

**Blended Human and Animal
Blastomycosis Surveillance
System in Minnesota**

APHA 2015

Joni Scheffel DVM MPH dip ACVPM
State Public Health Veterinarian
Supervisor, Zoonotic Diseases Unit
Minnesota Department of Health



Blastomycosis

- *Blastomyces dermatitidis* is a dimorphic fungus that exists as a mold in the environment and as a pathogenic yeast form in the body
- Endemic to Africa, India, and to regions of North America bordering the Ohio and Mississippi river valleys, the Great Lakes, and the Saint Lawrence River
- Transmission is by inhalation of airborne conidia after disturbance of contaminated soil

Blastomycosis: Clinical Presentation

- Median incubation period is 45 days (range, 21-106 days)
- Acute pulmonary symptoms of varying severity are most common (65% of cases)
- Other sites of infection are skin, bone, prostate and other genitourinary organs, and the meninges and brain
- 10% case fatality rate

**Blended Human-Animal
Surveillance for Blastomycosis**

- Human and veterinary cases are reportable in Minnesota
- Passive, laboratory and clinician based surveillance
 - Attending HCPs and veterinarians are contacted for clinical information
 - Human cases and owners of veterinary case are interviewed

E. EXPOSURE HISTORY	Patient Name: _____
Interview Date: ___/___/___	Interviewer: _____
Occupation Questions	
1) Do you work in any of the following fields? <input type="checkbox"/> Construction (1) <input type="checkbox"/> Landscaping (2) <input type="checkbox"/> Forestry (3) <input type="checkbox"/> Excavation (4) <input type="checkbox"/> Farming (5) <input type="checkbox"/> Nonrelated (6) <input type="checkbox"/> Other _____	
Job: _____	
Employer Location: City: _____ County: _____	
2) Do you work <1 mile from a waterway? <input type="checkbox"/> Y <input type="checkbox"/> N If yes, name of waterway: _____	
3) Any occupational exposures to soil, woodlot, or boggy areas? <input type="checkbox"/> Y <input type="checkbox"/> N If yes, describe: _____	
Home Environment Questions	
4) Which of the following best describes your neighborhood? <input type="checkbox"/> Urban neighborhood (1) <input type="checkbox"/> Suburbs (2) <input type="checkbox"/> Rural areas, wooded (3) <input type="checkbox"/> Rural area, farmland (4) <input type="checkbox"/> Other (5) _____	
5) Approximately how large is your property? <input type="checkbox"/> < 1/4 acre (1) <input type="checkbox"/> 1/4 to 2 acres (2) <input type="checkbox"/> > 2 to 20 acres (3) <input type="checkbox"/> > 20 acres (4) <input type="checkbox"/> unknown (9)	
6) Do you live on or near a wetland? <input type="checkbox"/> Y <input type="checkbox"/> N	
7) Do you live near a lake, river, stream, or pond? <input type="checkbox"/> Y <input type="checkbox"/> N If yes, how far away? <input type="checkbox"/> <100 ft (1) <input type="checkbox"/> 100-500 ft (2) <input type="checkbox"/> 500-1000 ft (3) <input type="checkbox"/> >1 mile (4) Name of body of water: _____	
8) Which of the following best describes your yard? <input type="checkbox"/> Mostly developed w/ lawn or landscaping (1) <input type="checkbox"/> Mostly undeveloped w/ woods or field (3) <input type="checkbox"/> Partially developed w/ lawn or landscaping (2) <input type="checkbox"/> Other (4) _____	
9) What type of foundation does your home have? <input type="checkbox"/> Full basement (1) Type of floor: _____ <input type="checkbox"/> Partial basement (2) Type of floor: _____ <input type="checkbox"/> Crawlspace (3) <input type="checkbox"/> Concrete slab (4)	
10) Does your home have air conditioning? <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Central air <input type="checkbox"/> Window unit How often do you use the air conditioning? _____	
11) Does your home have a woodburning stove or fireplace? <input type="checkbox"/> Neither How often do you use them? _____	
12) Do you store firewood indoors at your home? <input type="checkbox"/> Y <input type="checkbox"/> N	

F. HEALTH HISTORY

31) Do you have any chronic medical conditions that compromise your immune system? (e.g. diabetes, cancer, organ transplant)? Y N

32) Do you currently smoke? Y N

33) Did you smoke before onset? Y N

34) If you, but not a current smoker, stop date: _____

35) Were you taking any medications that compromised your immune system in the 12 months prior to onset of illness? Y N

36) If yes, list medication: _____

37) Does anyone in your household currently smoke? Y N

G. HOUSEHOLD HISTORY

40) Has anyone else in your family been diagnosed with blastomycosis? Y N

Who? _____

41) Do you have any pets? Y N Describe: _____

42) If you have dogs, have any ever been diagnosed with blastomycosis? Y N

If yes, when? _____ Vet name: _____ Phone: _____

Veterinary clinic: _____

Street: _____ Apt: _____ None: _____

H. MDH USE ONLY

Positive on (specify additional laboratory confirmation test, if any)

Confirmed case (documented blastomycosis spore/thermal based buds by any laboratory method or positive urine antigen test with compatible symptoms)

Suspected Symptomatic

County of probable exposure: _____

Location of probable exposure: _____

Delayed diagnosis analysis:

First visit to a doctor: _____

Subsequent doctor's office visit? How many? _____

Date: _____

Diagnosis of bacterial pneumonia prior to diagnosis of blastomycosis? Y N

Treatment prior to blastomycosis diagnosis:

Antibiotic: _____

Other: _____

None: _____

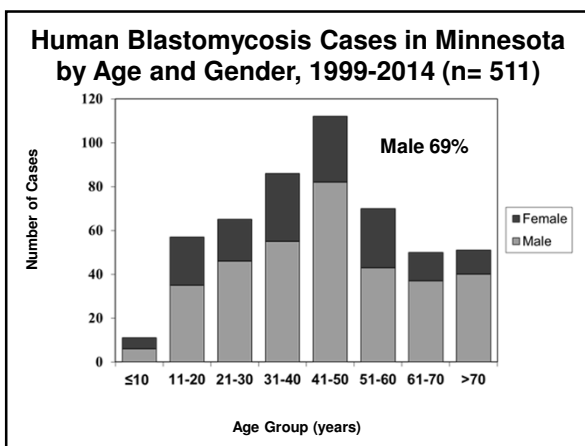
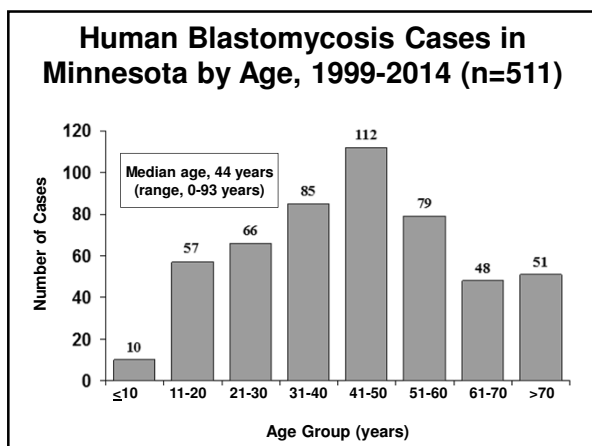
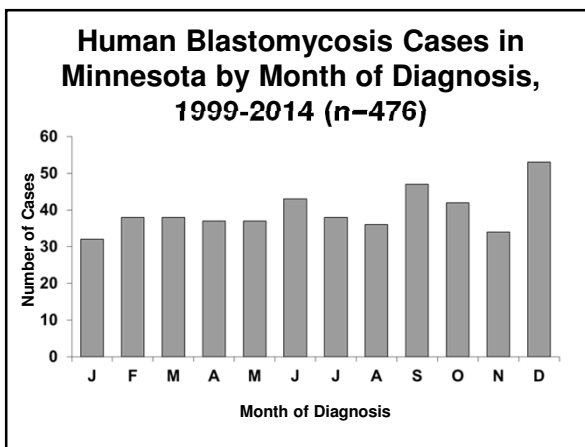
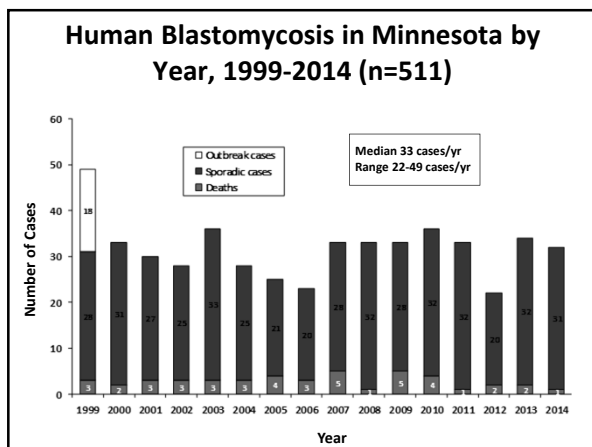
Number of days between first doctor's visit and date of first diagnostic test: _____

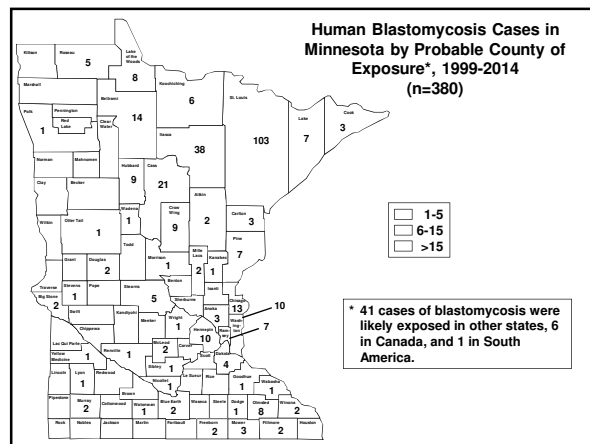
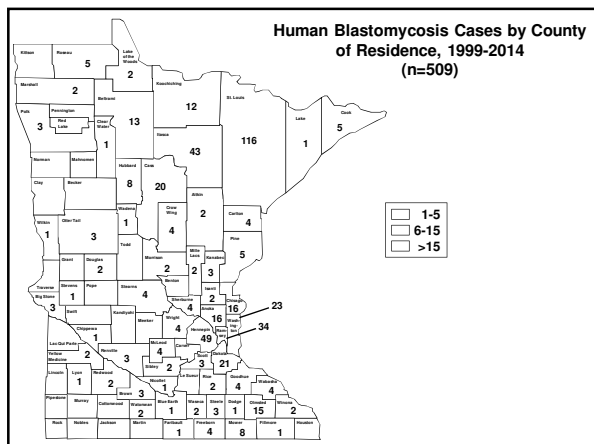
Delayed diagnosis? Y N

Factors: _____

Epidemiology of Human Blastomycosis in Minnesota, 1999-2014

- From 1999-2014, 511 laboratory-confirmed cases of human blastomycosis were reported to MDH
- A confirmed case is defined as a MN resident with:
 - a positive urine or serum antigen test, and compatible clinical symptoms (or)
 - B. dermatitidis* organisms cultured or visualized from tissue or body fluid





Human Blastomycosis Disease Locations, MN 1999-2014 (n=471)

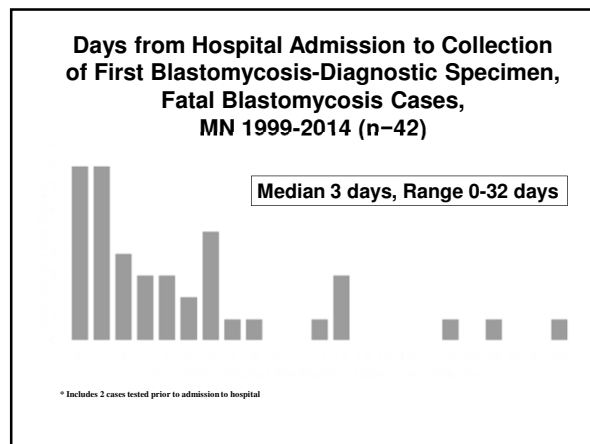
- Pulmonary only, 70%
- Extrapulmonary only, 8%
- Disseminated, 22%
 - Skin and soft tissue, 68%
 - Bones and joints, 15%
 - CNS, 7%
 - Eye, 1%
 - Other, 8%

Human Blastomycosis Cases, Minnesota 1999-2014

- Hospitalized, 69%
 - Median hospitalization = 8 days (range, 1-140 days)
- Case fatality rate, 9% (45/503)
- Median age of survivors = 43 years (range 3 – 93 years)
- Median age of fatal cases = 55 years (range 12 – 90 years)
- Fatal cases are more likely to have chronic illness p<0.004

Prevention

- There are no known practical measures for the prevention of blastomycosis
- Minimizing the severity of disease and the number of fatalities depends primarily on early recognition and appropriate medical treatment
- Unfortunately, delayed diagnosis is a problem with blastomycosis



20 year old Hmong patient

- Ginseng farmer in Redwood County, MN
- Born in Laos; emigrated to US with parents at age 7
- Smoker, morbidly obese (>400 lbs)
- Illness onset 1/21/2010
- Cough, fever, anorexia, fatigue
- Seen at local clinic 2x, treated with oseltamivir, Augmentin, azithromycin

20 year old Hmong patient

- Admitted to Hospital A on 2/1/2010 for pneumonia and pulmonary nodule
- Treated with levofloxacin, piperacillin-tazobactam, and vancomycin
- Admitted to Hospital B on 2/10/2010
- Treated with levofloxacin, piperacillin-tazobactam, vancomycin, tigecycline, and famciclovir
- 2/12/2010 Broncho-alveolar lavage (BAL) performed

20 year old Hmong patient

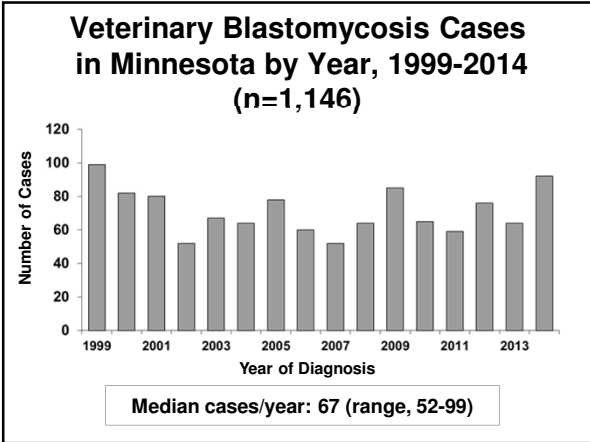
- 2/12/2010 BAL
- Smear: Presumptive blastomycosis
- Itraconazole PO started 2/12
- Amphotericin B IV started 2/15
- Patient died 2/21/2010
- Blastomycosis positive culture, 3/1/2010

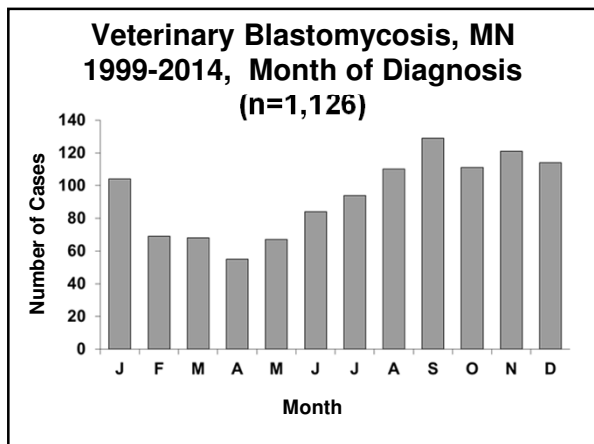
20 year old Hmong patient

- History of camping and fishing at Jag Lake Wisconsin during late fall 2009
- Blastomycosis endemic area of Wisconsin
- Part of a large cluster of blastomycosis cases among Hmong (and other) residents of and visitors to Marathon County WI

Epidemiology of Veterinary Blastomycosis in Minnesota, 1999-2014

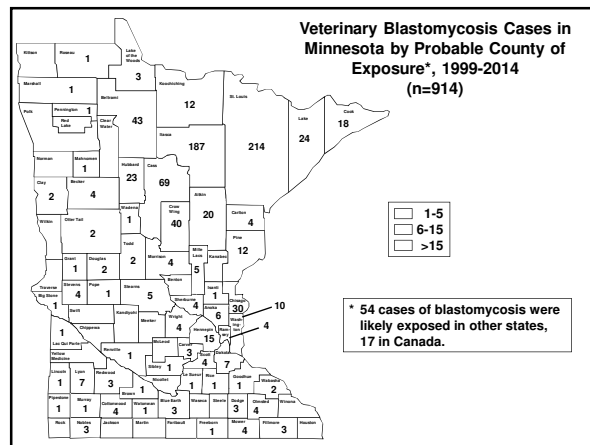
- From 1999-2014, 1149 laboratory-confirmed cases of veterinary blastomycosis were reported to BAH/MDH
- A confirmed case is defined as a MN domestic animal with:
 - a positive urine or serum antigen test and compatible clinical signs (or)
 - *B. dermatitidis* organisms cultured or visualized from tissue or body fluid





- ### Veterinary Blastomycosis, MN 1999-2014
- **Species**
 - 1104 (96%) canine
 - 42 (4%) feline
 - **Sex**
 - 603 (55%) male
 - 495 (45%) female
 - **Neutered**
 - 606 (71%)
 - **Median age**
 - 4 years
 - **Median weight**
 - 47 lbs (canine)
 - **Indoor/Outdoor Pet**
 - Indoor/Outdoor; 580 (71%)
 - Indoor only; 151 (18%)
 - Outdoor only; 87 (11%)

- ### Veterinary Blastomycosis, MN 1999-2014 (n=865)
- Pulmonary only, 39%
 - Extrapulmonary only, 18%
 - Disseminated, 43%
 - Skin/soft tissue, 43%
 - Eye, 12%
 - Soft tissue and eye, 14%
 - Bone, 5%
 - CNS, 2%

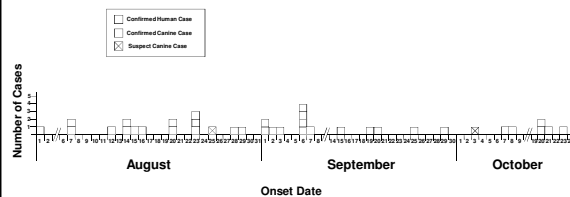


- ### Human Case Demographics
- 18 laboratory confirmed cases
 - All cases lived in the same neighborhood
 - Average age = 38 years
 - (range 7 to 70 years)
 - 72% cases were female
 - 10 (56%) of 18 cases hospitalized
 - (range 1 to 22 days)

Comparison of Ill vs. Non-ill South Grove Residents

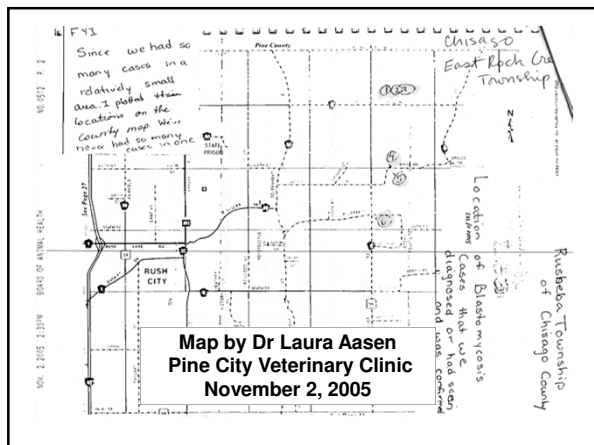
- Cases lived closer to a recent new house excavation site than healthy neighborhood controls ($p = 0.05$)
- Hunting, fishing, camping, gardening, hiking were not associated with illness
- 19 confirmed and 4 suspect canine cases lived in the same neighborhood as human cases
 - Dogs did not serve as sentinels

Figure 6. Illness Onset Dates for Human* and Canine* Blastomycosis Cases, 1999 Mountain Iron Outbreak



* One human case had an approximate onset date of July 11

* The onset date for three canine cases was unknown



MDH
MINNESOTA DEPARTMENT OF HEALTH

Protecting, maintaining and improving the health of all Minnesotans

November 4, 2005

Dear Clinician,

The Minnesota Department of Health (MDH) would like to thank you for your role in the care of Blastomycosis in your patients from Chisago County or northern Pine County. Clinicians in the area have reported a higher than expected number of cases of Blastomycosis in dogs from the East Coast area of East Epish Township in Chisago County, just west of the St. Cloud River.

Blastomycosis is caused by the dematiaceous fungus, *Blastomyces dermatitidis*. The organism is found primarily in rich, acidic soil along waterways of the Midwest and Central United States. Blastomycosis is not transmitted person-to-person or dog-to-person except under extraordinary circumstances. Transmission occurs through inhalation of aerosolized fungal conidia from contaminated soil.

The median incubation period is 47 days (range, 21 to 150 days). The most common clinical manifestations are acute pulmonary symptoms ranging from mild to fulminant, however, the infection can disseminate to skin, bones, the genitourinary system, and the central nervous system.

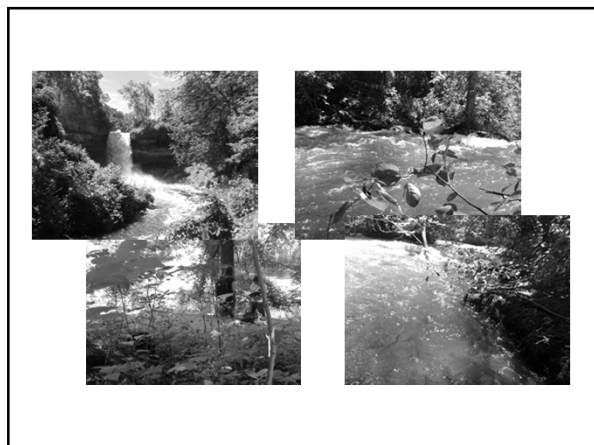
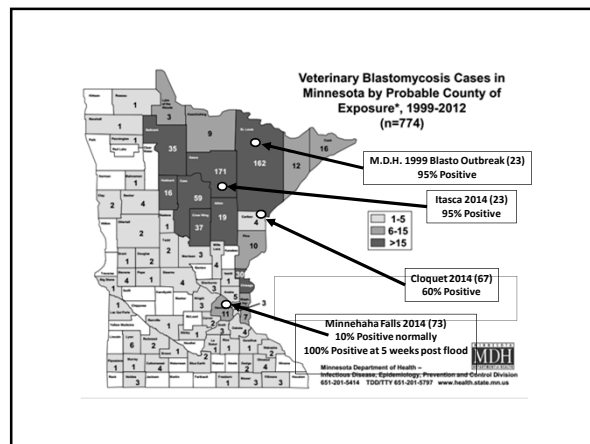
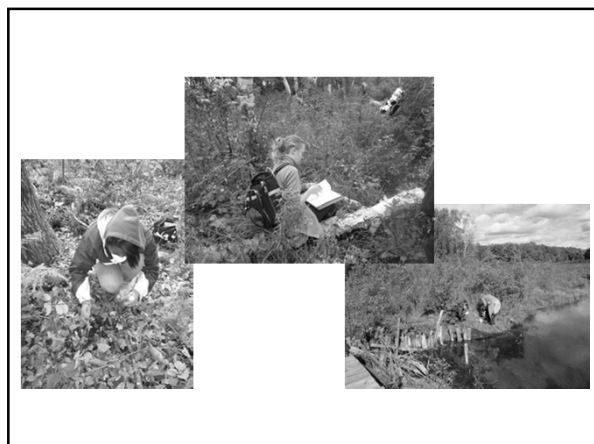
There are no known practical measures for the prevention of Blastomycosis. Minimizing morbidity and mortality from the disease depend primarily on early recognition and appropriate treatment. For more information, please call Dr. Joni Schuffler at 612-201-7114 or see the Blastomycosis page on the MDH website at: <http://www.health.state.mn.us/diseases/blastomycosis/index.html> or for the June 2005 Disease Control Newsletter article covering Blastomycosis at: <http://www.health.state.mn.us/diseases/newsletters/June2005/Blastomycosis.html>

Sincerely,
Joni Schuffler

Joni Schuffler, DVM, MPH
Epidemiologist and
State Public Health Veterinarian
Minnesota Department of Health
625 North Robert Street
St. Paul MN 55101-2108

Current Project:
Teaming up with a medical mycologist to do environmental sampling and PCR testing around the sites of canine clusters of blastomycosis

Kirsten Nielsen, PhD
Department of Microbiology
Medical School
University of Minnesota



Acknowledgements

- Tory Whitten
- Carrie Klumb
- Emma Leof
- Zoonotic Disease Unit Students
- Kiersten Nielson and her group
- Alex Boland
- Emily Gilbertson
- Heather Fowler
- MDH-PHL Laboratorians
- Jeff Bender
- Stacy Holzbauer