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Listeriosis

Surveillance and Investigation Protocol

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Office of Epidemiology and Prevention Services
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Listeriosis

Surveillance and Investigation Protocol

I. ABOUT THE DISEASE

Listeriosis is an uncommon but usually severe infection caused by the bacterium *Listeria monocytogenes (L monocytogenes)*. Symptoms include fever, chills, and headache. Pregnant people and people with weakened immune systems are at greatest risk for severe infection. Treatment may include antibiotics. Listeriosis can be prevented by thoroughly washing and cooking food.

Listeriosis is a category 3 reportable disease and should be reported to the local health department (LHD) within 72 hours. Outbreaks should be reported immediately to the LHD by phone.

A. Clinical Presentation

Signs and symptoms of *Listeria* depend on the individual being infected and where in the body the infection is. There are generally two types of infection: intestinal and invasive (more common). Invasive illness happens when the *Listeria* bacteria spreads to parts of the body other than the intestines. Severe manifestations often occur in women who are pregnant and their fetuses or newborn infants, older adults, and individuals with impaired cell-mediated immunity resulting from underlying illness or treatment.

Type of Illness	Symptoms	Severity and Fatality
Invasive illness in Pregnancy	• Fever • Flu-like symptoms, such as muscle aches and fatigue	• Mild or may not have symptoms. • However, infection during pregnancy usually leads to miscarriage, stillbirth, premature delivery, or life-threatening infection of the newborn.
Invasive illness in people who are not pregnant	• Fever • Flu-like symptoms, such as muscle aches and fatigue • Headache • Stiff neck • Confusion • Loss of balance • Seizures	• Can be severe • Almost 1 in 20 non-pregnant people with invasive listeriosis die.

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Intestinal illness	• Diarrhea • Vomiting	• Usually mild, lasts 2-3 days • However, some people with intestinal illness develop invasive illness.
Infection in newborn	Early-onset disease: • Preterm birth • pneumonia • septicemia Late-onset disease: • erythematous rash (granulomatosis infantisepticum) • bacteremia • meningitis • brain abscess • endocarditis	Early-onset disease: fatality rate of 14% to 56% Late-onset disease: fatality rate approximately 25%

B. Etiologic Agent

L. monocytogenes is a facultatively anaerobic, rod-shaped, gram-positive bacterium that can be isolated in standard bacterial culture of normally sterile sites. There are 12 serotypes of *Listeria* and are based on the immunoreactivity of two cell surface structures, the O and H antigens. The serotypes are 1/2a, 1/2b, 1/2c, 3a, 3b, 3c, 4a, 4b, 4c, 4d, 4e, and 7. Three of these serotypes (1/2a, 1/2b, and 4b) cause most (95%) human illnesses and 4b is most associated with outbreaks.

C. Reservoir

Listeria is distributed widely in the environment, in soil, forage, water, mud and silage. Animal reservoirs include wild and domestic animals, fowl, and people. Asymptomatic intestinal carriage in humans is common. Unlike most other foodborne pathogens, *Listeria* can multiply readily in contaminated refrigerated foods.

D. Incubation Period

- Invasive pregnancy associated illness: usually 2-4 weeks
- Invasive non-pregnancy associated illness: usually 1-14 days
- Self-limiting, febrile gastroenteritis: 24 hours

E. Mode of Transmission

Most cases of listeriosis arise from ingestion of contaminated foods, namely, raw or contaminated milk, soft cheeses, vegetables, and ready-to-eat meats. Although rare, papular lesions may develop on the hands and arms from direct contact with infectious material in veterinarians and farmers following direct animal contact involving livestock.

In neonatal infections, the organism can be transmitted from mother to fetus *in utero* or during passage through the infected birth canal. Rarely, outbreaks have occurred in nurseries due to contaminated equipment and materials.

F. Period of Communicability

Mothers of infected newborns can shed the infectious agent in vaginal discharges and urine for 7-10 days after delivery, rarely longer. Infected individuals can shed the organism in their stools for several months.

II. DISEASE CONTROL AND PREVENTION

A. Disease Prevention and Control Objectives

Reduce the risk of disease through:

1. Investigation of outbreaks and clusters in a timely manner to identify and remove any common source of disease.
2. Public education on prevention and control measures.
3. Healthcare provider education on recognition and reporting of disease to public health.

B. Disease Prevention and Control

Reduce the risk of transmission and incidence by educating the public and healthcare providers about:

1. People who are at a higher risk for disease:
   a. Older adults (65 and older)
   b. People who have weakened immune systems
   c. Pregnant people and newborns
2. Higher risk groups should not consume unpasteurized milk or soft cheeses made with unpasteurized milk. They should not eat meats, hot dogs, other processed meats, or leftover foods unless heated to an internal temperature of 165°F. These groups should not eat refrigerated smoked seafood, unless it is part of a dish that is cooked and hot, such as a casserole, or unless it is canned or shelf-stable product. For a detailed list of foods that these groups should not eat, see CDC's *How to Prevent Listeria Infection*.

3. Thoroughly wash raw vegetables before eating and keep them separated from raw food from animal source. Thoroughly cook raw food and wash hands and utensils after handling uncooked foods.
4. Keep the refrigerator temperature at 40°F or colder, and the freezer at 0°F or colder. Use a thermometer to ensure the refrigerator is kept at these temperatures.
5. Avoid the use of untreated manure on vegetable crops.

C. Treatment

Treatment for L. *monocytogenes* varies depending on the severity of illness. People with intestinal illness usually don't require antibiotic treatment unless they are very ill or at risk of becoming very ill.

1. Management of pregnant women: The American College of Obstetrics and Gynecology has issued an opinion on the Management of Pregnant Women with Presumptive Exposure to *Listeria monocytogenes*.
2. Management of people other than pregnant women with elevated risk of invasive listeriosis: The CDC has presented a framework for assessment and medical treatment for those who are at high risk and have been exposed. This framework includes the following:
   a. Exposed and asymptomatic.
   b. Exposed, afebrile, mild symptoms.
   c. Exposed, fever and symptoms consistent with invasive listeriosis.
   d. Exposed, history of symptoms in past 4 weeks, currently asymptomatic.
3. This framework does not replace existing clinical guidance and practices in managing patients with listeriosis.

III. DISEASE INVESTIGATION

A. Case Definition

Clinical Criteria

INVASIVE LISTERIOSIS:

- Systemic illness caused by *L. monocytogenes* manifests most commonly as bacteremia or central nervous system infection. Other manifestations can include pneumonia, peritonitis, endocarditis, and focal infections of joints and bones.
- Pregnancy-associated listeriosis has generally been classified as illness occurring in a pregnant woman or in an infant age ≤ 28 days. Listeriosis may result in pregnancy loss (fetal loss before 20 weeks gestation), intrauterine fetal demise (≥20 weeks gestation), pre-term

labor, or neonatal infection, while causing minimal or no systemic symptoms in the mother. Pregnancy loss and intrauterine fetal demise are considered to be maternal outcomes.
- Neonatal listeriosis commonly manifests as bacteremia, central nervous system infection, and pneumonia, and is associated with high fatality rates. Transmission of *Listeria* from mother to baby transplacentally or during delivery is almost always the source of early-onset neonatal infections (diagnosed between birth and 6 days), and the most likely source of late-onset neonatal listeriosis (diagnosed between 7–28 days).

NON-INVASIVE *LISTERIA* INFECTIONS:
- *Listeria* infection manifesting as an isolate from a non-invasive clinical specimen suggestive of a non-invasive infection; includes febrile gastroenteritis, urinary tract infection, and wound infection.

Laboratory/Imaging Criteria for Reporting

CONFIRMATORY LABORATORY EVIDENCE:
- Isolation of *L. monocytogenes* from a specimen collected from a normally sterile site reflective of an invasive infection (e.g., blood or cerebrospinal fluid or, less commonly: pleural, peritoneal, pericardial, hepatobiliary, or vitreous fluid; orthopedic site such as bone, bone marrow, or joint; or other sterile sites including organs such as spleen, liver, and heart, but not sources such as urine, stool, or external wounds); **OR**
- For maternal isolates: In the setting of pregnancy, pregnancy loss, intrauterine fetal demise, or birth, isolation of *L. monocytogenes* from products of conception (e.g. chorionic villi, placenta, fetal tissue, umbilical cord blood, amniotic fluid) collected at the time of delivery; **OR**
- For neonatal isolates: In the setting of live birth, isolation of *L. monocytogenes* from a non-sterile neonatal specimen (e.g., meconium, tracheal aspirate, but not products of conception) collected within 48 hours of delivery.

PRESUMPTIVE LABORATORY EVIDENCE:
- Detection of *L. monocytogenes* by culture-independent diagnostic testing (CIDT) in a specimen collected from a normally sterile site (e.g., blood or cerebrospinal fluid or, less commonly: pleural, peritoneal, pericardial, hepatobiliary, or vitreous fluid; orthopedic site such as bone, bone marrow, or joint; or other sterile sites including organs such as spleen, liver, and heart, but not sources such as urine, stool, or external wounds); **OR**
- For maternal isolates: In the setting of pregnancy, pregnancy loss, intrauterine fetal demise, or birth, detection of *L. monocytogenes* by CIDT from products of conception (e.g., chorionic villi, placenta, fetal tissue, umbilical cord blood, amniotic fluid) collected at the time of delivery; **OR**

- For neonatal isolates: In the setting of live birth, detection of *L. monocytogenes* by CIDT from a non-sterile neonatal specimen (e.g., meconium, tracheal aspirate, but not products of conception) collected within 48 hours of delivery.

SUPPORTIVE LABORATORY EVIDENCE:

- Isolation of *L. monocytogenes* from a non-invasive clinical specimen, e.g., stool, urine, wound, other than those specified under maternal and neonatal specimens in the Confirmatory laboratory evidence section.

Epidemiologic Linkage Criteria

FOR PROBABLE MATERNAL CASES:

- A mother who does not meet the confirmed case criteria, **BUT**
- Who gave birth to a neonate who meets confirmatory or presumptive laboratory evidence for diagnosis, **AND**
- Neonatal specimen was collected up to 28 days of birth, **OR**

FOR PROBABLE NEONATAL CASES:

- Neonate(s) who do not meet the confirmed case criteria, **AND**
  - Whose mother meets confirmatory or presumptive laboratory evidence for diagnosis from products of conception, **OR**
  - A clinically compatible neonate whose mother meets confirmatory or presumptive laboratory evidence for diagnosis from a normally sterile site.

Criteria to Distinguish a New Case from an Existing Case

There is currently insufficient data available to support a routine recommendation for criteria to distinguish a new case of listeriosis from prior reports or notifications. Duplicate or recurring reports of listeriosis in an individual should be evaluated on a case-by-case basis.

B. Case Classification

Pregnancy loss and intrauterine fetal demise are considered maternal outcomes and would be counted as a single case in the mother. Cases in neonates and mothers should be reported separately when each meets the case definition. A case in a neonate is counted if live-born.

SUSPECT

- person with supportive laboratory evidence

PROBABLE

- A person who meets the presumptive laboratory evidence, **OR**
- A mother or neonate who meets the epidemiologic linkage but who does not have confirmatory laboratory evidence.

CONFIRMED

- A person who meets confirmatory laboratory evidence

C. Reporting Timeframe to Public Health

Listeriosis is a category three disease and should be reported to the LHD within 72 hours. Outbreaks should be reported immediately. LHDs should report all outbreaks to the West Virginia Department of Health within 1 hour of report at (304) 558-5358 ext. 2.

D. Outbreak Recognition

Foodborne Disease Outbreak: Defined as two or more people experiencing a similar illness after ingestion of a common food or different food prepared or served in a common place.

Outbreak of *Listeria*: greater than expected number of cases reported during a certain timeframe, or 2 or more epidemiologically linked cases from 2 or more households.

Increased occurrence of a strain with a specific allele code detected by Whole Genome Sequencing (WGS) is sometimes first recognized by public health laboratory personnel, who then alert the epidemiology staff.

E. Healthcare Provider Responsibilities

1. Report all cases of listeriosis to the local health department by completing the confidential reportable disease case report form along with any laboratory reports. Report any positive labs electronically via the West Virginia Electronic Disease Surveillance System (WVEDSS). Report within the timeframe indicated:
   a. Sporadic case of listeriosis – Report to the local health department within 72 hours of diagnosis. Because *Listeria* is spread primarily through contaminated foods and can multiply at refrigerator temperatures, it is imperative that cases be reported as soon as possible to facilitate investigation.
   b. Outbreaks of listeriosis – Report to the local health department immediately by phone. Outbreaks are defined as two or more cases linked to consumption of the same food item.
2. Stay up to date on the most recent patient management framework for high-risk people, found at Caring for Patients with Listeriosis. This does not replace a healthcare

provider's own clinical judgement for medical treatment of an individual with *Listeria* infection.

F. Laboratory Responsibilities

1. Report all positive *Listeria* test results to the LHD in the patient's county of residence within 72 hours of results. Electronically report the lab results via WVEDSS or fax a copy to the LHD.
2. Submit all isolates of *Listeria* to the Office of Laboratory Services (OLS) for serotyping with the completed Microbiology Laboratory Specimen Submission Form. Send specimens to OLS at 167 11th Avenue, South Charleston, WV, 25303. For questions call (304) 558-3530.

F. Local Health Responsibilities

FOR INVESTIGATION OF SPORADIC CASES:

1. Complete a full investigation using the CDC *Listeria* Initiative Case Report Form.
2. Ask about the following exposures in the 3–70 days prior to onset:
   - Consumption of unpasteurized milk or unpasteurized dairy products (e.g. soft cheeses made with raw milk)
   - Consumption of prepackaged, ready-to-eat meat (e.g., hot dogs, turkey, bologna)
   - Consumption of refrigerated, prepared foods, or any foods from a deli
   - Consumption of dried, preserved or traditionally prepared meats (e.g., sausage, salami, jerky) or preserved, smoked, or traditionally prepared fish
   - Contact with farm animals or animal products
3. Enter investigation information into WVEDSS and attach the CDC *Listeria* Initiative Case Report Form to *the Attachments* section in the *Supplemental Info* tab.
4. Help coordinate sending specimens to OLS for WGS.
5. Identify mother or neonate cases, including probable cases (symptomatic persons who are epidemiologically linked to a case that meets supportive or confirmatory lab criteria). If an epidemiologically linked case is identified, open a case investigation in the WVEDSS and complete the Case Report Form as above.
6. Educate cases about appropriate control measures.
   a. General recommendations for all persons:
      i. Thoroughly cook raw food from animal sources, such as beef, pork, or poultry.
      ii. Wash raw vegetables thoroughly before eating.
      iii. Keep uncooked meats separate from vegetables and from cooked foods and ready-to-eat foods.
      iv. Avoid unpasteurized (raw) milk or foods made from unpasteurized milk.
      v. Wash hands, knives, and cutting boards after handling uncooked foods.

vi. Consume perishable and ready-to-eat foods as soon as possible.

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

i. Do not eat hot dogs, luncheon meats, or deli meats, unless they are reheated until steaming hot.
ii. Avoid getting fluid from hot dog packages on other foods, utensils, and food preparation surfaces, and wash hands after handling hot dogs, luncheon meats, and deli meats.
iii. Avoid ready-to-eat foods from delicatessen counters or leftover foods, unless heated/reheated to steaming hot before eating.
iv. Do not eat soft cheeses such as feta, Brie, Camembert, blue-veined cheeses, or Mexican-style cheeses (e.g., queso blanco, queso fresco, Panela); unless they have labels that clearly state they are made from pasteurized milk.
v. Do not eat refrigerated patés or meat spreads. Canned or shelf-stable patés and meat spreads may be eaten.
vi. Do not eat refrigerated 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.
vii. Do not eat raw or lightly cooked sprouts

7. Educate providers and laboratories to report cases of Listeriosis within 72 hours to the local health department. Outbreaks should be reported immediately.
8. Stay up to date on current national outbreaks at https://www.cdc.gov/listeria/outbreaks/index.html.

FOR INVESTIGATION OF OUTBREAKS:

1. Report suspected or confirmed outbreaks to the WV Dept. of Health Epi on-call at (304) 558-5358, option 2.
2. Refer to the Foodborne and Waterborne Outbreak Investigation Manual to investigate a foodborne outbreak.
3. During an outbreak, collaboration between the LHD, BPH, OLS and stakeholders are necessary to control the spread.

G. State Health Responsibilities

1. Prompt and complete reporting of Listeriosis cases to the CDC by reviewing cases in WVEDSS.
2. Work with the CDC, U.S. Food and Drug Administration (USDA) and WV OEHS on nationwide and multi-state outbreaks.
3. Provide technical expertise and consultation regarding surveillance, investigation, control measures and prevention of Listeriosis.
4. Summarize surveillance data for cases of Listeriosis on an annual basis and feedback information to partners.

IV. DISEASE SURVEILLANCE

A. Public Health Significance

Listeriosis is predominately foodborne and may have severe manifestations among those who are most susceptible. It was first recognized as a foodborne pathogen in the 1980s, and the incidence was first estimated at about 0.8 cases per 100,000. By the early 2000s, the incidence had declined to about 0.3 cases per 100,000. Since then, the incidence has remained largely unchanged.

There are about 1,600 cases of invasive disease annually in the United States (U.S.) caused by the *L. monocytogenes* bacteria. *Listeria* is the third leading cause of death from foodborne illness in the U.S. with about 260 annual deaths from infection.

In addition to being foodborne, *Listeria* can also be found in the environment in soil and water and in the intestines of animals.

B. Disease Surveillance Objectives

1. Determine the incidence of listeriosis in West Virginia.
2. Identify the demographic characteristics of persons with listeriosis.
3. Identify risk factors associated with listeriosis.
4. Rapidly identify outbreaks of listeriosis.

C. Surveillance Indicators

1. Proportion of cases with complete demographic information.
2. Proportion of cases with complete risk factor investigation.
3. Proportion of cases investigations with complete information on high-risk occupations (handling animals, carcasses, etc.).

V. REFERENCES

1. Cleveland Clinic. Listeriosis. https://my.clevelandclinic.org/health/diseases/17721-listeriosis. Accessed on Oct. 25, 2024.

2. Martin P. *Listeriosis,* in Heyman DL, edit. Control of Communicable Diseases Manual, 18th edition. American Public Health Association, 2004; Washington, DC. pp. 309-312.

3. CDC. *Listeria* Infection. https://www.cdc.gov/listeria/about/index.html

4. Lamont RF, Sobel J, Mazaki-Tovi S, Kusanovic JP, Vaisbuch E, Kim SK, Uldbjerg N, Romero R. Listeriosis in human pregnancy: a systematic review. J Perinat Med. 2011 May;39(3):227-36. doi: 10.1515/jpm.2011.035. Epub 2011 Apr 25. PMID: 21517700; PMCID: PMC3593057.

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