

# DISEASE CAUSED BY *CRYPTOCOCCUS*, A TYPE OF FUNGUS (CRYPTOCOCCOSIS)

## BASICS

### OVERVIEW

- A localized or generalized (systemic) fungal infection caused by the environmental yeast, *Cryptococcus*

### GENETICS

- No known influence

### SIGNALMENT/DESCRIPTION of ANIMAL

#### Species

- Dogs and cats

#### Breed Predislection

- Dogs—American cocker spaniels, Great Danes, Doberman pinschers, and boxers
- Cats—Siamese

#### Mean Age and Range

- Most common at 2 to 7 years of age (dogs and cats)
- May occur at any age; has been seen often in dogs under 6 months of age

#### Predominant Sex

- Dogs—none
- Cats—males

### SIGNS/OBSERVED CHANGES in the ANIMAL

- Vary depending on organ systems involved
- May have a history of problems for weeks to months
- Sluggishness (lethargy)
- Mild fever—seen in less than 50% of patients

#### Dogs

- Nervous system signs—seizures, wobbly, incoordinated or “drunken” appearing gait or movement (known as “ataxia”), weakness (known as “paresis”), blindness
- Skin ulceration
- Enlarged lymph nodes (known as “lymphadenopathy”)
- Vomiting and diarrhea
- Lack of appetite (known as “anorexia”)
- Nasal discharge

#### Cats

- Nasal discharge
- Nervous system signs—seizures, disorientation, and altered sense of balance (known as a “vestibular disorder”)
- Nodular tissue (known as “granulomas”) seen at the nostrils
- Firm swellings over the bridge of the nose
- Increased breathing rate
- Ulcerated, crusty skin lesions on the head
- Enlarged lymph nodes (lymphadenopathy)
- Eye disease

### CAUSES

- *Cryptococcus*, an environmental yeast
- Exposure to cryptococcal organisms and inability of the immune system to prevent colonization and invasion of the organisms into body tissues

### RISK FACTORS

- Feline leukemia virus (FeLV) or feline immunodeficiency virus (FIV) infection does not appear to increase risk of *Cryptococcus* infection; however, cats infected with FeLV or FIV have higher risk for more extensive disease and higher likelihood of treatment failure than cats that do not have FeLV or FIV infections

## TREATMENT



## HEALTH CARE

- Outpatient, if stable
- Nervous system signs—may require inpatient supportive care until stable

## ACTIVITY

- No restrictions in most cases

## DIET

- No special foods
- Cats—nasal blockage influences appetite; encourage them to eat by offering very tasty food
- Patients treated with itraconazole—give medication in fatty food (such as canned food) to improve absorption of the drug

## SURGERY

- Remove nodular masses (known as “granulomatous masses”) in the nose and throat to reduce breathing difficulties

## MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Fluconazole—preferred for involvement of the eyes or central nervous system, because it is water-soluble and able to enter the nervous system better than some other antifungal drugs; most economical drug choice
- Itraconazole capsules—give with a fatty meal to maximize absorption; pellets in the capsule can be mixed with food, as directed by your pet’s veterinarian; mixing the pellets in food has no apparent bad taste to the patient; itraconazole liquid—better absorption on empty stomach
- Terbinafine has been effective in treatment of cats with resistant infections
- Cryptococcal organisms are prone to become resistant to antifungal treatment
- Amphotericin B (administered intravenously)—may be used in dogs and cats that do not respond to fluconazole or itraconazole; monitor blood work (specifically blood urea nitrogen [BUN] and creatinine) closely to avoid permanent kidney damage (kidney damage is a potential side effect of the drug)

## FOLLOW-UP CARE

### PATIENT MONITORING

- Monitor blood work (liver enzymes) monthly in patients receiving fluconazole or itraconazole (antifungal drugs); monitor blood work (blood urea nitrogen and creatinine) in patients receiving amphotericin B
- Improvement in clinical signs, resolution of lesions, improvement in well being, and return of appetite measure response to treatment
- Serologic tests (blood tests that detect the presence of antigens of a certain disease-causing agent, in this case *Cryptococcus*), known as “capsular antigen titers”—determine response to and duration of treatment; after 2 months of treatment, the titers should decrease substantially, if treatment is effective; if ineffective, try another antifungal medication, because *Cryptococcus* can become resistant to drugs; “antigens” are any substances that induce an immune response; antigens include fungus (as in this case), proteins, viruses, bacteria, and pollen

### PREVENTIONS AND AVOIDANCE

- *Cryptococcus* is found throughout the environment and cannot be avoided

### POSSIBLE COMPLICATIONS

- Patients with nervous system disease may have seizures and permanent nervous system changes

### EXPECTED COURSE AND PROGNOSIS

- Treatment—anticipated duration of treatment is 3 months to 1 year; patients with central nervous system disease may require lifelong maintenance treatment
- Cats also infected with feline leukemia virus (FeLV) or feline immunodeficiency virus (FIV)—have a worse prognosis
- Serologic tests (blood tests that detect the presence of antigens of a certain disease-causing agent, in this case *Cryptococcus*), known as “capsular antigen titers”—measure every 2 months until 6 months after completion of treatment; continue treatment for 2 months after antigen is no longer detectable, if possible; if patient maintains low titers for months after all signs of disease have resolved, continue treatment for at least 3 months after reduction in antigen levels and resolution of clinical signs and try discontinuing treatment; if titers then rise significantly, resume therapy

## KEY POINTS

- Cryptococcosis is a long-term (chronic) disease that requires months of treatment

- The disease is not considered zoonotic (“zoonotic diseases” are diseases that can be passed from animals to people), but it is possible that the yeast may be transmitted to people through bite wounds
- The pet was exposed to the *Cryptococcus* from the environment; family members in the same environment could be at increased risk of infection, especially if they are unable to develop a normal immune response (known as being “immunosuppressed”)

## BASICS

### OVERVIEW

- Coccidioidomycosis is a generalized (systemic) disease caused by inhalation of infective spores of the soil-borne fungus, *Coccidioides immitis*
- “Mycosis” is the medical term for any disease caused by a fungus

### SIGNALMENT/DESCRIPTION of ANIMAL

#### Species

- Dogs and cats

#### Mean Age and Range

- Most patients are young animals (less than 4 years of age)

### SIGNS/OBSERVED CHANGES in the ANIMAL

- Lack of appetite (known as “anorexia”)
- Coughing
- Fever, unresponsive to antibiotics
- Lameness
- Weakness, partial paralysis, back and neck pain
- Seizures
- Change in vision
- Weight loss

#### Dogs

- Coughing
- Difficulty breathing (known as “dyspnea”)
- Fever
- Bone swelling, joint enlargement, and lameness
- Extreme weight loss with muscle wasting (known as “cachexia”)
- Sluggishness (lethargy)
- Enlarged lymph nodes (known as “lymphadenomegaly”)
- Skin ulcers and draining tracts
- Inflammation of the iris (the colored part of the eye) and other areas in the front part of the eye (known as “uveitis”); inflammation of the cornea (known as “keratitis”); inflammation of the iris (known as “iritis”)

#### Cats

- Extreme weight loss with muscle wasting (cachexia)
- Draining skin lesions
- Difficulty breathing (dyspnea)
- Lameness caused by bone involvement
- Inflammation of the iris (the colored part of the eye) and other areas in the front part of the eye (uveitis)

### CAUSES

- Infection by the soil-borne fungus, *Coccidioides immitis*
- *Coccidioides immitis* grows several inches deep in the soil, where it survives high environmental temperatures and low moisture; after a period of rainfall, the fungus returns to the soil surface where it forms spores, which are released and spread by wind and dust storms

### RISK FACTORS

- *Coccidioides immitis* is found in the southwestern United States in the geographic Lower Sonoran life zone—it is more common in Southern California, Arizona, and southwest Texas, and less common in New Mexico, Nevada, and Utah
- Aggressive nosing about in soil and underbrush may expose susceptible animals to large doses of the fungus in contaminated soil
- Dust storms after the rainy season; increased number of cases are noted after earthquakes
- Land development (where much earth disruption occurs) may lead to increased exposure

## TREATMENT

### HEALTH CARE

- Generally treated as outpatients
- Clinical signs (such as seizures, pain, coughing) should be treated appropriately

### ACTIVITY

- Restrict activity until clinical signs begin to subside

### DIET

- Feed a high-quality palatable diet to maintain body weight

### SURGERY

- Surgical removal of an affected organ may be indicated for cases with localized, nodular involvement in various organs (such as a consolidated lung lobe or involvement of the eye or kidney)

## MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Treatment of widespread (disseminated) disease often requires at least one year of aggressive antifungal therapy
- Low-dose, short-term treatment with steroids (prednisone administered by mouth) and cough suppressants may be required to alleviate the respiratory signs

### Dogs

- Several antifungal medications that may be given by mouth (oral treatment) currently are available for the treatment of coccidioidomycoses; they include 1) fluconazole—noted to greatly increase the success of treatment; has been used in treating infections involving the nervous system; cost of the drug has decreased significantly with the availability of a medical grade generic compound; 2) ketoconazole—may be given with food; some believe that administration of high doses of vitamin C at the time that ketoconazole is administered may improve the absorption of the drug; treatment should be continued for 1 year; 3) itraconazole—administered similarly as ketoconazole; it has been reported to have a higher penetration rate than ketoconazole, but a better clinical response has not been observed
- Amphotericin B is an antifungal medication that must be administered by intravenous injection; it is recommended rarely because of the high risk of kidney damage and the availability of effective oral medications

### Cats

- Any of the following antifungal medications may be used in cats: ketoconazole, itraconazole, fluconazole

## FOLLOW-UP CARE

### PATIENT MONITORING

- Serologic tests (blood tests that detect the presence of antibodies to a certain disease-causing agent or antigen; an “antibody” is a protein that is produced by the immune system in response to a specific antigen)—should be monitored every 3 to 4 months; animals should be treated until their antibody titers fall to less than 1:4
- Animals displaying poor response to therapy should have a 2 to 4 hour post-pill drug level measured to ensure adequate absorption of the drug
- Blood urea nitrogen (“BUN;” a blood test used in assessing the kidneys) and urinalysis should be monitored in all animals treated with amphotericin B; treatment should be discontinued temporarily if the BUN rises above 50 mg/dl or if granular casts are noted in the urine

### PREVENTIONS AND AVOIDANCE

- No vaccine is available for dogs or cats
- Contaminated soil in areas where *Coccidioides immitis* are found (known as “endemic areas”) should be avoided, particularly during dust storms after the rainy season

### POSSIBLE COMPLICATIONS

- Lung disease resulting in severe coughing may worsen temporarily after treatment is started, owing to inflammation in the lungs
- Liver toxicity may result from ketoconazole treatment
- Kidney toxicity may result from amphotericin B treatment

### EXPECTED COURSE AND PROGNOSIS

- Coccidioidomycosis is considered one of the most severe and life threatening of the generalized (systemic) fungal diseases (mycoses)
- The prognosis is guarded to grave
- Many dogs will improve following oral antifungal medication therapy; however, relapses may be seen, especially if therapy is shortened
- The overall recovery rate has been estimated at 60%, but some report a 90% response to fluconazole therapy
- The prognosis for cats is not well documented, but rapid spread of the disease throughout the body (dissemination) requiring long-term therapy should be anticipated
- Serologic tests (blood tests that detect the presence of antibodies to a certain disease-causing agent or antigen; an “antibody” is a protein that is produced by the immune system in response to a specific antigen) every 3 to 4 months after completion of treatment is recommended to monitor the possibility of relapse
- Spontaneous recovery from widespread (disseminated) coccidioidomycosis without treatment is extremely rare

## KEY POINTS

- The necessity and expense of long-term treatment of this serious illness, with the possibility of treatment failure, should be discussed with your pet’s veterinarian
- The antifungal medications used in treatment have potential side effects

