Clinical Reports

Disseminated geotrichosis in two dogs

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Two unrelated native Montana dogs from the same household were examined because of respiratory signs of disease. The dogs lived outdoors and frequently roamed the Sun River bottomland near Great Falls, Mont. The dogs' vaccination status was current and they were being fed a commercial dog food. Approximately one month prior to examination, both dogs had received multiple bite wounds from a wild raccoon. The wounds had not been treated and were healed at the time of examination.

Dog 1—A 3-year-old sexually intact male Labrador Retriever was examined because it had an episode of dyspnea. Physical examination revealed no abnormalities other than a mild cough elicited by tracheal palpation. A tentative diagnosis of infectious tracheobronchitis was made and outpatient treatment with penicillin and dexamethasone was begun. Seven days after initial examination, the dog was reexamined because of increasing signs of listlessness, anorexia, and polydipsia. Physical examination findings included fever (40.7°C), an inflamed pharynx, deep cough elicited by tracheal palpation, muffled heart sounds, and moist rales.

A CBC revealed leukocytosis (18,800 cells/μl) with a left shift (1,692 band neutrophils/μl). Abnormal serum biochemical values included high alkaline phosphatase activity (305 IU/L; normal, 25 to 50 IU/L), low albumin concentration (2.6 g/dl; normal, 3 to 4.8 g/dl), and high phosphorus concentration (6.1 mg/dl; normal, 2.5 to 5 mg/dl). Thoracic radiography revealed numerous multiple nodular pulmonary densities that were bilaterally distributed and often confluent (Fig 1). On the basis of the physical examination findings, laboratory results, and radiographic lesions, our differential diagnoses were pulmonary neoplasia or pneumonia, Dirofilariasis, histoplasmosis, blastomycosis, and coccidioidomycosis are not endemic in Montana and thus were ruled out.

The dog was hospitalized and treated with 300 mg of ampicillin (IM, q 12 h), 100 mg of gentamicin (IM, q 12 h), and 200 mg of aminophylline (PO, q 12 h). Prior to hospitalization, the dog had received 20 mg of dexamethasone in IM injections and an IM injection of 20 mg of methylprednisolone. The dog died 8 days after initial examination.

Dog 2—Seven days after dog 1 was first examined, the other dog in the household, a 7-year-old male Irish Wolfhound, was admitted because of a cough of 3 days' duration. The dog was listless, anorectic, polydipsic, and febrile (41.1°C). Lung and heart sounds were normal. A CBC revealed neutrophilia (15,225 neutrophils/μl) with a left shift (700 band neutrophils/μl) and lymphopenia (700 lymphocytes/μl). Abnormal serum biochemical values included high serum alkaline phosphatase activity (92 IU/L) and low albumin concentration (2.7 g/dl). Further diagnostic tests were refused by the owner. A tentative diagnosis of infectious tracheobronchitis with secondary bacterial infection was made. Treatment with 300 mg of ampicillin (PO, q 12 h) and 100 mg of gentamicin (IM, q 12 h) was begun. Also, the dog was given an IM injection of 4 mg of dexamethasone.

During the following week, the dog remained febrile (39.6 to 40.9°C) and developed severe dys-
pneumonia and pyralism. Results of routine bacterial culturing of a blood sample 6 days after admission were negative. The dog’s condition deteriorated in spite of antibiotic treatment (gentamicin and ampicillin). The dog was euthanatized 11 days after admission.

Gross necropsy findings in both dogs were similar. Numerous small to large (≤3 cm-diameter), irregular, often coalescing, pale yellow to brown, firm lesions randomly scattered throughout the pulmonary parenchyma were found. In both dogs, the liver was swollen and had rounded margins and prominent lobular architecture. Numerous small (<1 cm-diameter) irregular pale yellow foci were randomly scattered throughout the cortices of both kidneys of dog 1. A few similar lesions were noticed in the kidneys of dog 2. Formalin-fixed specimens of lung, liver, and kidney from dog 1, and lung, liver, kidney, spleen, heart, lymph node, thyroid, skeletal muscle, trachea, and intestine from dog 2 were submitted for histologic examination.

Both dogs had severe pneumonia characterized by coalescing foci of necrosis and a diffuse cellular infiltrate of neutrophils and macrophages, including multinucleated giant cells (Fig 2). A few lymphocytes were seen. In dog 1, numerous free and phagocytized fungi were evident with H&E stain. Gomori methenamine silver staining enhanced the visualization of these fungi, which were short septate mycelial elements and round to oval, yeast-like cells. Results of Gram and Giemsa staining were negative for bacteria and protozoa in tissue sections from both dogs.

The lesions and morphologic appearance of the organisms were consistent with those described previously in a dog with disseminated geotrichosis. The diagnosis was confirmed by fluorescent antibody identification of the fungi as Geotrichum candidum in paraffin sections from dog 1. Fluorescent antibody identification of the fungi in dog 2 was not accomplished because of the paucity of organisms.

Geotrichum candidum is a ubiquitous saprophytic fungus of soil, decaying organic matter, and contaminated food. In human beings, it is part of the normal flora of the mouth and intestines. It has been isolated from the feces of clinically normal human beings and animals, cutaneous lesions in snakes and flamingos, and diarrheaic feces from a dog and apes, and has been associated with lymphadenitis in pigs and intestinal disease in ocelots. One case of disseminated geotrichosis has been reported in dogs.

In human beings, G candidum rarely causes local infections in the skin, respiratory tract, conjunctiva, and gastrointestinal tract. Several cases of Geotrichum fungemia and 2 cases of fatal disseminated geotrichosis with multiorgan tissue invasion have been reported. In one case of disseminated geotrichosis, tissue invasion by the fungus was noticed in the lungs, heart, spleen, and

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in the ascending colon at the site of recurrent carcinoma following fluorouracil treatment. The other case involved fungal infection of the heart, lungs, liver, spleen, peripancreatic soft tissue, hilar and retroperitoneal lymph nodes, and bone marrow following multi-drug chemotherapy for chronic myelogenous leukemia with lymphoid blast transformation.

Geotrichosis is thought to disseminate in animals for which resistance has been altered by terminal illness, immunosuppressant therapy, or long-term use of antibiotics. Other than use of corticosteroids as part of the treatment regimen once the disease was clinically apparent, no obvious cause of immunosuppression could be identified in the 2 cases described here. The extensive corticosteroid treatment received by dog 1 may have caused the much higher number of organisms in tissue sections than seen in dog 2.

The development of clinical disease in the 2 dogs during the same week would suggest a common source of exposure. The pulmonary route is considered a likely portal of entry, because of the extensive pneumatic lesions in both dogs. The raccoon-bite wounds and ingestion of the organism also are possible routes of infection.

The clinical signs, disease course, and postmortem lesions in the 2 dogs were similar to those described in the third dog, also a Labrador Retriever, with disseminated geotrichosis. Clinical signs in all 3 dogs included coughing elicited by tracheal palpation, fever, anorexia, polydipsia, and progressive dyspnea. The third dog with disseminated geotrichosis also had icterus. The course of disease in all 3 dogs was rapidly progressive and unresponsive to antibiotics. All 3 dogs died or were euthanized 2 weeks or less after the onset of clinical signs.

Because of the disease's rapid course after the development of clinical signs, early diagnosis and initiation of appropriate treatment would be essential for successful resolution of disseminated geotrichosis. Radiography accompanied by cytologic examination and culturing of thoracic fluid and tracheal wash specimens could possibly establish an early diagnosis. Antifungal treatment of disseminated geotrichosis in animals has not been reported; however, in vitro tests indicate sensitivity of G. candidum to amphotericin-B and 5-fluorocytosine.

Geotrichum candidum was identified by culturing in the case of the third dog with disseminated geotrichosis. Some investigators have expressed doubt that G. candidum was the etiologic agent in that case because of the lack of well-formed mycelia in tissue sections. Fluorescent antibody identification of G. candidum in tissue sections from dog 1 confirms its role as the causative agent of a rare systemic mycosis in dogs.