Blastomycosis Cluster Investigations 2008

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Background

• *Blastomyces dermatitidis*
  – Dimorphic fungus
    • Exists in nature (ambient temperature) in mycelial phase
    • Converts to pathogenic yeast phase at 37°C
  – Conidia readily become airborne when the mycelia are disturbed
    • >99% when conidiophores are first wetted
  – Easily inhaled into the lungs → pulmonary infection
Background

• Disease
  – Natural infection appears to be limited to mammals
  – Ranges from subclinical to fatal
    • Can be asymptomatic and self-limiting
    • Symptoms often include weight loss, fever, malaise, fatigue, pleuritic chest pain, cutaneous lesions
  – Major manifestations
    • Pulmonary (53-76%), Cutaneous
    • Minor – Bone, Genitourinary, CNS
Background

• Ecology
  – Rarely isolated from nature
  – Appears to prefer
    • Acidic soil (sandy loam, pine)
    • Humidity/recent rainfall
    • Presence of animal excreta
    • Decaying vegetation
    • Changes in water levels
    • Excavation
  – Likely proliferates in “microfoci”
    • Short lived
    • *Isolation often not possible by the time the outbreak has been identified*
Background

• Epidemiology
  – Overwhelming majority of cases are sporadic, not associated with epidemics

• Endemic areas
  – Southeastern and south-central states bordering the Mississippi and Ohio River basins
  – Midwestern states and Canadian provinces that border the Great Lakes
  – Most cases are reported from Mississippi, Arkansas, Kentucky, Tennessee, and Wisconsin
– Highest incidences reported from Vilas and Oneida counties, WI (Occurrence ~ 4 per 100,000 people), and along Mississippi river in Arkansas
Blastomycosis cases 2002-2008 from the States in which it is reportable

- Illinois
- Louisiana
- Michigan
- Minnesota
- Mississippi
- Missouri
- Wisconsin
This study

- Case clusters were identified in the Hayward area (Sawyer Co.) and St. Croix County in 2008 through standard disease surveillance reporting.
Purpose

- Identify any common exposure events or risk factors among cases
- Review climatic data to assess environmental conditions that may have increased the prevalence of the organism
Methods

• Identified cases through the Wisconsin Electronic Disease Surveillance System (WEDSS)
• Visited sites to survey the surrounding lands for characterization and possible point source exposures
• Conducted interviews with cases to determine possible environmental exposures
  – St. Croix data pending
• Gathered climatic data through the National Climactic Data Center (NCDC)
Results - Hayward

• 9 cases with onset in 2008
  – Age range 16-75 (mean 42 yrs)
  – 7/9 (78%) hospitalized
  – 7 Male, 3 Female

• 5 personal interviews obtained

• No common exposure site identified

• Surrounding area characterized by multiple waterways, sandy loam soils and high abundance of pine trees
Results - Hayward

Incidence of Blastomycosis in Sawyer Co. by Year

<table>
<thead>
<tr>
<th>Year</th>
<th># of Cases Diagnosed</th>
</tr>
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<tbody>
<tr>
<td>2003</td>
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<tr>
<td>2004</td>
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<td>2007</td>
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<td>2008</td>
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</table>
Results - Hayward

Hayward Exposure Dates

Date of possible exposure
Results - Hayward

- 4/5 (80%) live in Residential neighborhoods within Hayward city limits
- 0/5 (0%) routinely worked outside during their exposure periods
- 4/5 (80%) had standing water on their property during the exposure period
  - 3/5 (60%) spent at least 10 hours a week in their yard
- 3/5 (60%) had done landscaping <1 mile from a river, lake or stream
- 3/5 (60%) cleared brush or cut down trees
- 3/5 (60%) collected and transported yard waste
- 3/5 (60%) were exposed to rotten wood or vegetation
- 3/5 (60%) had some sort of immune suppression
  - 3/5 (60%) diabetic
Results - Hayward

- Individual risk factors identified
  - One individual was a “shut in” (previously ill)
    - Exposed to dust from city excavation project near home
  - One individual frequently fished
    - Also cleared brush
  - One elderly individual with immune compromise reported leaf blowing
    - Ephemeral pools around home
  - One individual was diabetic with frequent fishing
    - Raked leaves that had overwintered in lawn
  - One individual spent time in wetlands
    - Raked pine needles and hauled to dump
  - One individual not interviewed reported a large facial exposure to rotten wood in the area
Hayward Climatic Data

Hayward Exposure Dates

Departure from normal monthly precipitation for Hayward, WI 2008
Hayward Climatic Data

PDSI values
-0 to -0.5 = normal
-0.5 to -1.0 = incipient drought
-1.0 to -2.0 = mild drought

Man-made changes are not considered in the calculation
Hayward Climatic Data

Z-index values
- -1.24 to 0.99 = near normal
- -1.99 to -1.25 = mild/moderate drought
- -2.74 to -2.0 = severe drought

"Moisture Anomaly Index“

Measure of the departure from normal of the moisture climate for that month
Discussion

• No point source of infection identified
• Increased incidence most likely reflects increased prevalence of *Blastomyces* in environment
• Previously identified risk factors present
  – Period of diminished precipitation
  – Sandy, acidic soils
  – Ubiquitous shallow waterways with changing water levels
  – Majority of cases had decreased immune function and/or exposure to decaying vegetation
• Investigation of case clusters helps to focus the picture of environmental conditions favorable for *Blastomyces* growth
Discussion

• Limitations
  – Case-control study needed to determine significance of risk factors
  – Small number of cases limits the power of the study
  – Climatic data not precise (regional)
    • Incidence in Hayward may reflect population density surrounding waterways
Sources

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• UW MPH Program
Questions?