### BLASTOMYCOSIS

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<th>Animal Group(s) Affected</th>
<th>Transmission</th>
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<td>Canids, felids, ursids, mustelids, primates, marine mammals, horses, bats.</td>
<td>Inhalation of airborne conidia from disturbed endemic soil.</td>
<td>Fever, anorexia, coughing, dyspnea, ocular and nasal discharge, loss of body condition, draining, cutaneous lesions, lameness, ocular disease of anterior uveitis or retinal disease.</td>
<td>Disease severity may range from asymptomatic to fatal fulminant respiratory failure. Clinical signs may persist for weeks to months before disease progresses in severity.</td>
<td>Itraconazole is currently treatment of choice in dogs. Rarely, amphotericin B is used due to nephrotoxicity. Fluconazole is a lower cost alternative to itraconazole. Treatment duration in dogs usually 3-6 months.</td>
<td>No standards for prevention or control due to origin of organism in the soil.</td>
<td>No</td>
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**Susceptible animal groups:** Blastomycosis has been reported in canids, felids, ursids, mustelids, primates, felids, equids, marine mammals, and bats.

**Causative organism:** Blastomyces dermatitidis

**Zoonotic potential:** Human infection is generally a result of exposure to a shared environmental source, rather than transmission from another mammalian host. Although very rare, reports of zoonotic transmission associated with dog bites, cat scratches, animal necropsies, and a kinkajou bite have been documented. Care should be taken to avoid accidental inoculation with contaminated objects such as needles, knives, and similar. One report of a localized Blastomyces infection in a veterinarian occurred following an inadvertent needle puncture during aspiration of a draining lesion.

**Distribution:** The fungus is endemic in the Mississippi-Ohio River basin and central Atlantic states of the U.S. and northern Ontario and Manitoba, Canada. It is believed to be a soil saprophyte, associated with acidic, sandy soil, often in close proximity to a water source.

**Incubation period:** Usually 2-6 weeks, but clinical signs may appear as long as several months to years after infection.

**Clinical signs:** Blastomycosis is typically a primary pulmonary disease as infection often occurs via the inhalation of aerosolized fungal spores from a soil source. Primary cutaneous disease does occur, although rarely. Infections are often disseminated and clinical signs are associated with distribution of lesions. Fever, anorexia, coughing, dyspnea, loss of body condition and draining, cutaneous lesions are common clinical signs. Bone or joint involvement can result in lameness. Ocular involvement is also relatively common dogs.
and may be exhibited by anterior uveitis and subretinal effusion which can lead to retinal detachment and blindness.

**Post mortem, gross, or histologic findings:** With pulmonary involvement, lesions are often distributed throughout the lungs and consist of multifocal to coalescing white-grey granulomas, sometimes with central abscessation. Regional lymph nodes are typically involved and characterized by granulomas, abscesses, or caseous lesions. Similar granulomatous lesions will be seen with disseminated disease in any involved tissues. The distribution of disease throughout the body often includes, but is not limited to, the lungs, skin, eyes, bones, joints, lymph nodes, and central nervous system. Microscopically, organisms appear as spherical thick-walled yeasts of 8-20um in diameter with broad-based budding. Organisms can usually be identified cytologically from lymph node aspirates or impression smears from draining skin lesions. Pyogranulomatous inflammation is frequently observed on cytology or histopathology specimens. Organisms may be infrequent in more chronic infections. Histologically, hematoxylin and eosin (H&E) stains may result in poor visualization of fungal elements; therefore, special stains such as Periodic Acid-Schiff (PAS) stain or Gomori’s methenamine silver (GMS) stain should be used in addition to H&E.

**Diagnosis:** Radiographs can be helpful in identifying lesions within the respiratory system. A diffuse, nodular interstitial or bronchointerstitial pattern is often observed and may be accompanied by thoracic lymphadenopathy, pleural effusion, or pneumomediastinum. Radiographic bone lesions may also be identified as osteolysis and amorphous bone proliferation. Endoscopic examination may reveal fungal granulomas within the nose or nasopharynx, and specimens for cytology, histopathology, and culture can be obtained via endoscopic-guided biopsy. Transtracheal wash, bronchoalveolar lavage, or lung aspirate may be used to collect samples for cytology when pulmonary lesions are present. Cytologic identification of organisms (as described above) with accompanying inflammation is the preferred method of diagnosis. An antigen test (currently commercially available from MiraVista Diagnostics, Indianapolis IN) can detect *Blastomyces* antigen in urine or serum with high sensitivity and specificity. Current antibody tests using agar gel immunodiffusion (AGID) methods have low sensitivity during active infection.

**Material required for laboratory analysis:** Tracheal wash, bronchoalveolar lavage, impression smears or aspirates of enlarged lymph nodes, skin lesions, or draining exudates are appropriate for cytological examination. Biopsy of granulomatous lesions can be submitted for histopathology. Urine or serum can be submitted for antigen concentrations. Serum can be sampled for antibody testing with AGID but this is less sensitive than the urine antigen early in the course of the disease.

**Relevant diagnostic laboratories:** Many commercial and state veterinary laboratories can provide cytologic, histopathologic, and serologic diagnostic services. Serum samples for itraconazole concentrations can be sent to The Fungus Testing Lab (University of Texas Health Science Center, San Antonio, Texas) or MiraVista Diagnostics (Indianapolis, Indiana). Mira Vista Diagnostics can also perform the antigen test for *Blastomyces*.

**Treatment:** Itraconazole is currently the treatment of choice for blastomycosis, given its ease of administration orally and lower toxicity. Itraconazole blood concentrations should be measured 14-21 days after beginning treatment; dosage should be increased if serum concentrations <3.0ug/mL. Given the high cost of itraconazole, fluconazole is a lower-cost alternative but generally requires longer treatment duration. Duration is typically 4 months with itraconazole and 6 months with fluconazole. Antigen serum concentrations may be used to monitor therapy and treatment should be continued until antigen concentrations <1ug/mL. Absorption of compounded itraconazole is inconsistent and may account for treatment failures. Treatment relapse is not uncommon within 1 year of treatment. Amphotericin B is nephrotoxic and requires intravenous administration, but may be an excellent option for animals presenting with serious disease, or not responding to itraconazole.
**Prevention and control:** *Blastomyces dermatitides* originates from the soil, and will grow in shaded, sandy, acidic soil with close proximity to water. Although sterilization of soil is not realistic, restriction of access by animals to areas where other cases are thought to have originated may reduce risk. Alteration of the environment to eliminate the growth conditions of the organism may be beneficial.

**Suggested disinfectant for housing facilities:** Replacing soil or gravel based outdoor housing facilities with concrete floors will reduce the presence of the organism in the housing area. Disinfectants with antifungal spectrum of action may be used on impervious environmental surfaces according to the manufacturer’s directions; however, no disinfection method of the environment is proven to eliminate *Blastomyces* organisms.

**Notification:** Human and animal cases may be reportable in certain states so ask local public health and animal health officials for direction in your area. A national surveillance program does not currently exist in the United States.

**Measures required under the Animal Disease Surveillance Plan:** None currently.

**Measures required for introducing animals to infected animal:** Blastomycosis is generally not considered a contagious disease that is directly transmitted.

**Conditions for restoring disease-free status after an outbreak:** Disease-free status can only be achieved after a minimum of 60-90 days to 180 days of therapy accompanied by complete resolution of clinical signs and lesions. Given the relative common occurrence of relapse, patients should be monitored for return of clinical signs or lesions in the following 12-15 months. Increasing urine or serum antigen concentrations may indicate a possible relapse.

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**References:**