

# Blastomycosis: More Evidence for Exposure Near One's Domicile

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## ABSTRACT

**Background**—Our previous publications on the epidemiology of blastomycosis suggested that the etiologic organism, *Blastomyces dermatitidis*, may be acquired at home, however this view was challenged in an editorial.

**Methods**—1) Field study of 2 properties that preliminarily suggested disease acquisition in the home. Owner interviews, site visits and environmental cultures using our in-vitro technique were used. 2) An address registry of human and dog blastomycosis cases was constructed from extensions of our previously published case series. 3) Literature review.

**Results**—1) Blastomycosis occurred in a dog (December, 1998) and then a cat confined to its home (September, 1999), from a household in urban Manitowoc County, WI; and additionally in a house-confined cat (July, 1998) at a home in Milwaukee, WI. Interviews implicated the basement and the attic or basement, respectively, as the most likely source of infection at these homes. Environmental cultures were negative for *Blastomyces*.<sup>2</sup> Of the 229 domiciles in the registry, a minimum of 27 (12%) were associated with more than one blastomycosis case, 10 sites with more than two and 7 with more than three. In 4 domiciles, repeat cases occurred in different families. Most cases were separated by 1 year or more (range: 3 weeks to 7 years).<sup>3</sup> Recent case series reveal a minority of outdoor activities and occupations among humans with blastomycosis. The organism has been isolated from an inhabited yard and from a house being razed.

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**Conclusions**—There appears to be growing evidence that blastomycosis may be acquired at home, and that *B. dermatitidis* may be relatively persistent on certain properties.

## INTRODUCTION

Blastomycosis,<sup>1,2</sup> a potentially fatal<sup>3</sup> systemic and cutaneous fungal infection of humans and animals is highly endemic in Wisconsin, particularly Vilas County where human incidence figures over 13 years have remained at 40/100,000 for the county and 100/100,000 for the Eagle River area. In the discussion of this May, 1998 *WMJ* publication,<sup>4</sup> we suggested that in a highly endemic area such as Vilas County, Wisconsin, place of residence may be more important for exposure to the etiologic agent *Blastomyces dermatitidis* than the degree or type of outdoor activity. This hypothesis was based on extensive interviews of human patients and owners of affected dogs and the geographic clustering of cases over time. This view was questioned in an accompanying editorial.<sup>5</sup> We appreciated this editorial and were challenged by it. This paper presents 3 lines of additional evidence to further support our hypothesis.

## METHODS

Field studies were performed on 2 households in which animal blastomycosis cases suggested infection acquisition in or near the domicile. In-depth interviews<sup>6</sup> were performed with the owners of the homes. Interview reliability was considered excellent as both owners are professionals—one a medical practitioner. Twenty environmental samples were taken from each property utilizing our in-vitro technique for isolation of *B. dermatitidis*.<sup>7</sup>

An address registry, including date of disease occurrence, of Vilas County domiciles associated with 1 or more blastomycosis cases was constructed. Sources included data on file from our 2 human case series, 1979-1990 and 1991-1996,<sup>4</sup> and all subsequent

human cases from mandatory reports to the Vilas County health department, 1997 through May 1999, who were interviewed. The data was analyzed retrospectively as previously described.<sup>4</sup> In total, these data bases included 134 physician-diagnosed, laboratory-confirmed human cases, of whom 84% were interviewed regarding prior human or dog blastomycosis cases on their property.

Addresses of dogs with veterinarian-diagnosed blastomycosis were ascertained from a single veterinarian practice in Eagle River. This portion of the address registry included recorded data from our prospectively entered case-control study of dogs with blastomycosis whose owners had been interviewed retrospectively in the August, 1990 through July, 1993 study,<sup>9</sup> and dog cases retrospectively identified at this practice June 1994 through May 1999 (missing months of data due to office renovation). Overall, 59% of the owners of 95 dogs were interviewed regarding prior cases on the property. Repeat cases on properties were identified by these interviews and by noting duplicate addresses of disease occurrences.

A MEDLINE search, 1966 through May, 2000, using "blastomycosis" as subject heading and keyword, and references from standard textbook sources<sup>12</sup> were utilized to identify pertinent published literature.

## RESULTS

### *Field Studies*

A 10-year-old male golden retriever, which resided in an 82-year-old home in an urbanized area of Manitowoc County, Wisconsin, was diagnosed with pulmonary blastomycosis in December 1998. A 10-year-old domestic long hair female cat from the same household was diagnosed with ocular blastomycosis, having onset in September 1999. The house was 220 meters from the nearest waterway, a river. Evidence of bats and mice had previously been noted in the house. The grassy yard contained arbor vitae bushes and wood chips below a front porch, signs of rabbit burrows and a compost heap in the backyard. The dog was often outdoors, confined mostly within its yard and occasionally taken to Lake Michigan beaches, but never to the river. The cat was occasionally held in the owners' arms on the front porch, did not go into the yard, and was taken for veterinarian visits, but otherwise remained exclusively in the house. A commonly frequented area of the home by both animals was a damp, poured concrete basement that contained two areas where portions of the floor had been removed to allow the passage of utility pipes and similar structures. These areas contained earth and some decomposing vegetation. At least one had

evidence of small mammal activity including droppings and corn that had been transported there. Cultures obtained December 2, 1999 from these and other areas of the basement, an intermittently damp area of a second floor bathroom near the bathtub, and the previously described areas of the yard tested negative for *B. dermatitidis*.

The second case was a 6-year-old domestic medium hair cat diagnosed with a blastomycotic abscess in August 1998 after having had signs of the illness a month earlier. Being a reclusive cat, it was strictly confined to the inside of its 100-year-old house in urban residential Milwaukee, WI, 800 meters from Lake Michigan and 900 meters from the Milwaukee River. Evidence of mice had been noted in the house. The cat spent most of its time in the attic but also frequented its litter box located in the basement. Being strictly confined to the house except for veterinarian visits, the cat had only escaped the house two or three times in its life. The aging concrete basement had evidence of intermittent moisture and areas of decaying wood. There were also two areas where the integrity of the basement floor/foundation was breached and earth was exposed. One of these included an abandoned coal chute filled with earth, coal dust, and other debris. Cultures taken January 7, 2000 from the attic and the described areas of the basement were negative for *B. dermatitidis*.

### *Registry*

Of the 229 addresses, 27 (12%) had two or more associated cases, 10 addresses had three or more cases, and 7 had four or more. Among Eagle River mailing addresses, 23/163 (14%) of addresses were associated with at least one repeat case. Of the 27 addresses with repeat cases, 26 addresses had at least one case separated from the nearest other case by more than 3 months, and 24/27 had at least one pair of cases separated by 1 year or more. The range of separation of nearest cases varied from 3 weeks to 7 years. Four addresses were associated with subsequent cases in different families who sequentially occupied the domicile.

## LITERATURE REVIEW

Our descriptive studies of human blastomycosis in the Vilas County areas<sup>4,8</sup> revealed relatively few blastomycosis patients engaging in common outdoor activities. In our case-controlled study of area dogs,<sup>9</sup> blastomycosis cases were more likely to live near a waterway but no more likely to engage in hunting or swimming than a control group of other outdoor exposed dogs.

Similar epidemiologic findings are present in studies of other states. In a human case-control study from Louisiana, outdoor occupations were not over-represented in the blastomycosis cases, nor were hunting, gardening or camping.<sup>10</sup> In a series of Louisiana dogs with blastomycosis, 24% of the cases were considered strictly indoor pets.<sup>11</sup> Among Mississippi humans with blastomycosis, only 29% were engaged in outdoor occupation.<sup>12</sup> Similarly, among blastomycosis patients in Tennessee, only 23 of 65 cases were engaged in outdoor occupations, and only 5 of 72 reported recreation outdoors.<sup>13</sup>

Previously, *B. dermatitidis* has been isolated from between the walls of an abandoned urban house,<sup>14</sup> and we recently isolated the fungus from a wooded rural Eagle River property.<sup>7</sup> The positive culture was from a woodpile located 5 meters in front of a kennel associated with 4 cases of dog blastomycosis over a 14-year period. The kennel is located 12 meters in front of the owner's house.

## DISCUSSION

While not conclusive, we offer 3 additional lines of evidence that one's place of residence may be a significant risk factor for acquisition of blastomycosis. Case series and case-controlled studies of blastomycosis have failed to implicate specific outdoor activities with disease risk. The circumstantial evidence of our two field studies is compelling as was our isolation of *B. dermatitidis* from a rural Eagle River front yard, in association with several cases in dogs on the property over time.<sup>7</sup> Positive environmental cultures for this fungus are exceedingly rare<sup>7</sup> and cultures should not be used to rule out the presence of the organism at a particular site.

The percentage of properties with repeat cases of blastomycosis in our address registry is likely an underestimation given the inability to interview a significant number of subjects, and the inclusion of only 1 of several veterinarian practices in the Vilas County area. Thus, in Eagle River, at a minimum, when there is a human or dog case of blastomycosis at a property, there is a 14% chance over the next several years of 1 or more additional cases.

To us, the distribution of repeat cases over years, and even over different families, is consistent with

the property as a risk factor rather than a remote common point source. Indeed, these data suggest the relative persistence of *B. dermatitidis* over time on or near certain properties in highly endemic areas.

## ACKNOWLEDGMENTS

The authors thank Esmeralda Santana for manuscript preparation, the Vilas County Health Department, Kristen Kastner and the pet owners of our field study cases.

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