

Listeriosis is a disease resulting from an invasive infection with *Listeria monocytogenes*. The term does not refer to asymptomatic colonization of the gastrointestinal tract by the organism (1).

1. Case Definition

Invasive clinical illness^a with isolation of *Listeria monocytogenes* (*L. monocytogenes*) from a normally sterile site (e.g., blood, cerebrospinal fluid, joint, pleural or pericardial fluid);

OR

In the setting of miscarriage or stillbirth, isolation of *L. monocytogenes* from placental or fetal tissue (including amniotic fluid and meconium) (2).

2. Reporting Requirements

Laboratory: All positive laboratory tests defined above for *L. monocytogenes* are reportable.

Health Care Professional: Confirmed cases and deaths in individuals where the health care professional believes that listeriosis was present at death or contributed to the individual's death are reportable to Manitoba Health, Public Health Surveillance Unit (form available at: www.gov.mb.ca/health/publichealth/cdc/protocol/form2.pdf).

3. Clinical Presentation/Natural History

Listeriosis is a rare but severe disease that occurs predominantly in pregnant women, the unborn fetus, newborns, the elderly and immunocompromised persons (3). Infection may initially present as an acute mild febrile illness with gastrointestinal symptoms but bacteremia and/or central nervous system infection (i.e., meningitis, meningococcal meningitis) may subsequently develop (4, 5). After the neonatal period, bacteremia without an evident focus is the most common presentation of listeriosis (5). Meningococcal meningitis may present acutely, with the sudden onset of fever, intense headache, nausea, vomiting and signs of meningeal

irritation or subacutely with symptoms evolving over several days. The subacute presentation occurs primarily in the immunocompromised or elderly individuals (4). Healthy adults and children are occasionally infected with *Listeria* but rarely become seriously ill (1). Asymptomatic infection likely occurs at all ages (4). Complications including disseminated intravascular coagulation, adult respiratory distress syndrome and rhabdomyolysis with acute renal failure have been documented (5). Death with listeriosis ranges from 10% to 50% for the high risk groups; the highest rate is among newborns in the first week of life (6).

Pregnant Women and Newborns (pregnancy-associated cases): Illness is most common in the third trimester (5). Maternal infections may be asymptomatic or may be associated with an influenza-like illness with fever, malaise, headache, gastrointestinal tract symptoms and back pain (7). Listeriosis can cause spontaneous abortion or premature labour (4). Central nervous system infection in the absence of other risk factors is rare during pregnancy (5). Asymptomatic women may still transmit infection to the fetus (8). Neonatal illness may be early-onset (< 7 days after birth) or late-onset (≥ 7 days after birth) (6, 7, 9). Preterm birth, pneumonia and septicemia are common in early-onset disease (7). Late-onset infections usually present as meningitis (7).

4. Etiology

Listeria monocytogenes is a gram-positive rod-shaped bacterium that is able to survive and multiply at refrigerator temperatures (4°C to 10°C) commonly used to control pathogens in food (6). Foods contaminated with *Listeria* look, smell and taste normal (10). There are at least 13 serovars of *L. monocytogenes* but almost all disease is caused by types 1/2a, 1/2b, 1/2c and 4b (5).

^a Characterized by meningitis or sepsis. Infection during pregnancy may result in fetal loss through miscarriage, stillbirth, neonatal meningitis or sepsis (2).

5. Epidemiology

5.1 Reservoir and Source

Listeria monocytogenes occurs mainly in soil, water, and fodder (livestock food prepared by storing and fermenting green forage plants in a silo) (4). Animal reservoirs include domestic and wild mammals, fowl and humans (4). Asymptomatic carriage is common, and higher in slaughterhouse workers and laboratory workers exposed to *L. monocytogenes* (2). *Listeria* can multiply in contaminated refrigerated foods (4).

5.2 Transmission

Listeria is transmitted mainly through the ingestion of contaminated food (5). Sporadic disease and outbreaks have been linked to ingestion of raw or contaminated milk, soft cheeses, vegetables and ready-to-eat meat products such as hot dogs, pâté and deli meats (4). Neonatal infections are acquired through transplacental transmission; transmission from mother to child during passage through the birth canal and nosocomial transmission may account for some infections in newborns (4, 11). Papular lesions on hands and arms have been described following direct contact with infectious material (4).

5.3 Occurrence

General: Listeriosis is an infrequently diagnosed infection that occurs worldwide (4). Sporadic disease is more common than outbreaks (4). Outbreaks of listeriosis are more common in the summer (12). In Europe, the incidence is increasing and the distribution of cases is shifting to primarily an infection of elderly persons and those with predisposing medical conditions (13, 14). In the United States the estimated incidence of disease caused by *Listeria* declined from 1996 to 2005 but remained stable from 2005 to 2008 inclusive (15).

Canada: The number of people who become seriously ill with listeriosis has been increasing steadily, from 85 cases in 2003 to an estimated 239 cases in 2008 (1). Most cases have been sporadic and not associated with outbreaks (1). In 2008, a single national outbreak resulted in 57 reported

cases with 23 deaths with listeriosis a direct or contributing cause (16). Most cases and deaths occurred in Ontario (16). Nearly 80% of those infected during the outbreak lived in long-term care homes or were in hospitals that served contaminated meats (17). A cluster of four cases of listeriosis (3 in Quebec, 1 in Ontario) with symptom onset in November-December 2010 has recently been reported.

Manitoba: On average 3-5 cases of listeriosis are reported annually in Manitoba. Incidence is highest in the ≥ 60 year age group. Five cases were reported in 2008, one of which was linked to the national listeriosis outbreak. Two cases were reported in 2009 and four cases in 2010.

5.4 Incubation Period

Variable, from 3-70 days after exposure. Average incubation is estimated to be 21 days (4).

5.5 Host Susceptibility

Neonates, pregnant women, the elderly (≥ 60 years) and the immunocompromised are at highest risk of being diagnosed with listeriosis and having severe life-threatening complications (4). There is little evidence of acquired immunity even after severe infection (4).

5.6 Period of Communicability

Mothers of infected newborn infants shed the organism in vaginal discharges and urine for 7-10 days after delivery, rarely longer (4). Infected individuals may shed *L. monocytogenes* in their stools for several months; however, secondary infections among household contacts have not been identified (4).

6. Laboratory Diagnosis

The clinical diagnosis of listeriosis is difficult as initial signs and symptoms are non-specific and flu-like; therefore, laboratory diagnosis is essential.

Testing is recommended for symptomatic individuals only, even in outbreak situations (18, 19). If listeriosis is suspected, please indicate "possible Listeriosis" on the requisition. Listeriosis is

confirmed by isolation of *L. monocytogenes* from normally sterile sites (e.g., blood, CSF, joint, pleural or pericardial fluid) or from placental or fetal tissue including amniotic fluid and meconium in the setting of miscarriage or stillbirth. Serotyping is performed on all isolates from sterile sites and from stool specimens where “suspected foodborne illness” is indicated on the requisition and *L. monocytogenes* is subsequently identified.

7. Key Investigations for Public Health Response

For all cases, the *Invasive Listeriosis Questionnaire* available at:

www.gov.mb.ca/health/publichealth/surveillance/listeriosis_questionnaire.pdf should be completed and faxed to Manitoba Health.

Collection of implicated food samples for testing (usually performed by Public Health Inspectors). Refer to the *Enteric Illness Protocol* available at: www.gov.mb.ca/health/publichealth/cdc/protocol/enteric.pdf for procedure.

8. Control

8.1 Management of Cases

Treatment: Consultation with an infectious diseases specialist is recommended. Empiric therapy to cover *L. monocytogenes* while awaiting laboratory confirmation is recommended for the following symptomatic high risk groups:

- Pregnant women;
- Neonates with acute or delayed sepsis syndrome while undergoing diagnostic workup for sepsis in the newborn;
- Immunocompromised persons presenting with meningitis; and
- Elderly or nursing or personal care home residents with meningitis (19).

Empiric therapy is not recommended for symptomatic individuals who are not at high risk **unless** a compelling link between contaminated food product consumption and disease can be made (19).

Ampicillin is the preferred therapy for laboratory-confirmed cases of listeriosis (7, 19). Some sources recommend an aminoglycoside such as gentamicin in addition to ampicillin for severe cases (4, 5, 7). For penicillin-allergic patients, trimethoprim-sulfamethoxazole (use with caution in pregnant patients) (4, 7, 9, 19) or vancomycin (7, 9, 19) may be used. Cephalosporins are not effective in the treatment of listeriosis (4, 7, 9, 19). Clinical experience with quinolones is lacking (5, 9).

Infection Control Measures: Routine Practices should be used for hospitalized patients.

8.2 Management of Contacts

Generally no public health intervention is required for contacts of listeriosis cases.

8.3 Management of Foodborne Outbreaks

A foodborne outbreak is defined as two or more people experiencing similar illness after consuming food from a common source (1).

- Investigate outbreaks to identify a common source of infection, and prevent further exposure to that source. Refer to the *Enteric Illness Protocol* available at: www.gov.mb.ca/health/publichealth/cdc/protocol/enteric.pdf.
- Public notification should occur. The level of notification will usually be at the discretion of regional Public Health and/or the Office of Disaster Management for local outbreaks but may be at the discretion of the Federal Government for nationally linked outbreaks as per *Canada's Foodborne Illness Outbreak Response Protocol (FIORP) 2010: To guide a multijurisdictional response* available at: www.phac-aspc.gc.ca/zoono/fiorp-pritioa/index-eng.php
- Education (refer to section 8.4 below).

8.4 Preventive Measures

- Education of the public on risk factors and prevention strategies. It is recommended that all individuals:

- Read and follow all package labels and instructions on food preparation and storage and heed expiry dates (10).
- Thoroughly wash raw fruits and vegetables before eating (4, 5, 10).
- Thoroughly cook raw food from animal sources (e.g., beef, pork, poultry) (4, 5).
- Store and handle uncooked meats separately from vegetables, cooked foods and ready-to-eat foods (5).
- Avoid consumption of raw (unpasteurized) milk or foods made from raw milk (5).
- Clean hands, utensils, dish cloths and cutting boards after working with uncooked foods before using again to avoid cross-contamination (4, 5, 10).
- Refrigerate or freeze perishable food, prepared food and leftovers within two hours (10).
- Avoid eating recalled products and return them to the place of purchase (20).
- In addition to the recommendations above, individuals at high risk (immunocompromised by illness or medications, pregnant women and the elderly) should:
 - Avoid soft cheeses such as feta, Brie, Camembert, Mexican-style and blue-veined cheese unless they have labels that clearly state they are made from pasteurized milk. There is no need to avoid hard cheeses, cream cheese, cottage cheese or yogurt (5, 6).
 - Avoid or reheat leftover foods or ready-to-eat foods (e.g., hot dogs, deli meats) until steaming hot before eating (4, 5). Microwave cooking does not always reheat food uniformly and bacteria may survive in cold spots (21).
 - Avoid spreading fluid from packages (e.g., hot dogs) onto other foods, cutting boards, utensils, dishes and food preparation surfaces (1). Wash hands after handling hot dogs and ready-to-eat foods (6).
 - Avoid eating refrigerated pâtés or meat spreads; canned or “shelf-stable” (pasteurized) pâtés may be eaten (6).
 - Avoid eating refrigerated smoked seafood unless it is contained in a cooked dish, such as a casserole; canned or “shelf-stable” smoked seafood may be eaten (6).
 - Discard deli meats three days after purchase or sooner if the product has a foul odour (the foul odour may be due to other spoilage organisms).
- Continued refinement of practices in the farm-to-fork continuum aimed at preventing *Listeria* from entering the food chain (9). Recommendations include but are not limited to the following:
 - Avoid the use of untreated manure on vegetable crops.
 - Improve food-production hygiene to reduce the levels of *L. monocytogenes* contamination in ready-to-eat foods (14).
 - Pasteurize all dairy products where possible. Soft cheeses are candidates for irradiation after ripening (4).
 - Monitor non-pasteurized dairy products by culturing for *Listeria* (4).
- Education of veterinarians and farmers to take proper precautions in handling aborted fetuses and sick or dead animals (4). Pregnant women, immunocompromised persons and the elderly should avoid contact with these animals.

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