Ontario Public Health Standards: Requirements for Programs, Services and Accountability

Infectious Disease Protocol

Appendix 1:
Case Definitions and Disease-Specific Information

Disease: Blastomycosis

Effective: November 2022
Blastomycosis

☒ Communicable
☐ Virulent

**Health Protection and Promotion Act** (HPPA)

**Ontario Regulation (O. Reg.) 135/18** (Designation of Diseases)

Provincial Reporting Requirements

☒ Confirmed case
☒ Probable case

As per Requirement #3 of the “Reporting of Infectious Diseases” section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:

- **O. Reg. 569** (Reports) under the HPPA;
- The iPHIS User Guides published by Public Health Ontario (PHO); and
- Bulletins and directives issued by PHO.

Type of Surveillance

Case-by-case

Case Definition

Confirmed Case

Laboratory confirmation of infection:

- Positive *Blastomyces dermatitidis* and *Blastomyces gilchristii* (*B. dermatitidis/gilchristii*) culture with confirmation using a validated method;

**OR**
• Molecular confirmation by nucleic acid amplification test (NAAT) testing or through sequencing analysis using a clinically validated assay

**Probable Case**

Laboratory evidence of infection by visualization of characteristic *B. dermatitidis/gilchristii* large, broad-based, budding yeast through direct microscopic examination of patient specimens.

**Outbreak Case Definition**

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (*i.e.*, confirmed and/or probable).

In areas not known to be endemic for *Blastomyces* spp., the occurrence of two or more cases linked to a common location or specific event is suggestive of an outbreak. In areas endemic for blastomycosis, an outbreak would be an increase in case numbers above expected levels.

**Sample Outbreak Case Definitions**

**Confirmed Case**

Persons associated with a particular location during a defined time period.

• Positive *Blastomyces dermatitidis* or *Blastomyces gilchristii* (*B. dermatitidis/gilchristii*) culture with confirmation using a validated method
OR

- Molecular confirmation by nucleic acid amplification test (NAAT) testing or through sequencing analysis using a clinically validated assay

Probable Case

Persons associated with a particular location during a defined time period.

- Visualization of large, broad-based, budding yeast, characteristic of *Blastomyces* spp. through direct microscopic examination of patient specimens

OR

- Molecular confirmation by NAAT testing or through sequencing analysis using an assay validated for research purposes that is not clinically validated

OR

- Detection of *Blastomyces* antigen at or above the minimum level of quantification in serum, urine, or other body fluid by enzyme immunoassay (EIA) test

OR

- A clinical diagnosis of blastomycosis **AND** undergoing empiric blastomycosis treatment.

Person Under Investigation (PUI)

Persons associated with a particular location during a defined time period.

- New onset fever and/or chills and/or night sweats with no attributable source

**AND/OR**

- Cough (new or worsening or different from an individual’s baseline health status)

**AND/OR**

- Shortness of breath (new or worsening or different from an individual’s
baseline health status)

**AND/OR**

- At least one of the following findings determined to be likely attributed to *Blastomyces* infection:
  - New and abnormal lung findings on chest imaging (e.g., pulmonary infiltrates, nodule, or mass-like lesions) within the last three months

The EIA threshold is not set based on clinical or epidemiological data but rather to err on the side of specificity rather than sensitivity. Cross-reactivity is a known problem with the EIA antigen test, and cases known to be infected with another fungal infection should not be counted as blastomycosis cases.

When assessing for the symptoms above, the focus should be on evaluating if they are new, worsening, or different from an individual's baseline health status. Symptoms should not be chronic or related to other known conditions or receiving a COVID-19 vaccine in the past 48 hours. Symptoms should not be attributable to a COVID-19 infection.

**Clinical Information**

**Clinical Evidence**

Not applicable

**Clinical Presentation**

Blastomycosis is a fungal infection that primarily affects the lungs, but can become a systemic infection with extrapulmonary manifestations. Up to 50% of pulmonary cases remain asymptomatic. Pulmonary blastomycosis may be acute or chronic.

Acute pulmonary infection, which often goes undiagnosed, presents as an influenza-like illness with the sudden onset of fever, cough, and a pulmonary infiltrate on chest radiographs. The acute disease often resolves spontaneously after 1-3 weeks. A subset of those with acute infection will go on to severe disease and acute respiratory distress syndrome (ARDS).
Chronic pulmonary infection has a slow onset where initial symptoms of cough and chest pain may be mild or absent. Clinical manifestations may include 2 to 6 months of weight loss, fever, night sweats, cough with sputum and chest pain, and may be similar to tuberculosis, other fungal infections and cancer. There is a very high mortality rate for patients who develop ARDS with chronic pulmonary infection.\textsuperscript{6,7}

Extrapulmonary disease can occur in patients with blastomycosis but is more common in patients with chronic pulmonary infection. The most common extrapulmonary site for infection is the skin (cutaneous lesions are often located on the face and distal extremities). Other common sites include bone, the genitourinary system, and the central nervous system, but any system can be affected.\textsuperscript{4,6}

Untreated, chronic and extrapulmonary blastomycosis can eventually progress to death, and a high index of suspicion is required for prompt treatment of all disease to prevent progression.\textsuperscript{4,6}

While both immunocompetent and immunocompromised persons can develop illness due to \textit{Blastomyces} spp., persons who are immunocompromised are more likely to develop severe disease and have higher mortality.\textsuperscript{6}

Primary cutaneous blastomycosis is rare, but can occur following direct inoculation (\textit{i.e.}, traumatic puncture) of infected material into the skin.\textsuperscript{7} Skin lesions in primary cutaneous blastomycosis are similar in appearance to those caused by extrapulmonary disease affecting the skin.\textsuperscript{8} Verrucous (rough, warty) and/or ulcerative lesions usually appear on the face, trunk and extremities.\textsuperscript{4}

Animals, particularly dogs, may also be at risk of developing clinical blastomycoses. While not directly transmissible from dogs to humans, the presence of disease in dogs act as a sentinel of infected regions and/or point sources. Testing of clinically affected dogs, at the owner’s expense, should be encouraged whenever possible to provide surveillance data for the region. This is particularly important when the case is located in a non-endemic area and/or does not have a history of travel to a known endemic region.
Laboratory Evidence

Laboratory Confirmation

Any of the following will constitute laboratory confirmation of a case of Blastomycosis:

- Positive *B. dermatitidis/gilchristii* culture with confirmation using a validated method
- Molecular confirmation by NAAT testing or through sequencing analysis

Approved/Validated Tests

- Standard culture for *B. dermatitidis/gilchristii* with confirmation using a validated method
- Direct visual exam by microscopy
- Molecular confirmation by NAAT testing or through sequence analysis

Indications and Limitations

Not applicable

Although urine antigen† and serological testing is available, the sensitivity and specificity are poor, and therefore they are not generally recommended, unless as part of an outbreak. If a patient has a reactive *Blastomyces* serology result, it is recommended that appropriate specimens be collected for microscopy and culture.

For further information about human diagnostic testing including fungal culture, contact the Public Health Ontario Laboratories.

† Testing not currently available in Canada but can be carried out in partner labs if clinically and epidemiologically warranted.

Case Management

In addition to the requirements set out in the requirements #2 of the “Management
of Infectious Diseases – Sporadic Cases” and “Investigation and Management of Infectious Disease Outbreaks” sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall exercise a high index of suspicion given the non-specific clinical presentation of disease. Early treatment is recommended to prevent morbidity and mortality.\(^6\)

Treatment is under the direction of the attending health care provider. Most patients will require treatment. Treatment is indicated for all patients with progressive pulmonary or extrapulmonary diseases as well as those patients who are immunocompromised. Therapeutic options for blastomycosis have been described in a guideline by the Infectious Disease Society of America.\(^6\)

Consideration of the appropriateness of detailed case follow-up is based on local epidemiology of blastomycosis and knowledge of local endemic areas. Detailed follow-up of cases occurring in areas that are not known to be endemic for *Blastomyces* spp. supports provincial surveillance for new and emerging risk areas for exposure.

Provide cases with information about the infection and how it spreads as listed above.

**Contact Management**

Blastomycosis is not transmissible person-to-person or from animal-to-person, thus is it non-communicable. No contact management is required, except if exposed to the same source; then manage contacts as indicated above in Management of Cases and monitor contacts for clinical signs and symptoms of blastomycosis. Contacts should seek medical attention if they display signs and symptoms of blastomycosis.

**Outbreak Management**

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread.

In areas not known to be endemic for *Blastomyces* spp., the occurrence of two or
more cases linked to a common location is suggestive of an outbreak. In areas endemic for blastomycosis, an outbreak would be an increase in the number of cases above expected levels.

**Prevention and Control Measures**

**Personal Prevention Measures**

The effectiveness of personal preventive measures to reduce inhalation exposure is unknown. There is no approved vaccine available to prevent blastomycosis.

In areas of Ontario where *Blastomyces* spp. are known to be present, the risk of infection may be reduced by avoiding activities that cause disruption of soil; this is particularly important for individuals with compromised immune systems.

**Infection Prevention and Control Strategies**

Decontamination of sites of exposure is not possible, and soil testing is not reliable. Early diagnosis and treatment of disease are therefore important control strategies.

In areas known to be endemic, boards of health may consider periodic education reminders to health care providers ahead of the peak occurrence of blastomycosis in October-December. Raising awareness among health care providers may increase the index of suspicion for blastomycosis and enable earlier diagnosis and treatment for patients.

Routine practices are recommended for hospitalized cases. Refer to PHO’s website to search for the most up-to-date information on Infection Prevention and Control (IPAC).

**Disease Characteristics**

**Aetiologic Agent** - *Blastomyces dermatitidis* (*B. dermatitidis*) and *Blastomyces gilchristii*, are thermally dimorphic fungi. Both grow as a mould (or mycelial/filamentous) form at 25°C (“room temperature”), and as a yeast form at 37°C (“body temperature”). Upon entering the body from the environment, the
mould transforms into the yeast-phase as part of the adaptation process to a new environment with an elevated temperature. Unlike other fungi which are considered opportunistic pathogens, the dimorphic fungi, including *Blastomyces* spp. are considered true pathogens and can cause disease in otherwise healthy individuals.7

**Modes of Transmission** - Inhalation of airborne spores in dust from the mould or saprophytic growth forms.4 Cases of blastomycosis from direct inoculation into the skin are rare, but can occur.10

No person-to-person transmission or zoonotic transmission. Infection in animals, particularly dogs, has been identified, but animals do not appear to directly transmit the disease to humans.4

**Incubation Period** – The incubation period ranges between 21-106 days, with a median of 43 days.11

**Period of Communicability** – Not applicable as there is no person-to-person transmission, nor zoonotic transmission from infected animals.4

It is not known how long spores can retain their infectivity.12

**Reservoir** - Soil is the only known reservoir. *Blastomyces* spp. have been found in moist soil along waterways, and in undisturbed spaces in and around residential and commercial areas, such as under porches or sheds.4

**Host Susceptibility and Resistance** - People who participate in occupational and recreational outdoor activities in wooded areas (such as forestry work, hunting, and camping) in endemic areas may be at higher risk of exposure to *Blastomyces* spp. Susceptibility is general in areas where *B. dermatitidis* is present in the environment.5,7 Immunocompromised individuals have higher morbidity and mortality with blastomycosis infection.4

Please refer to [PHO’s Reportable Disease Trends in Ontario reporting tool](https://www.phac-aspc.gc.ca) for the most up-to-date information on infectious disease trends in Ontario.

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.
References


Case Definition Sources


## Document History

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<td>Entire Document</td>
<td>New template. Appendix A and B merged. No material content changes.</td>
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