, fatal acute lung injury, and anaphylaxis can occur.
  - ❑ Adult infection is usually limited to <5 worms.

**Signs & Examination**

- Cats are often subclinical
- Coughing and/or dyspnea are the most common signs.

- ❑ Up to 50% of affected cats present with respiratory distress or tachypnea.
- ❑ Increased bronchovesicular sounds may be auscultated in the thorax.
- Vomiting, neurologic signs, and sudden death can occur.
- Caval syndrome is uncommon (because of small number of worms present).
- Heart murmurs are unusual and suggest primary cardiac disease.

**Dx Diagnosis**

**Laboratory Findings**

- Serum biochemistry profile results are often within reference ranges.
- CBC may show eosinophilia.

**Imaging**

**Radiography**

- Cardiac changes consistent with heartworm disease are seen in ~50% of cats with positive result for heartworm infection.
- Pulmonary artery blunting and tortuosity is less common in cats than in dogs.

- ❑ If artery blunting is present, the right caudal lobar artery will be affected first.

- Right ventricular and mainstem pulmonary artery enlargement are uncommon.

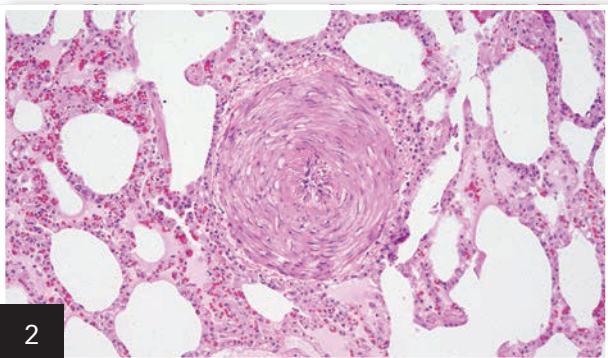
- The most common abnormality is diffuse bronchial or broncho-interstitial pattern consistent with feline allergic airway disease.

**Echocardiography**

- May confirm if serologic testing is suggestive of heartworm disease
- Helps rule out primary or concomitant heart disease
- Although fewer worms are present in feline hearts (as compared with dogs), worm size relative to the small heart can make worms easier to detect.
  - ❑ Worms may be visualized, but quantification is difficult.

**Other Diagnostics**

- Antibody testing detects antibodies to larvae and adult worms.
  - ❑ Sensitive but not specific for presence of adult worms
  - ❑ Negative result indicates that heartworm infection is unlikely.
  - ❑ Significant incidence of false-positive results (eg, 76.1%–77.2% specificity)<sup>4</sup>
    - False-positive results may reflect previously resolved infection, larvae that did not/will not develop to adults, and aberrant adult infection.
- Antigen testing detects mature female worms.
  - ❑ More specific (98.1%–99.4%)<sup>5</sup> than antibody testing but not as sensitive
  - ❑ Positive result indicates heartworm infection, but false-negative result can occur with immature or male-only infections.
    - These infections are common (small number of worms).



**Histopathology of the pulmonary artery of a cat infected with *D immitis*.** Courtesy of Dr. Julia A. Conway

Cats are often subclinical, but when signs are present, the most common are coughing and/or dyspnea.

### Heartworm Preventive Options for Cats

#### Oral

##### Ivermectin

Heartgard (heartgard.com)

##### Milbemycin oxime

Interceptor (interceptor.novartis.us)

#### Monthly Topical

##### Imidacloprid–moxidectin

Advantage Multi (bayerdvm.com)

##### Selamectin

Revolution (revolution4cats.com)

- Combination antigen–antibody testing is recommended.
- Tests to detect microfilariae are typically not performed, as microfilaremia (ie, presence of heartworm offspring) is rare and transient in cats.

## Tx Treatment

### Adulticide Therapy

- No approved adulticide therapy is available for cats because of high mortality from pulmonary thromboembolism and possible anaphylactic-like reaction to dead or dying worms.
  - Therapy is palliative only.

### Emergency Therapy for Signs

- Oxygen therapy
- Bronchodilators
- Fast-acting corticosteroids (eg, dexamethasone)
- Supportive care (eg, fluid therapy)

### Chronic Therapy

- Oral or inhaled corticosteroids
- Oral or inhaled bronchodilators
- Doxycycline

### Adjunct Therapies

- Antiemetics
- Doxycycline to eliminate *Wolbachia pipientis* (symbiotic bacteria harbored by *D immitis*)<sup>5,6</sup>

- Weakens adult worms and their fertility
- May improve pulmonary pathology
- Macrocyclic lactones may decrease life span of adult worms.
- Ultrasound-guided manual worm removal

## Rx Medications

### Dexamethasone

- For emergency treatment at 1 mg/kg IV

### Doxycycline

- 10 mg/kg q12h PO for 3 weeks starting at diagnosis

### Macrocyclic lactones

- Preventive medication should begin at diagnosis and continue for life.

### Prednisolone

- Often used to decrease pulmonary inflammation
  - 2 mg/kg PO q24h, then tapered to lowest effective dose

### Bronchodilators

- Aminophylline at 4 mg/kg PO q24h
- Terbutaline 1.25 mg/cat PO q12h

## \* In General

### Relative Cost

- Treatment cost is relatively low (\$–\$\$), as no adulticide therapy is available and care is supportive only.
- Respiratory distress secondary to heartworm infection can be an emergency and increase cost.

### Cost Key

\$ = up to \$100  
\$\$ = \$101–\$250  
\$\$\$ = \$251–\$500  
\$\$\$\$ = \$501–\$1000  
\$\$\$\$\$ = more than \$1000

### Prognosis

- Prognosis is guarded.
  - Infection can be fatal, as no acceptable treatment is available; however, infection can be cleared naturally.

### Prevention

- Heartworm disease is preventable with administration of macrocyclic lactones (see **Heartworm Preventive Options for Cats**).
- Prevention should be started at 8 weeks of age and continue for life.
  - Medications should also include efficacy against some internal and external parasites. ■ **cb**

See **Aids & Resources**, back page, for references & suggested reading.

### Find More



Look for the companion article, **Canine Heartworm Infection**, in an upcoming issue.