

## 8 | *LISTERIA MONOCYTOGENES*

### 8.1 | Disease agent

- *Listeria monocytogenes*

### 8.2 | Disease agent characteristics

- Gram-positive, facultatively anaerobic, motile, non-spore forming, facultatively intracellular rod-shaped bacterium
- Order: Bacillales; Family: *Listeriaceae*
- Size: 0.5–4 × 0.5–2 μm
- Nucleic acid: The genome of *Listeria monocytogenes* is 2.9 Mb of DNA.
- Growth enhanced by exposure to cold temperature and grows well at 4°C

### 8.3 | Disease name

- Listeriosis

### 8.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Very low
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Low

### 8.5 | Background

- Stable in the population and most cases are sporadic.
- Growing interest in this organism has resulted from food-borne outbreaks and concerns about food safety.
- Frequent cause of serious opportunistic septicemia and meningoenzephalitis in at-risk populations.
- Common veterinary pathogen.
- *Listeria monocytogenes* can be divided in 12 serotypes. Food products are commonly contaminated with serotypes 1/2a, 1/2b, 1/2c, and 4b; serotype 4b is commonly associated with outbreaks.

### 8.6 | Common human exposure routes

- Most human listeriosis is a result of consumption of food contaminated with *Listeria*, including dairy prod-

ucts, prepared meats, and vegetables. Recovery rates from 15% to 70% from many foods are documented, suggesting ingestion of the organism must be extremely common.

- The organism is widespread in nature, found in soil, decaying vegetation, water and the fecal flora of many mammals. It has been found in the stool of 5% of well adults.
- Other modes of transmission include from mother to child transplacentally or through a colonized birth canal, via cross-infection in newborn nurseries, and transcutaneously after contact with infected animals.

### 8.7 | Likelihood of secondary transmission

- Human-to-human transmission appears limited to vertical transmission from mother to fetus, and rare instances of cross-contamination during delivery or in the nursery.

### 8.8 | At-risk populations

- Pregnant women, newborns, and the elderly
- Immunosuppressed transplant recipients and other individuals with impaired cellular immunity, including those with human immunodeficiency virus infection, or receiving chemotherapy
- Individuals with chronic liver disease, diabetes, or iron overload
- Occupational risk for those who work with animals and silage (farmers, veterinarians, and others)

### 8.9 | Vector and reservoir involved

- No vector.
- Infected animals and food products derived from them serve as the reservoir.

### 8.10 | Blood phase

- Bacteremia without a primary source has been the most common manifestation of listeriosis in compromised hosts.
- Asymptomatic bacteremia in platelet donors has been demonstrated.

### 8.11 | Survival/persistence in blood products

- As an organism capable of growing at 4°C, *L. monocytogenes* would be expected to grow in whole blood and RBCs, but experimental studies are lacking, and it has not been isolated from these products.
- Several episodes of platelet contamination have been reported, detected through quality control culture of apheresis platelets from asymptomatic donors.
- Transfusion transmissions have also been documented.

### 8.12 | Transmission by blood transfusion

- Very low; reports have been published documenting *Listeria* contamination of platelets interdicted by routine testing. An initial case reported a febrile platelet reaction followed by disseminated *Listeria* infection. A serotype concordant strain of *Listeria* was isolated from the component and the patient; both shared the same antimicrobial susceptibility pattern. Genomics were not performed. In a second report from Italy, involving a pooled buffy coat platelet, *Listeria* was identified from one of the 5 units in the pool; genomic identity of donor and recipient strains was confirmed. The source of *Listeria* in these cases is likely asymptomatic bacteremia in the donor or possibly environmental contamination.

### 8.13 | Cases/frequency in population

- Incidence of infection in the United States (laboratory-based): 2.4 per million population per year

### 8.14 | Incubation period

- Acute gastroenteritis: 1–2 days (ingestion of 10<sup>9</sup> or more organisms)
- The incubation period for invasive disease is poorly characterized but evidence from cases with recognized ingestion suggests 11–70 days with a mean of 31.

### 8.15 | Likelihood of clinical disease

- Often infection is asymptomatic or unrecognized, but high-risk individuals develop severe systemic manifestations.

### 8.16 | Primary disease symptoms

- In healthy adults, the infection is mostly asymptomatic, but gastrointestinal symptoms with mild fever may develop. Attack rates in foodborne outbreaks can approach 75%.
- Septicemia, meningitis, and meningoencephalitis occur mostly in neonates, the elderly, patients with defective cell-mediated immunity, and other high-risk patients.
- In pregnant women, inapparent infection in the mother can manifest as abortion, stillbirth, and neonatal infection.

### 8.17 | Severity of clinical disease

- Ingestion of large numbers of organisms by healthy people can result in self-limited, febrile gastroenteritis.
- Clinically recognized systemic disease is almost always severe in high-risk populations, but bacteremia with minimal clinical signs and symptoms can occur in healthy hosts.

### 8.18 | Mortality

- 10%–30% in neonatal populations and among at-risk populations with systemic disease

### 8.19 | Chronic carriage

- Humans can carry *L. monocytogenes* asymptotically in the gastrointestinal tract for prolonged periods.
- Intracellular organisms in macrophages may be able to survive for periods of time, but a role for chronic intracellular infection has not been established.

### 8.20 | Treatment available/efficacious

- Treatment with ampicillin with or without gentamicin effective
- Trimethoprim-sulfamethoxazole is alternative agent

### 8.21 | Agent-specific screening question(s)

- No specific question is in use.
- No sensitive or specific question is feasible because of the absence of recognizable risk factors.

- Under circumstances of a common source outbreak, the need for specific donor screening questions would need to be addressed.

### 8.22 | Laboratory test(s) available

- FDA-licensed blood donor screening test exists.
- FDA-licensed tests currently in general use for bacteriological quality control of apheresis platelets can detect this organism. *L. monocytogenes* will grow readily on blood enriched media and commercial blood culture systems. WHO reference panel includes a sample of *L. monocytogenes* from a transfusion-transmitted case that grows readily in blood.
- Serology: complicated by antigenic cross-reactivity with other bacteria and the possibility of having a culture-confirmed invasive disease without measurable antibody production. Measurement of antibody to listeriolysin O has been used in outbreak settings.
- Other research tests include PCR and real-time PCR.

### 8.23 | Currently recommended donor deferral period

- No FDA Guidance or AABB Standard exists.
- Prudent practice would be to defer donor until signs and symptoms are gone and any course of treatment is complete.

### 8.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

### 8.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

### 8.26 | Leukoreduction efficacy

- Unknown

### 8.27 | Pathogen reduction efficacy for plasma derivatives

- Specific data indicate that the multiple steps in the fractionation process are robust and capable of inactivating and/or removing bacteria at concentrations that may be present in plasma.

### 8.28 | Other prevention measures

- None

### SUGGESTED READING

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