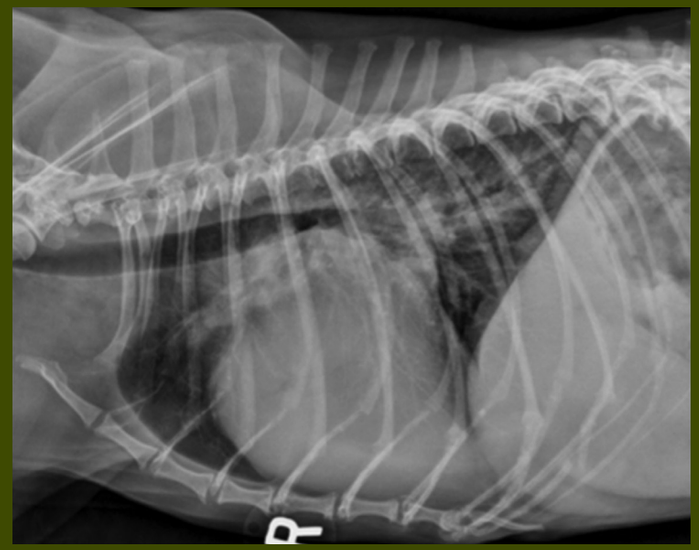
prevent new infections.
Surgical removal of heartworms is recommended when dogs have a large number of heartworms in their heart chambers. This condition is often called 'caval syndrome' and can develop suddenly in some dogs. Heartworm removal in these cases involves making a small incision in the skin on the neck and also in the jugular vein that leads to the heart. Heartworms are manually removed with special steerable, bendable forceps or a basket. Within a few weeks following recovery from surgery, standard injectable treatment is recommended to eliminate any remaining worms in the lungs. Worms in the lungs cannot be removed manually.

How is HW prevented?

To prevent heartworm infection in the dog population and to provide your pet with the best possible protection against heartworms, the following guidelines are recommended:

- All puppies should be started on preventive medication no later than eight weeks of age.
- Your dog should be evaluated routinely (typically once a year) for heartworms, particularly with an antigen blood test. This is especially important if there are occasional times your dog has not received its HW prevention medication.
- All dogs that live in high risk areas or travel to high risk areas should be on preventive medication year round. In some areas (cooler climates), your veterinarian may recommend that you only need to use the preventative medication during the high-risk season when mosquitos are around. However, the Heartworm Society of North America recommends year-round preventative medication for all dogs.
- Dogs that show new signs of heartworm disease as outlined above should be have a HW antigen blood test performed.
- If your dog is diagnosed with HW, a veterinarian should treat to limit, and ideally, prevent permanent damage to the heart and lungs, as well as to keep your dog alive.
- Prevention is the best approach to HW. If preventive medication and monitoring programs are followed, unnecessary treatment, permanent heart and lung damage, and heartworm-related death can be avoided.



VETERINARY MEDICINE
& BIOMEDICAL SCIENCES
TEXAS A&M UNIVERSITY

Small Animal Clinical Sciences
Cardiology Service

College of Veterinary Medicine
& Biomedical Sciences

Texas A&M University
4474 TAMU
College Station, TX 77843-4474
Tel 979.845.2351
Fax 979.845.6978

http://vethospital.tamu.edu/small-animal-hospital/cardiology

Client Information Series

Heartworm Disease: Prevention & Treatment

VETERINARY MEDICAL
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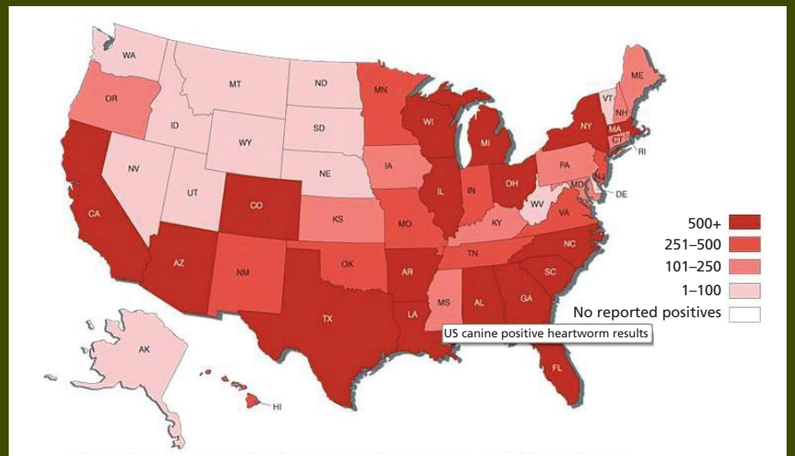
What is heartworm disease?

Heartworm disease (HW) is a potentially serious problem in dogs in many geographic areas including almost all of the United States. Years ago HW was only common in the southern coastal areas of the U.S., but due to the movement of dogs with the human population, the disease has spread over most of the country. However, with proper preventive therapy, heartworm disease will not be a risk to your dog.

HW is caused by *Dirofilaria immitis*, a parasitic worm that lives as an adult predominantly in large blood vessels in the lungs and in some cases in the right side of the dog's heart. Heartworms do most of the damage to the heart and lungs in the adult stage, at which time the worms can measure over one foot long. Mosquitoes transmit heartworms from dog to dog. The adult heartworms can live in a dog for up to 7 years. The adults produce microfilariae, or heartworm larvae, which can be found within the bloodstream of affected dogs if adult female worms are present in their lungs.



What are the clinical signs of HW?

Signs of HW may occur within six months of infection (after a dog is bitten by an infected mosquito) or may not appear at all. Whether or not a dog develops clinical signs depends on the severity of the infection (number of adult worms that are present) and the dog's own response to the worms. In most cases, signs will begin within 1-2 years after infection. Typical signs include coughing, labored breathing, weakness, and tiring with exercise. Since the signs vary, the disease may be advanced before a dog begins to show any signs of infection. In some dogs, signs may be mistaken for another problem. In advanced disease, the heart and lungs can be severely damaged or even plugged up with worms. Eventually, heart failure can occur and dogs can die from damage caused by heartworms before, during, or after appropriate treatment is started.

Clinical signs that may be associated with HW infection in dogs, include:

- Coughing
- Labored breathing
- Fast breathing
- Weakness
- Tiring with exercise
- Collapse or fainting
- Weight loss
- Dark colored urine (color of red wine)
- Distended abdomen

Note: These signs may occur in dogs with HW but can also occur with other diseases. Not every dog will develop all of the following 'clinical signs' and many dogs will have more than one.

How is HW diagnosed?

Typically, a blood sample will be taken from your dog to test for heartworm infection. This test detects markers (antigens) from adult female worms and is very accurate. Chest radiographs (x-rays), blood tests to evaluate the kidneys and liver, and/or an echocardiogram (ultrasound of the heart) may also be recommended in some cases.

What are the treatment options for HW?

The most common treatment for HW requires that your veterinarian give an injectable medication to kill the adult heartworms. Currently, there is only one medication available for the treatment of adult heartworms. The medication is called melarsomine (Immiticide®) and is an arsenical type compound that kills the adult heartworms. It is the treatment recommended by the American Heartworm Society. There are two basic treatment options with Immiticide®—the two-injection method and the three-injection method. The American Heartworm Society recommends the three-injection method for all dogs. Following treatment with each injection, your dog must be ***STRICTLY*** rested for four to six weeks, during which time the dead adult heartworms will be slowly destroyed and removed by the body. Exercise increases blood flow within the heart and lungs and commonly leads to significant complications after treatment, such as pieces of dead worms moving deeper into the lungs causing coughing, severe difficulty breathing, distress, and even sudden death. Preventive medication for HW is also started during treatment to