Public Health Response to 2 Clinical Cases of Blastomycosis in Colorado Residents

Elizabeth Lyon Hannah,1 Ann Marie Bailey,2 Rana Hajjeh,3 Kenneth Gershman,1 Mark Lindsley,1 and Richard E. Hoffman1

1Colorado Department of Public Health and Environment, Denver, and 2Boulder County Health Department, Boulder, Colorado; and 3Division of Mycotic Diseases, Centers for Disease Control and Prevention, Atlanta

We summarize the public health response after the identification of 2 cases of pneumonia caused by Blastomyces dermatitidis infection in Colorado residents. The response to these cases emphasizes the need for physicians to add fungal infection to the list of differential diagnoses for patients who have refractory pneumonia, even those who live in areas of nonendemicity.

Blastomycosis is a disease that is caused by inhalation of spores from Blastomyces dermatitidis, a dimorphic fungus that is associated with soil and rotting wood. Blastomycosis most commonly presents as a subacute pulmonary disease, but the clinical spectrum of the disease extends from asymptomatic infection to disseminated disease that involves the skin, bones, and genitourinary system [1].

In the United States, blastomycosis occurs sporadically throughout the Ohio River and Mississippi River valleys and the southeastern states, and the risk of exposure is very small, even in areas where the disease is endemic [2–4]. The overall morbidity associated with blastomycosis is not well defined; however, Colorado is clearly outside of the generally accepted area of endemicity for the disease. Fewer than 20 cases of blastomycosis in either humans or animals have previously been reported in Colorado, although there have been reports of reactivation of the disease among Colorado residents who previously resided in areas of endemicity [5–7].

In late August 1998, 2 cases of suspected fungal pneumonia were reported to the Boulder County Health Department in Boulder, Colorado. Both cases occurred in immunocompetent, otherwise healthy adults who were working for the City of Boulder Open Space & Mountain Parks program. In the epidemiologic investigation of these cases, a “confirmed case” was defined by isolation of B. dermatitidis from an individual who had clinically compatible illness.

**Patient 1.** On 20 August 1998, a 25-year-old man presented with a 5-day history of fever (temperature, 40°C), weight loss, fatigue, arthralgia, and productive cough. The patient was initially treated with azithromycin, which was switched to trimethoprim-sulfamethoxazole after 3 days. After the patient had received antibiotic therapy for 8 days, a chest radiograph revealed diffuse, bilateral alveolar infiltrates. A CT scan of the lungs demonstrated diffuse, bilateral nodular opacities. An open lung biopsy was performed, and biopsy specimens revealed small, budding yeasts (size, 2–8 μm). Differential diagnoses included histoplasmosis, cryptococcosis, or coccidiomycosis. After culture was done for 10 days, B. dermatitidis was morphologically identified and confirmed by use of a DNA probe (GenProbe; Accuprobe). Confirmation of the diagnosis was provided by the Mycotic Diseases Laboratory at the Centers for Disease Control and Prevention, Atlanta.

**Patient 2.** On 24 August 1998, a 35-year-old man presented with a 4-day history of fever (temperature, 39°C), fatigue, shortness of breath, arthralgia, skin lesions (on the arms, legs, and trunk), cough, chest pain, and weight loss. The patient was given a diagnosis of community-acquired pneumonia and was treated with amoxicillin-clavulanate. The patient was seen again 3 days later, and findings on chest radiography led to a diagnosis of atypical pneumonia; treatment with amoxicillin-clavulanate was subsequently changed to azithromycin. The patient’s condition continued to worsen, and on 3 September, a CT scan of the lungs revealed diffuse, bilateral pulmonary nodules. The pulmonologist who treated this patient also consulted with patient 1 and rapidly made a connection between the 2 patients’ work histories and the clinical course of the disease; this connection led the pulmonologist to suspect that patient 2 had fungal pneumonia. Transbronchial biopsy and lavage were attempted, but results of Gram stains and cultures were negative. An open lung biopsy was subsequently performed and revealed small, budding yeasts that were identical to those found in patient 1. After culture was done for 21 days, B. dermatitidis was morphologically identified.

**Public health investigation.** An epidemiologic investigation confirmed that the 2 patients were employed by the City of Boulder Open Space & Mountain Parks program and that
they had worked together on a prairie dog relocation project on 3 August and 10 August. According to a Boulder city ordinance, new developments must arrange for the relocation of displaced animals. A semiarid grassland that had previously been inhabited by prairie dogs but was currently vacant was being prepared for relocation of displaced animals. The vacant burrows in this grassland housed numerous rodent, snake, and bird species.

Workers’ duties at the site involved the use of a gasoline-powered auger and hand trowels to excavate old burrows. Fifteen employees and volunteers worked in the area. Personal protective equipment was not used at the site. Workers’ responses to interviews indicated that the 2 affected individuals were part of a crew of 3 individuals who performed vigorous hand digging that resulted in their faces being close to the ground and that ultimately led to these individuals having greater exposure to dust and, therefore, B. dermatitidis spores than did the remainder of the work crew.

Data on the amount of rain that fell during the time when these work activities were performed revealed that, during the last 10 days of July and the first 5 days of August, a total of 4.39 in of rain fell in Boulder (Colorado Climate Center, Colorado State University, Fort Collins, unpublished data). Normal measurements of rainfall in Boulder during the months of July and August are 1.98 in and 1.3 in, respectively; therefore, during a period of 15 days, Boulder received an amount of rain that was 1.1 in greater than that expected for the entire 2 months. In addition, it rained on 13 of the 15 days from July 22 through August 5.

The 13 individuals who were not ill were interviewed and referred to an occupational health specialist to undergo screening, which included chest radiography; findings on chest radiography were normal. Blood samples were obtained from 14 of the workers, including the 2 patients, and were submitted for serologic tests, including CF, immunodiffusion, and RIA. Blood samples were obtained at an average of 86 days after the workers had been exposed to the relocation site. The results of all serologic tests were negative. To evaluate the excavated soil, 10 composite soil samples were collected from randomly selected burrows at the site. Cultures of these soil samples were performed on yeast extract phosphate agar [8] and showed negative results for growth of B. dermatitidis.

Discussion. Fungal infection should be considered in the differential diagnosis of patients who have lobar or atypical pneumonia, especially when the patients are refractory to initial antibiotic therapy and/or have a significant history of outdoor exposure in an area of endemicity. Diagnosis of blastomycosis is problematic because of the absence of a highly sensitive and specific serologic test for the disease [9]. In addition, no reliable skin test is available [3].

An interesting feature of this outbreak is its short incubation period, which was estimated to be 13 days and 18 days in patients 1 and 2, respectively. This incubation period is shorter than that previously observed in outbreak situations (30–45 days) [4, 10]. Patients 1 and 2 had prolonged (duration, ≥5 h), close contact with the soil, which perhaps resulted in an increase in the number of spores inhaled. Although both patients previously had resided in areas where they could have been exposed to B. dermatitidis, it is unlikely that reactivation of the disease would have occurred simultaneously. This temporal clustering of cases of blastomycosis suggests that the 2 workers acquired the disease in Boulder. The finding that the 12 individuals who were not sick had negative serologic test results suggests that no other workers were infected with B. dermatitidis. However, because of the low sensitivity of the serologic assays, we are unable to determine the rate of asymptomatic infection [9]. Because it is very difficult to isolate B. dermatitidis [10] from environmental samples, the lack of growth of B. dermatitidis in soil samples obtained for culture in this study is not unexpected.

Several factors may have contributed to the occurrence of blastomycosis in these 2 workers. B. dermatitidis is commonly associated with soil that contains high nitrogen and organic content [10], which may have been provided by the stored food and fecal matter of the animals that lived in the burrows. The heavy rainfall also may have contributed, because moisture and humidity are thought to play a role in reproduction of the fungal organism and in aerosolization and subsequent transmission of the spores [10, 11]. The spores that formed could have easily been spread in the dust that was created when the workers were digging. This outbreak of blastomycosis demonstrates the importance of adding fungal infections to the list of differential diagnoses for patients who have refractory pneumonia, even those patients who reside in areas of nonendemicity.

Acknowledgments

We would like to thank the staff of the City of Boulder Open Space & Mountain Parks program; Eric J. Esswein of the National Institute of Occupational Safety and Health, Denver, for technical assistance (including soil sampling); Drs. Bruce Klein and Dennis Baumgartner, University of Wisconsin School of Medicine, Madison, for providing clinical and environmental testing; Drs. De Groote, Smith, and Bjerke, for providing clinical information and specimens; and Dr. Dennis D. Lenaway and the environmental staff at the Boulder County Health Department, Boulder, Colorado.

References


