



Fungal Pneumonia

Basics

OVERVIEW

- Inflammation of the interstitial, lymphatic, and peribronchial tissues of the lung, caused by deep fungal (known as “mycotic”) infection; “interstitial” relates to spaces within tissues or organs; “lymphatic” refers to vessels within the body that transports lymph, a clear to slightly colored liquid that contains white blood cells—it serves many functions including removing bacteria from tissues and returning fluids to the circulation; “peribronchial” refers to something that surrounds the bronchus or bronchi (airways going from the windpipe [trachea] into the lungs)
- Various fungi can cause “deep fungal infections”; they include *Blastomyces*, *Histoplasma*, *Coccidioidomyces*; *Cryptococcus*; and *Aspergillus*; the fungi are found in different locations in the United States
- Depends on geographic distribution in the United States: Blastomycosis—seen in the Southeast and Midwest, along the Mississippi, Ohio, Missouri, and Tennessee Rivers and southern Great Lakes; also in southern Midatlantic states; Histoplasmosis—similar to, but more widely distributed than, blastomycosis; pockets of disease in Texas, Oklahoma, and California; Coccidioidomycosis—Southwest from Texas to California; Cryptococcosis and Aspergillosis—widespread throughout the United States
- “Pneumonia” is inflammation of the lungs
- “Upper respiratory tract” (also known as the “upper airways”) includes the nose, nasal passages, throat (pharynx), and windpipe (trachea)
- “Lower respiratory tract” (also known as the “lower airways”) includes the bronchi, bronchioles, and alveoli (the terminal portion of the airways, in which oxygen and carbon dioxide are exchanged)

GENETICS

- Breed susceptibilities may be related to defects in cell-mediated immunity

SIGNALMENT/DESCRIPTION OF PET

Species

- Dogs
- Cats (less common)

Breed Predilections

- Generalized (systemic) disease caused by a fungus (known as “systemic mycosis”)—large-breed dogs kept outdoors or used for hunting or field trials; Doberman pinschers and rottweilers may be susceptible to more severe widespread (disseminated) disease
- Generalized (systemic) disease caused by *Aspergillus* (known as “aspergillosis”)—German shepherd dogs may be overrepresented in population of affected dogs

Mean Age and Range

- Young pets (less than 4 years of age) are more susceptible than other ages
- Any age may be affected

Predominant Sex

- Males affected 2–4 times more often than females

SIGNS/OBSERVED CHANGES IN THE PET

- Depend primarily on the organ systems involved
- Illness affecting many body systems
- Chronic weight loss and lack of appetite (known as “inappetence”)
- Discharge from eyes and/or nose
- Coughing—may be prominent; seen inconsistently even with severe lung disease; may be triggered by putting pressure on or feeling the windpipe or trachea
- Difficulty breathing (known as “dyspnea”) or exercise intolerance common; difficulty breathing may be noted when the pet is resting, if severe disease
- Labored breathing—more common in cats; sign of severe disease in both dogs and cats
- Sudden (acute) blindness or squinting of the eyes (known as “blepharospasm”)—if eyes are affected
- Raised bumps (known as “papules”) and nodules on the skin—common, but often missed until draining tracts appear
- Lameness—common if the feet are affected or if inflammation/infection of the bone (known as “osteomyelitis”) develops
- Depression and emaciation—in pets with long-term (chronic) disease
- Fever—about 50% of affected pets
- Harsh, loud breath sounds—common when listening to the lungs with a stethoscope (known as “auscultation”)
- Short, rough snapping sounds (known as “crackles”) may be heard when listening to the lungs with a stethoscope (auscultation)—may be prominent, especially in cats
- Enlarged lymph nodes (known as “lymphadenopathy”)—common in dogs with fungal infections
- Blastomycosis (dogs)—multiple nodules on and under the skin, with draining tracts; inflammation of the iris and other areas in the front part of the eye (known as “uveitis”); loss of attachment of the retina, the back part of the eye, characterized by the presence of multiple nodules (known as “granulomatous retinal detachment”) common
- Coccidioidomycosis—dogs; severe pain caused by inflammation/infection of the bone (osteomyelitis) common; cats: skin lesions common
- Histoplasmosis—dogs: emaciation and diarrhea (often bloody) prominent; cats: skin lesions seen
- Cryptococcosis—infection involving the nasal passages and surrounding soft tissue is common

CAUSES

- *Blastomyces dermatitidis*—lungs are the primary route of infection
- *Histoplasma capsulatum*—lungs and possibly gastrointestinal tract are the primary routes of infection
- *Coccidioides immitis*—lungs are the primary route of infection
- *Cryptococcus neoformans*—nasal cavity is the primary route of infection, with direct extension into the eyes or central nervous system (brain, spinal cord); lungs are less important route of infection
- *Aspergillus*—nasal cavity and lungs are the primary routes of infection

RISK FACTORS

- Blastomycosis, histoplasmosis, and cryptococcosis—environmental exposure to soils rich in organic matter; exposure to bird droppings or other fecal matter may make the pet susceptible to blastomycosis and cryptococcosis; living near water
- Coccidioidomycosis—environmental exposure to sandy, alkaline soil after periods of rainfall; outdoor activities (such as hunting and field trials); decreased ability to develop an immune response (immunosuppression), especially poor cell-mediated immunity, may contribute to generalized (systemic) spread of fungal infection
- Cats—feline leukemia virus (FeLV) infection does not appear to be a risk factor and feline immunodeficiency virus (FIV) infection may be a minor risk factor

- Prednisone—may worsen the disease
- Chemotherapy
- Cancer involving certain cells in the lymph nodes, spleen, and/or bone marrow (known as “lymphoreticular cancer”)

Treatment

HEALTH CARE

- Outpatient—if the pet is still eating
- Inpatient evaluation and treatment—if the pet is dehydrated, has lack of appetite (anorexia), and has severely low levels of oxygen (known as “severe hypoxia”)
- Administration of fluids, oxygen, and antibiotics, as needed

ACTIVITY

- Restricted

DIET

- Feed high-quality protein, calorically dense food
- Histoplasmosis, accompanied by severe gastrointestinal involvement—feed highly digestible food

SURGERY

- Localized, inflammatory nodules (known as “granulomas”) may be removed surgically
- Painful eyes due to secondary glaucoma (in which the pressure within the eye is increased) may require surgical removal of the eye(s)

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
- Itraconazole—drug used to treat fungal infections; it is considered to be an “antifungal drug”; most often used first; must be given with food
- Fluconazole—antifungal drug; drug of choice for cryptococcosis and pets with central nervous system (brain, spinal cord) or urinary tract involvement
- Lipid-complexed amphotericin B—antifungal drug; administered intravenously (IV)
- Posaconazole—antifungal drug; may be more effective for aspergillosis; administer with food
- Ketoconazole—antifungal drug; may be effective; higher incidence of side effects; longer treatment is necessary; relapse is common
- Amphotericin B—antifungal drug; administered intravenously (IV); may be used in combination with azole drug, such as itraconazole or ketoconazole for severely affected pets
- Amphotericin B—alternative; may give under the skin (subcutaneously) diluted in 0.45% saline/2.5% dextrose solution
- Voriconazole—antifungal drug; used for invasive aspergillosis, in which the deep fungal infection spreads through various tissues of the body

Follow-Up Care

PATIENT MONITORING

- Liver enzymes—evaluated monthly by blood tests, while the pet is on itraconazole, fluconazole, or ketoconazole
- Blood urea nitrogen (BUN) and creatinine—measure before each dose of amphotericin B, to monitor effects on the kidneys
- Chest x-rays (radiographs)—re-evaluate before discontinuing treatment

PREVENTIONS AND AVOIDANCE

- Monitor for signs of recurrence

POSSIBLE COMPLICATIONS

- Blindness is usually permanent
- Kidney failure from treatment with amphotericin B

EXPECTED COURSE AND PROGNOSIS

- Blastomycosis—requires a minimum of 2 months of treatment; 60–70% of dogs are cured by treatment with itraconazole; those not cured usually relapse; dogs with difficulty breathing (dyspnea) or low levels of oxygen in the blood (known as “hypoxemia”) have poorer prognosis
- Other deep fungal infections—continue treatment until 1 month past remission
- Generalized (systemic) aspergillosis—prognosis not as good as for other fungal causes
- Relapse—may occur up to 1 year after treatment

Key Points

- Less than 70% of dogs and a smaller percentage of cats are likely to respond to treatment
- Treatment is expensive and will probably be necessary for more than 2 months
- Clean environmental areas that have high organic matter or feces (take appropriate precautions to protect yourself from breathing in material in the area; you may want to consult with your physician first)
- Fungal infections can occur in people—no direct transmission of the infection from animals to people (known as “zoonotic disease”), except from penetrating wounds contaminated by the fungal organism; rather concern is that people and pets live in the same environment and if the pet has a fungal disease, the people could be exposed to the same fungal organism

Notes

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