

# Histoplasmosis in Animals

## Introduction

Histoplasmosis (Histo) is a fungal infection (an infection caused by mold) that is common in animals and humans. Though it cannot be spread from one species to another, it often occurs in both at the same time because both are exposed to similar environments. Veterinarians who are familiar with the signs of infection may consider this diagnosis and can obtain rapid results by testing blood and urine samples for presence of antigen. Antigen is a by-product of the histo yeast that may be found in the urine and blood. This method of testing may eliminate the need for biopsies of tissues infected with the fungi. A biopsy is surgical procedure that removes a sample of a body tissue for further study. These biopsy samples are viewed with a microscope to see if the yeast form of histo is present and may be cultured to see if histo can be grown from the tissue. Diagnosis also can be made by testing the blood for antibodies to histo. Treatment for severe cases of histo with amphotericin B and milder cases with itraconazole are highly effective if they are started before the illness becomes severe. The effectiveness of treatment can be assessed by determining if antigen levels in the blood or urine decline. Blood levels of itraconazole may be measured to be sure they are high enough to treat the infection but not so high as to cause side effects.

## Where histo is found?

Histo is caused by the fungus *Histoplasma capsulatum*, which is found soil containing large amounts of bat or bird droppings, or in accumulations of drops in old buildings. Histo occurs most often in the Mississippi, Missouri, and Ohio River valleys of the US (Figure 1), which is referred to as the “endemic” area, and in certain parts of Latin America, but can occur outside of the endemic area. To illustrate, about half of dogs and Thoroughbred horses and two-thirds of humans in certain parts of Kentucky had positive skin tests for Histo, indicating that they had been infected with Histo in the past. Bats often develop chronic intestinal infection and shed histo in the feces, potentially depositing it outside the endemic area.

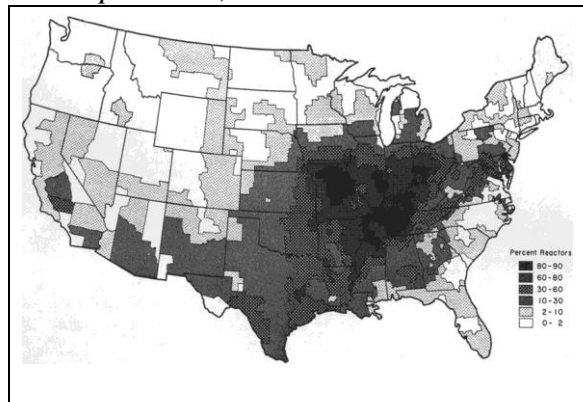


Figure 1. Endemic distribution, based upon Histoplasmin skin reactivity

## Who is susceptible and how do they get it?

All mammals are susceptible to histo, but cases have been reported most often in dogs, cats, and horses. Birds, because of their high body temperature, are not susceptible to natural infection. Histo is acquired by breathing in spores that have been aerosolized from soil containing the organisms. Histo cannot be spread from animal to animal or person to person, but disease in one can be a signal of exposure to histo in the other due

to shared activities. In other words, if a pet had histo, it would not infect another pet or the pet owner, but both were exposed to the same contaminated soil, both could have been infected.

### What are the symptoms?

General symptoms of infection include fever, tiredness, and weight loss. If the lungs are infected other symptoms may include cough, chest pain, and difficulty

Symptom	Dogs	Cats
Fever	25%	58%
Weight loss	42%	83%
Cough or trouble breathing	50%	40%
Reduced activity or depression	58%	66%
Diarrhea or bleeding	83%	NS

breathing (Table 1). Enlarged lymph nodes in the lung may put pressure on the airway, causing cough and difficulty breathing.

Histo also may spread from the lungs through the blood to other parts of the body, called disseminated Histo. Any tissue may be involved in disseminated Histo. General

symptoms include weight loss, fever, and reduced activity. Dogs often have diarrhea, which may be bloody. Cats often have bone infection. Symptoms of eye involvement may include blindness or discoloration of the eyes, and those of brain infection may include seizures or findings suggestive of a stroke. Spontaneous abortion can occur in pregnant horses due to involvement of the placenta, causing either the foal to be aborted or to die shortly after birth.

### How is histo diagnosed?

Several tests are available to detect histoplasmosis, the newest of which is antigen detection.

*Antigen test.* Based on findings in humans, the most sensitive and rapid test for diagnosis of disseminated and acute pulmonary histoplasmosis is antigen detection. Antigen refers to a substance produced by Histo as it grows in the tissues. Antigen is released into the blood and excreted in the urine where it can be detected. Antigen also can be detected in fluid taken from the lungs. The antigen test is positive in over 90% of cases of disseminated disease and 80% of acute pneumonia cases in humans. The antigen found in histo is similar to that found in blasto, and a positive test does not distinguish between the two infections. Furthermore, a negative result does not rule out a diagnosis of histo, since the test may be negative in 10-20% of cases.

*Fungal stain and culture.* If biopsies are performed or lung washings are obtained, the specimens can be examined under the microscope for Histo yeasts. To do this, the biopsy specimen or lung washings are stained with dye-like substances that make it easier to see the yeast with a microscope. The specimen also may be cultured to grow the yeast. One drawback of this approach is the need to perform a minor surgical biopsy or to take fluid from the lungs to obtain the specimen. Both fungal stain and culture may be falsely negative, and culture may take up to four weeks for Histo to grow.

*Antibody test.* Blood may be tested to detect the presence of antibodies to Histo, in what may be referred to as serologic tests. Antibody tests are positive in about 90% of pneumonia cases and 70% of disseminated cases.

## **How is histo treated?**

Amphotericin B is the treatment of choice in severe cases, and is usually given for a week or two. Amphotericin B must be given intravenously (through a vein) in the veterinarian's office or hospital. Blood tests must be performed to check for side effects of this treatment.

Itraconazole is recommended as initial treatment in mild cases and after a week or two of amphotericin B in more severe cases. Itraconazole is given in pill or liquid form once or twice daily. The capsules should be taken with food and the liquid form on an empty stomach. The amount of itraconazole in the blood may be measured to assure that levels are in the proper range. If itraconazole levels are too high, they may cause loss of appetite, vomiting, and diarrhea. Itraconazole also can damage the liver, which may be checked for by blood tests during treatment.

A few other oral medications can be used in place of itraconazole. Ketoconazole has been used but is less effective than itraconazole and produces more side effects. Fluconazole is less effective than itraconazole, but is better tolerated and less expensive. Posaconazole and voriconazole have been used in a few cases but are very expensive.

Enlarged lymph nodes in the lungs may cause breathing difficulty caused by airway obstruction. Corticosteroids may be used to reduce the size of the nodes and improve air flow into the lungs. Corticosteroids, however, interfere with killing the organism, and cause progression of the infection. For this reason itraconazole is usually given with the corticosteroid.

Antigen testing may help determine the effectiveness of the therapy. As the animal's health improves, antigen levels decline and eventually become negative.