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). 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.

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:


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

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*PS Remember to report all cases of occupational disease!
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