

LISTERIOSIS

REPORTING INFORMATION

- **Class B:** Report by the close of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
 - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the [Ohio Confidential Reportable Disease form \(HEA 3334\)](#).
 - The [Ohio Enteric Case Investigation Form](#) may be useful in the local health department follow-up of cases. Do not send this form to the Ohio Department of Health (ODH); information collected from the form should be entered into ODRS where fields are available and the form should be uploaded in Administration section of ODRS.
 - The [Centers for Disease Control and Prevention \(CDC\) Listeria Initiative Case Report Form](#) (OMB No. 0920-0728) should be used to assist in local disease investigation and contact tracing activities. Information collected from the form should be entered into ODRS where fields are available and uploaded to ODRS. If the case is lost to follow up, pages 3-5 of the form should be uploaded to ODRS. If you have problems uploading the form, you may fax the completed form to the ODH Bureau of Infectious Diseases Outbreak Response and Bioterrorism Investigation Team (ORBIT) at 614-564-2456.
- Key fields for ODRS reporting include: date of illness onset, the interview fields, the fields in the Food History module and the fields in the Travel and Other Exposures module.

AGENT

The bacterium, *Listeria monocytogenes*, is a Gram-positive rod-shaped bacterium. The genus *Listeria* includes 6 different species (i.e. *L. monocytogenes*, *L. ivanovii*, *L. innocua*, *L. welshimeri*, *L. seegligeri*, and *L. grayi*). Only *L. monocytogenes* is consistently associated with human illness. There are 13 serotypes of *L. monocytogenes* which can cause disease, but more than 95 percent of human isolates belong to only three serotypes: 1/2a, 1/2b, and 4b. *L. monocytogenes* serotype 4b strain is responsible for 33 to 50% of sporadic human cases worldwide and for all major foodborne outbreaks in Europe and North America since the 1980s.

L. monocytogenes resists heat, salt, nitrite and acidity better than many organisms and grows at temperatures as low as 34°F (1°C). Low storage temperatures slow, but do not stop growth. Commercial freezer temperatures of 0°F will stop *L. monocytogenes* from multiplying, but may not destroy it. Commercial pasteurization procedures for dairy products have been determined to be sufficient to destroy this organism. Proper cooking and reheating of foods will effectively control *Listeria*. The organism can colonize cracks, food-filled crevices, and inaccessible areas in food preparation and processing facilities and equipment. This presents a significant challenge to sanitation procedures.

Infectious Dose

The infectious dose is unknown, but it is believed to be strain and host dependent. In susceptible persons, the infectious dose may be less than 1,000 organisms.

CASE DEFINITION

Clinical Description

In adults, invasive disease caused by *L. monocytogenes* manifests most commonly as meningitis or bacteremia. Infection during pregnancy may result in fetal loss through miscarriage or stillbirth, neonatal meningitis or bacteremia. Other manifestations may also be observed.

Laboratory Criteria for Diagnosis

- Isolation of *L. monocytogenes* from a normally sterile site (e.g. blood or cerebrospinal fluid [CSF] or, less commonly, joint, pleural or pericardial fluid)
- In the setting of a miscarriage or stillbirth, isolation of *L. monocytogenes* from placental or fetal tissue

Case Classification

Suspected*: A clinically compatible case with pending laboratory results

Confirmed: A clinically compatible case that is laboratory-confirmed

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed it was not a case

*This case classification can be used for initial reporting purposes to ODH as CDC has not developed a classification.

SIGNS AND SYMPTOMS

Listeriosis is a foodborne bacterial disease which may present as one of the two clinical pictures:

Non-invasive Listeriosis – A milder form of the disease is also referred to as acute febrile gastroenteritis. After a short incubation, symptoms following ingestion of high doses of *L. monocytogenes* occur in healthy individuals. Symptoms include:

- Diarrhea
- Fever
- Headache
- Myalgia (muscle pain)

Invasive Listeriosis – *L. monocytogenes* penetrates the blood-brain-barrier or placental barrier leading to severe infections of the brain or fetus respectively. Invasive listeriosis affects high-risk people, including immunocompromised individuals, the elderly, debilitated adults, pregnant women, and the very young. The incubation period is variable and ranges from 3 to 70 days. Data from some outbreak investigations suggest that the median incubation period is longer among pregnant women than non-pregnant adults. Symptoms depend on the organ system affected and may include:

- Meningitis
- Pneumonia
- Septicemia
- Endocarditis
- Abscesses, skin lesions, conjunctivitis (milder forms)

In pregnant women, listeriosis is particularly harmful. Infected pregnant women may experience mild flu-like symptoms, although they are at risk for:

- Premature delivery
- Miscarriage

- Spontaneous abortion
- Stillbirth

In infants, symptoms may include:

- Loss of appetite
- Lethargy
- Jaundice
- Vomiting
- Respiratory distress (usually pneumonia)
- Skin rash
- Shock
- Meningitis
- Death within a few hours of birth

DIAGNOSIS

Listeria can be cultured from blood, cerebrospinal fluid, meconium, gastric washings, placental tissue, amniotic fluid, aborted fetus or other normally sterile locations including joint pleural and pericardial fluid. Fecal culture is not sensitive or specific; 1 to 15% of the population may carry *L. monocytogenes* asymptotically in the intestines. Serologic tests are unreliable. Laboratories should send all *Listeria* isolates to ODH Laboratory for serotyping and PFGE analysis. Detection of *L. monocytogenes* in a food source supports the diagnosis.

EPIDEMIOLOGY

Source

Listeria are found widely spread in the environment and in animals. They have been isolated from soil, dust, animal feed, water, sewage, domestic and wild mammalian and avian species, fish, crustaceans and asymptomatic humans. Foods associated with common source outbreaks include raw and contaminated pasteurized milk, soft cheeses, cole slaw and celery. Uncooked hot dogs, ready-to-eat meats, undercooked chicken and unwashed vegetables have also been associated with listeriosis.

Occurrence

Approximately 1 – 15% of the population is thought to carry *L. monocytogenes* asymptotically in the intestines. Healthy people rarely become ill after exposure. Incidence in humans is higher in the summer.

Serious cases almost always occur in the elderly, immunocompromised, debilitated, pregnant women and neonates. *L. monocytogenes* causes up to 10% of community-acquired meningitis. In susceptible groups of adults, the mortality rate is 20-30%. It can be as high as 70% in individuals with untreated neurological disease.

Although pregnant women rarely become ill or die, listeriosis may result in the death of the fetus or neonate. Combined perinatal and neonatal mortality rates from 14-56% have been reported. The case fatality rate is 20%-30% in infected newborns and approaches 50% when onset occurs in the first 4 days after birth. Approximately 40% of clinical cases occur within the first three weeks of life.

In the United States, an estimated 1,600 persons become ill with listeriosis each year. About 1 in five people with listeriosis dies.

Compared to 1996-1998, the incidence of listeriosis declined by about 42% by 2012. However, there was no observed change in incidence of listeriosis in 2012 compared to 2006-2008.

Mode of Transmission

Although *Listeria* can be spread by inhalation or direct contact (e.g. genital contact), most infections are acquired by ingestion. Contaminated food sources include raw meat and fish, unpasteurized dairy products and uncooked vegetables. *L. monocytogenes* has also been found in processed foods including: soft, sliced or grated cheese, deli cold cuts and ice cream.

Healthy people seem to be able to eat most *Listeria*-contaminated foods without clinical signs; however, in susceptible persons, the infectious dose may be less than 1,000 organisms.

Early onset neonatal infections (onset ≤ 3 days after birth) may arise from mother to fetus/infant transmission via the transplacental route or from an ascending intrauterine infection. Late onset neonatal infections (onset > 3 days after birth) can be acquired during passage through the birth canal.

Skin infections may occur from direct contact with infected animals or soil contaminated with infected animal feces. In most human cases, the portal of entry is not apparent. The organism may be shed in human stool for several months.

Period of Communicability

Period of communicability is unknown. Some infected people may excrete *L. monocytogenes* for several months in feces. Mothers of infected newborns can shed the organism for 7 to 10 days after delivery. Vaginal carriage does occur in humans. *Listeria* has been isolated from human milk. Despite this, person-to-person transmission is rarely seen.

Incubation Period

The incubation period is typically 2 to 3 weeks after eating food contaminated with *Listeria*. However, cases have occurred as late as 70 days after exposure or as early as the same day of exposure. Newborns infected during birth develop symptoms a few days to a few weeks later.

PUBLIC HEALTH MANAGEMENT

Case

When listeriosis cases are identified, the primary goal of local health jurisdictions is to identify the source of the infection so that others do not get infected. As most cases are acquired by ingestion, an attempt should be made to determine possible contaminated food sources and to collect any remaining food with its packaging for testing at the ODH Laboratory. Clinical isolates from cases should be sent by the hospitals to ODH Laboratory.

The CDC has developed a special initiative to study and prevent listeriosis. To contribute to this effort, state and local investigators are asked to complete a detailed food questionnaire on each reported case. The questionnaire is available at: [Centers for Disease Control and Prevention \(CDC\) *Listeria* Case Form](#).

Isolation

There is no isolation requirement. Contact precautions may be appropriate for heavily infected infants. Effective antimicrobial treatment is essential for invasive disease. Combination therapy has been recommended due to its effectiveness in animals. Please consult CDC or a current reference for treatment due to frequently changing recommendations.

Contacts

It appears that many people have contact with and carry the organism, but few develop symptomatic infections. Precautions for those contacts who are immunocompromised may be indicated as it appears that the persons most affected by listeriosis fall into this category.

Prevention and Control

There is no immunization available. Prevention relies on food safety in most cases. Some additional recommendations are specific to persons who are at high risk.

General recommendations:

- Thoroughly cook raw food from animal sources, such as beef, pork or poultry to a safe internal temperature. For a list of recommended temperatures for meat and poultry, visit [IsItDoneYet?](#)
- Rinse raw vegetables thoroughly under running tap water before eating.
- Keep uncooked meats and poultry separate from vegetables and from cooked foods and ready-to-eat foods.
- Do not drink raw (unpasteurized) milk, and do not eat foods that have unpasteurized milk in them.
- Wash hands, knives, countertops and cutting boards after handling and preparing uncooked foods.
- Consume perishable and ready-to-eat foods as soon as possible.

Persons at high risk, such as pregnant women and persons with weakened immune systems should follow the general recommendations listed above, as well as, the following specific recommendations below:

- Meats
 - Do not eat hot dogs, luncheon meats, cold cuts, other deli meats (e.g. bologna), or fermented or dry sausages unless they are heated to an internal temperature of 165°F or until steaming hot just before serving.
 - Avoid getting fluid from hot dog and lunch meat packages on other foods, utensils and food preparation surfaces, and wash hands after handling hot dogs, luncheon meats and deli meats.
 - Do not eat refrigerated pâté or meat spreads from a deli or meat counter or from the refrigerated section of a store. Foods that do not need refrigeration, like canned or shelf-stable pâté and meat spreads, are safe to eat. Refrigerate after opening.
- Cheeses
 - Do not eat soft cheese such as feta, queso blanco, queso fresco, Brie, Camembert, blue-veined or panela (queso panela) unless it is labeled as made with pasteurized milk. Make sure the label says, "MADE WITH PASTEURIZED MILK."
- Seafood
 - Do not eat refrigerated smoked seafood, unless it is contained in a cooked dish, such as a casserole, or unless it is a canned or shelf-stable product. Refrigerated smoked seafood, such as salmon, trout, whitefish, cod, tuna and

mackerel, is most often labeled as "nova-style," "lox," "kippered," "smoked" or "jerky." These fish are typically found in the refrigerator section or sold at seafood and deli counters of grocery stores and delicatessens. Canned and shelf stable tuna, salmon and other fish products are safe to eat.

Recommendations to keep food safe:

- Be aware that *L. monocytogenes* can grow in foods in the refrigerator. Use an appliance thermometer, such as a refrigerator thermometer, to check the temperature inside your refrigerator. The refrigerator should be 40°F or lower and the freezer 0°F or lower.
- Clean up all spills in your refrigerator right away, especially juices from hot dog and lunch meat packages, raw meat, and raw poultry.
- Clean the inside walls and shelves of your refrigerator with hot water and liquid soap, then rinse.
- Divide leftovers into shallow containers to promote rapid, even cooling. Cover with airtight lids or enclose in plastic wrap or aluminum foil. Use leftovers within 3 to 4 days.
- Use precooked or ready-to-eat food as soon as you can. Do not store the product in the refrigerator beyond the use-by date; follow the United States Department of Agriculture (USDA) refrigerator storage time guidelines:
 - **Hot Dogs** – store opened package no longer than 1 week and unopened package no longer than 2 weeks in the refrigerator.
 - **Luncheon and Deli Meat** – store factory-sealed, unopened package no longer than 2 weeks. Store opened packages and meat sliced at a local deli no longer than 3 to 5 days in the refrigerator.

What is listeriosis?

Listeriosis, a serious infection caused by eating food contaminated with the bacterium *Listeria monocytogenes*, is an important public health problem in the United States. The disease primarily affects older adults, pregnant women, newborns and adults with weakened immune systems. However, rarely, persons without these risk factors can also be affected. The risk may be reduced by following a few simple recommendations.

What are the symptoms of listeriosis?

A person with listeriosis usually has fever and muscle aches, often preceded by diarrhea or other gastrointestinal symptoms. Almost everyone who is diagnosed with listeriosis has "invasive" infection, in which the bacteria spread beyond the gastrointestinal tract. The symptoms vary with the infected person:

- Pregnant women: Pregnant women typically experience only a mild, flu-like illness. However, infections during pregnancy can lead to miscarriage, stillbirth, premature delivery, or life-threatening infection of the newborn.
- Persons other than pregnant women: Symptoms, in addition to fever and muscle aches can include headache, stiff neck, confusion, loss of balance, and convulsions.

How great is the risk for listeriosis?

In the United States, an estimated 1,600 persons become seriously ill with listeriosis each year. Of these, approximately 260 die. Individuals at increased risk are:

- Pregnant women, who are about 10 times more likely than other healthy adults to get listeriosis. About one-third of listeriosis cases happen during pregnancy.
- Newborns rather than pregnant women themselves suffer the serious effects of infection in pregnancy.
- Persons with weakened immune systems.
- Persons with cancer, diabetes or kidney disease.
- Persons with AIDS, who are almost 300 times more likely to get listeriosis than persons with intact immune systems.
- Persons who take glucocorticosteroid medications.
- The elderly.

Healthy adults and children occasionally become infected with *Listeria*, but they rarely become seriously ill.

How does *Listeria* get into food?

L. monocytogenes is found in soil and water. Vegetables may become contaminated from the soil or from manure used as fertilizer. Animals may carry the bacterium without appearing ill and can contaminate foods of animal origin such as meats and dairy products. The bacterium has been found in a variety of raw foods, such as uncooked meats and vegetables, as well as processed foods that become contaminated during processing, such as soft cheeses and cold cuts at the deli counter. Unpasteurized (raw) milk or foods made from unpasteurized milk can contain the bacterium. *Listeria* is killed by pasteurization, and heating procedures used to prepare ready-to-eat processed meats should be sufficient to kill the bacterium; however, unless good manufacturing practices are followed, contamination can occur after processing.

How do you get listeriosis?

You get listeriosis by eating food contaminated with *Listeria*. Babies can be born with listeriosis if their mothers eat contaminated food during pregnancy. Although healthy persons may consume contaminated foods without becoming ill, those at increased risk for infection can probably get listeriosis after eating food contaminated with even a few

bacteria. Persons at risk can prevent *Listeria* infection by avoiding certain high-risk foods and by handling food properly.

How do you know if you have listeriosis?

If you think you have symptoms of listeriosis, consult your doctor. A blood or spinal fluid test (to cultivate the bacteria) will show if you have listeriosis. During pregnancy, a blood test is the most reliable test.

How can you reduce your risk for listeriosis?

General recommendations:

- Thoroughly cook raw food from animal sources, such as beef, pork or poultry.
- Wash raw vegetables thoroughly before eating.
- Keep uncooked meats separate from vegetables and from cooked foods and ready-to-eat foods.
- Avoid raw (unpasteurized) milk or foods made from raw milk.
- Wash knives, hands and cutting boards after handling uncooked foods.

Recommendations for persons at high-risk, such as pregnant women and persons with weakened immune systems, in addition to the recommendations listed above:

- Avoid soft cheeses such as feta, Brie, Camembert, blue-veined and Mexican-style cheese. (Hard cheeses, processed cheeses, cream cheese, cottage cheese or yogurt need not be avoided.)
- Cook until steaming hot left-over foods or ready-to-eat foods, such as hot dogs, before eating.
- Although the risk of listeriosis associated with foods from deli counters is relatively low, pregnant women and immunosuppressed persons may choose to avoid these foods or thoroughly reheat cold cuts before eating.
- Consume perishable and ready-to-eat foods as soon as possible.
- Do not eat refrigerated pâtés or meat spreads. Canned or shelf-stable pâtés and meat spreads may be eaten.
- Avoid getting fluid from hot dog packages on other foods, utensils and food preparation surfaces.
- Wash hands after handling hot dogs, luncheon meat and deli meats.
- Do not eat smoked seafood, unless it is contained in a cooked dish, such as a casserole. Refrigerated smoked seafood, such as salmon, trout, whitefish, cod, tuna or mackerel, is most often labeled as "nova-style," "lox," "kippered," "smoked," or "jerky." The fish is found in the refrigerator section or sold at deli counters of grocery stores and delicatessens. Canned or shelf-stable smoked seafood may be eaten.

Can listeriosis be treated?

When infection occurs during pregnancy, antibiotics given promptly to pregnant women can often prevent infection of the fetus or newborn. Babies with listeriosis receive the same antibiotics as adults, although a combination of antibiotics is often used until physicians are certain of the diagnosis. Even with prompt treatment, some infections result in death. This is particularly likely in the elderly and in persons with other serious medical problems.