

Outbreak of Blastomycosis among Michigan Paper Mill Workers

One year ago, this past spring an outbreak of 120 cases of Blastomycosis occurred, including 13 individuals that required hospitalization and one death that was identified among employees and contractors of a large paper mill in Escanaba, Michigan in Delta County in the Upper Peninsula. There were no community cases; the one individual who developed blastomycosis who did not work at the paper mill developed the disease after he went to the paper mill for a job interview. *Blastomyces gilchristii* was the species of Blastomyces identified as the cause of the outbreak (See Box 1). The symptoms of the first case identified in the outbreak began on December 14, 2022 and the symptoms of the last identified case began on May 14, 2023 (Figure 1)¹. The largest number of cases became symptomatic in February and early March 2023. The 120 cases among paper mill workers compares to 34 cases over 15 years from 2007-2022 (~2 cases/year) from Delta County and adjoining Menominee County.

The process at the paper mill where the Blastomycosis cases occurred first involves chipping logs. The wood chips then go into a Kraft or Refiner Mechanical Pulp (RMP) mill. In the Kraft mill, hot water, sodium hydroxide and sodium sulfide are used to break down the chips. In the RMP mill, the wood chips are mechanically ground without chemicals. After the initial treatment of the wood chips, the chips are bleached and then go into the paper making machine. Cases of blastomycosis were not localized to workers in a particular part of the paper mill but occurred among office staff, people working with logs, wood chips products, and throughout the other production areas of the paper mill.

Figure 1. Outbreak Curve of Blastomycosis Cases in Delta and Menominee Counties, 2023¹



The facility covers 2,000 acres, with multiple buildings and over 400 HVAC systems. Given the nature of the process, there are large piles of logs waiting to be chipped, and large piles of wood chips waiting to be processed. The paper mill is alongside the Escanaba River. The mill produces 730,000 tons of coated sheets, coated web, coated digital and InkJet, and label paper.

Given the large number of affected workers and the absence of a previous documentation of a blastomycosis outbreak among industrial workers, both the local and state health departments encouraged the papermill to request a Health Hazard Evaluation (HHE) from the National Institute for Occupational Safety and Health (NIOSH).

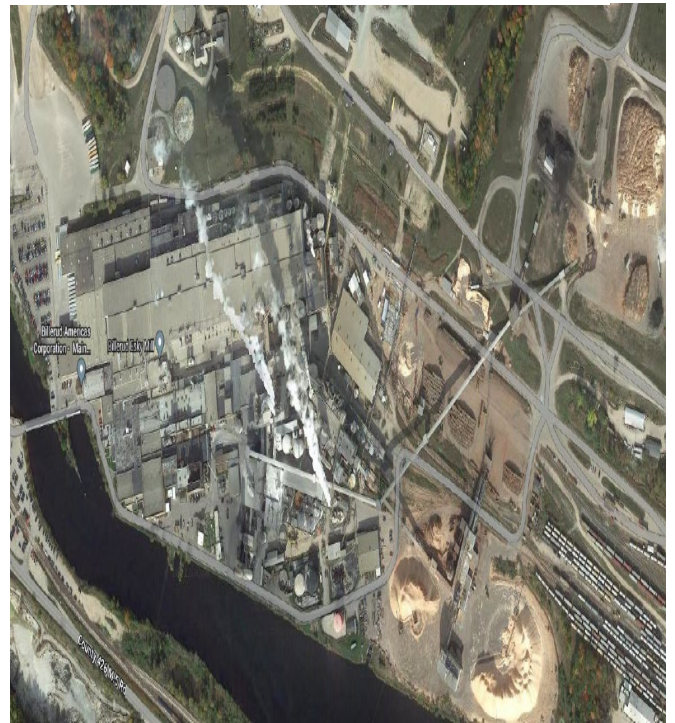
The papermill submitted a request and NIOSH initiated an HHE on March 27, 2023. The HHE included offering medical interviews and collection of urine antigen for *Blastomyces* to the ~1,000 workers (840 full time employees plus contractors) at the papermill. In addition, 52 environmental samples from soil, eight from wood chips, 271 from indoor surface dust, and 152 from the heating, ventilation, and air conditioning (HVAC) systems for *Blastomyces* from around the papermill were collected. *Blastomyces* was not found in any of the environmental samples. Two possible reasons why all environmental samples were negative are; 1) difficulty in identifying *Blastomyces* species in environmental samples (no commercial laboratories provide this service, and the work was performed at a research lab); and 2) the environmental samples were collected after a three week cleanup that took place in the paper mill in response to the outbreak.

As part of the HHE, 608 employees/contractors agreed to be interviewed and 578 provided urine samples. Fifty-two of the urine *Blastomyces* antigen samples were positive (9%); including 25 individuals who had not been identified as a case of blastomycosis.

Previous outbreaks reported in the medical literature have been smaller, affecting three to 98 individuals. Sources of exposures identified in previous outbreaks have been a beaver lodge, canoe trips, wood piles, yard waste, construction sites, and prairie dog homes. However, many times the environmental source of the fungus was not identified. Five examples of previously reported outbreaks:

- 1) CDC. Blastomycosis acquired occupationally during prairie dog relocation — Colorado, 1998. MMWR 1999; 48:98-100.
- 2) Cockerill FR III, Roberts GD, Rosenblatt JE, et.al. Epidemic of pulmonary blastomycosis (Namekogan fever) in Wisconsin canoeists. Chest 1984; 86:688-692.
- 3) Frye MD, Seifer FD. An outbreak of blastomycosis in eastern Tennessee. Mycopathologi. 1991; 116:15–21.
- 4) Klein BS, Vergeront JM, Weeks RJ, et al. Isolation of *Blastomyces dermatitidis* in soil associated with a large outbreak of blastomycosis in Wisconsin. N Engl J Med 1986; 314:529-534.
- 5) Pfister JR, Archer MS, Hersil S, et al. Non-rural point source blastomycosis outbreak near a yard waste collection site. Clin Med Res 2011; 9:57-65.

Figure 2. Aerial View of the Paper Mill



Box 1 - Overview of Blastomycosis

Blastomycosis is a fungal lung disease that occurs three weeks to three months after inhalation of *Blastomyces* spores. The most frequent symptoms are fever, coughing, weight loss, and fatigue. It is a rare condition. Only 50% of infected people have symptoms. The fungus is found in moist soils, decomposing wood and leaves, mainly around the Great Lakes and in the Mississippi, Ohio, and St. Lawrence River valleys. Three species of *Blastomyces* are recognized to cause disease: *B. dermatitidis*, *B. gilchristii*, and *B. helices*. The disease does not spread from person to person or animals to people, although the disease can spread by a needlestick injury. It can rarely spread from the lung to other parts of the body; the skin, central nervous system, skeletal system, genitourinary system, mouth, nose, thyroid, and lymph nodes. Culture is the gold standard for diagnosis but broncho lavage, and urine antigen tests are commonly used for diagnosis. Less useful are antibody tests. (<https://www.cdc.gov/fungal/diseases/blastomycosis/health-professionals.html>). The most recent surveillance data from the five states that track Blastomycosis, Arkansas, Louisiana, Michigan, Minnesota, and Wisconsin identified 240 cases in 2019, 238 in 2020 and 241 in 2021 (Williams SL, Smith DJ, Benedict K, et al. Surveillance for Coccidioidomycosis, Histoplasmosis, and Blastomycosis During the COVID-19 Pandemic — United States, 2019–2021. MMWR Morb Mortal Wkly Rep 2024;73:239–244).

Conclusion

This is the largest outbreak of Blastomycosis identified. All cases were related to the paper mill. No community cases occurred. To date no precipitating factor at the mill (e.g., construction, change in work practices) was identified that caused the outbreak to occur in the winter of 2022-2023. Neither environmental sampling nor urine antigen testing for *Blastomyces* among the workforce was useful to determine the location in the paper mill that was the source of the exposure. The occurrence of one case of blastomycosis in an individual who came for a job interview and only was in one of the paper mill buildings and that all employees entered and exited the paper mill through this same building suggests that contamination of the ventilation system in this building was the source of the exposure. A three-week shut down of the mill, during the end of April and the first week of May 2023, with a thorough cleaning and replacement of the air filters with a higher Minimum Efficiency Reporting Value (MERV) rating may explain why all the environmental samples for *Blastomyces*, which were done after the cleanup, were negative. That no new cases of Blastomycosis occurred this past winter 2023-2024 is consistent with the HVAC system in the building through which all workers entered and exited the paper mill was the source of the outbreak. The final NIOSH Health Hazard Evaluation Report, which has not yet been released, will possibly provide additional information on the source of the outbreak that will be useful to prevent future outbreaks at this and other paper mills.

References

1. Van Howe RS. The Billirud Mill Blastomycosis Outbreak: Comparison to Historical Controls. Med Mycol 2023 Dec 5:myad123. doi:10.1093/mmy/myad123.

*Project

S E.N.S.O.R.

News

Michigan State University
College of Human Medicine
West Fee Hall
909 Wilson Road, Room 117
East Lansing, MI 48824-1316
Phone (517) 353-1846

In this issue: V35n2: Outbreak of Blastomycosis among Michigan Paper Mill Workers

*PS Remember to report all cases of occupational disease!

Printed on recycled paper.

Amir Wolfe, M.D.
President, Michigan Occupational
& Environmental Medical Association
Larry Hennessey, M.D.
Michigan Allergy and Asthma Society
Darryl Lesoski, M.D., M.P.H.
Munson Medical Center
Traverse City, MI
Thomas G. Robins, M.D., M.P.H.
University of Michigan
School of Public Health
Division of Occupational Medicine
Samyr Nasr, MB, BCH
President, Michigan Thoracic Society
Eric J. Rose, D.O.
Marquette General Health System
Marquette, MI

The project SENSOR News is published
quarterly by Michigan State University-
College of Human Medicine with funding
from the National Institute for Occupational
Safety and Health and is available at no cost.
Suggestions and comments are welcome.
(517) 353-1846
MSU-CHM
West Fee Hall
909 Wilson Road, Room 117
East Lansing, MI 48824-1316

Project SENSOR staff
At the Michigan Occupational Safety
& Health Administration (MIOSHA)

Barton G. Pickleman
Director MIOSHA

At Michigan State University-
College of Human Medicine

Kenneth D. Rosenman, M.D.
Professor of Medicine
Project SENSOR, Director
Mary Jo Reilly, M.S.
Project SENSOR Coordinator
Tracy Carey

Michigan Law Requires
the Reporting of
Known or Suspected
Occupational Diseases
Reporting can be done by:

WEB

oem.msu.edu

E-Mail

ODREPORT@msu.edu

FAX

(517) 432-3606

Telephone

1-800-446-7805

Mail

Michigan Occupational Safety &
Health Administration (MIOSHA)
Management and Technical
Services Division
PO Box 30649
Lansing, MI 48909-8149

Reporting forms can be obtained by
calling 1-800-446-7805