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
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 in Minnesota by Year, 1999-2014 (n=511)

- Median 33 cases/year
- Range 22-49 cases/year

Human Blastomycosis Cases in Minnesota by Month of Diagnosis, 1999-2014 (n=476)

- Number of Cases by Month

Human Blastomycosis Cases in Minnesota by Age, 1999-2014 (n=511)

- Median age, 44 years (range, 0-93 years)

Human Blastomycosis Cases in Minnesota by Age and Gender, 1999-2014 (n=511)

- Male 69%
### 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

### Days from Hospital Admission to Collection of First Blastomycosis-Diagnostic Specimen, Fatal Blastomycosis Cases, MN 1999-2014 (n=42)

- Median 3 days, Range 0-32 days

*Includes 3 cases tested prior to admission to hospital.*
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
- Itraconizole 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 Cases in Minnesota by Year, 1999-2014**

<table>
<thead>
<tr>
<th>Year of Diagnosis</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>37</td>
</tr>
<tr>
<td>2000</td>
<td>39</td>
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<td>2013</td>
<td>58</td>
</tr>
<tr>
<td>2014</td>
<td>59</td>
</tr>
</tbody>
</table>

Median cases/year: 67 (range, 52-99)
**Veterinary Blastomycosis, MN 1999-2014, Month of Diagnosis (n=1,126)**

- **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%

**Veterinary Blastomycosis Cases in Minnesota by Probable County of Exposure*, 1999-2014 (n=914)**

* 54 cases of blastomycosis were likely exposed in other states, 17 in Canada.

**South Grove Neighborhood Mountain Iron, MN 1999**

- 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)

**Human Case Demographics**

- 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

<table>
<thead>
<tr>
<th>Onset Date</th>
<th>Confirmed Canine Case</th>
<th>Suspect Canine Case</th>
<th>Confirmed Human Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>September</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>October</td>
<td>11</td>
<td>11</td>
<td>11</td>
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</tbody>
</table>

* One human case had an approximate onset date of July 11
* The onset date for three canine cases was unknown

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

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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