



## DATASHEET

Microbiological Hazard Series

**Pathogen Name:** *Listeria monocytogenes*

**Characteristics:** *Listeria monocytogenes* is a Gram-positive, rod-shaped, facultative bacterium, motile by means of flagella typically measuring 0.5 to 2µm long and 0.5µm in diameter. It has the ability to grow at low temperatures, a range of pH values (between 4.3 and 9.6), and can reproduce at temperatures between 1 and 45°C.

Not only can it survive at 1°C, unlike many other pathogens but it can also grow in these conditions so it is known as a psychrophile. It is also notable for its persistence in food-manufacturing environment.

**Pathogenicity:** *Listeria monocytogenes* is the bacteria that is the principal cause of listeriosis in humans. It was first described as a human pathogen in the 1920s.

Although relatively rare, human listeriosis is often severe and mortality rates can approach 50%. The main target populations for Listeriosis are pregnant women/foetuses/neonates - perinatal and neonatal infections; persons immunocompromised by, for example, corticosteroids, anticancer drugs, graft suppression therapy, AIDS, cancer patients, particularly leukemic; the elderly.

**Infectious Doses:** The approximate infective dose of *Listeria monocytogenes* is estimated to be 10 to 100 million colony forming units (CFU) in healthy hosts, and only 0.1 to 10 million CFU in individuals at high risk of infection. However, the infective dose may vary widely and depends on a variety of factors including the individual effected.

**Sources (Including High - Risk food groups):** Many foods have been associated with *Listeria monocytogenes*. Examples include raw milk, inadequately pasteurized milk, chocolate milk, cheeses (particularly soft cheeses), soft serve ice cream, pâté, raw vegetables, raw poultry and meats (all types). It is also found widely in the environment, soil, manure, decaying vegetable matter, silage, water and animal feed. Another major source is the food manufacturing environment especially on floors and drains.

**Onset Period:** Gastroenteritis caused by *Listeria monocytogenes* has a relatively short incubation period, from a few hours to 2 or 3 days. The severe, invasive form of the illness can have a very long incubation period, estimated to vary from 3 days to 3 months.

**Illness, Symptoms and Complications:** It can cause 2 forms of disease. One can range from mild symptoms to intense symptoms of diarrhoea, nausea, vomiting, aches, fever and usually will go usually away by itself. The other is a deadlier form which can occur when the infection spreads through the bloodstream and can result in meningitis and blood poisoning. The duration of symptoms generally depends on the health status of the infected person and can last from days to several weeks.

In pregnant women, Listeriosis occurs mostly during the third trimester, and is characterised by a "flu like" illness with symptoms such as fever, chills, malaise, arthralgia, back pain, and diarrhoea. Intrauterine infection of the foetus can lead to foetal death, spontaneous abortion, premature delivery, or the birth of a foetus that dies shortly after birth.

### Controls to reduce the risk:

The design and layout of floors and drainage systems is particularly important as floors and drains have been confirmed as a source of *Listeria monocytogenes*. Controls include making sure floors are designed to drain areas rapidly to prevent pooling. Drains should have adequate capacity and be trapped inside and outside the facility.

As it is known to grow at low temperatures, environmental and storage temperatures must be maintained, controlled and monitored at all times. Storage areas should be designed to maintain the correct product temperature.

Cleaning with detergents followed by disinfection helps to reduce the number of microorganisms. The correct choice of chemicals, equipment, procedures and frequency are all important.

Where feasible, food processors should incorporate a listericidal processing step (e.g. cooking meat products to 70°C for two minutes) into the production of RTE and other at risk foods. Thermal processing steps such as cooking and pasteurisation are very effective in reducing numbers of *Listeria monocytogenes*. In some foods, a single intrinsic or extrinsic variable (e.g. pH, Temperature) may be used as a listericidal step. However, it is recommended that a combination of variables is used.

EXAMPLE OUTBREAKS		
YEAR	LOCATION	DETAILS
2008	Canada	Cross-contamination of cooked ready to eat deli meat products resulting in 22 deaths.
2011	USA	Contaminated Cantaloupes effected at least 146 people and resulted in 22 deaths.
2014	Denmark	Contaminated meat products including salami and hot dogs resulting in 15 deaths.

  

SUMMARY TABLE	
<b>Source</b>	Food: <ul style="list-style-type: none"> <li>• Raw or unpasteurised milk</li> <li>• Soft cheese</li> <li>• Raw vegetables</li> <li>• Raw meat</li> </ul> Environment: <ul style="list-style-type: none"> <li>• Soil</li> <li>• Water</li> <li>• Floors and Drains (in food manufacturing facilities)</li> </ul>
<b>Growth Temperature</b>	<ul style="list-style-type: none"> <li>• 1 and 45°C</li> </ul>
<b>Growth pH range</b>	<ul style="list-style-type: none"> <li>• 4.3 and 9.6</li> </ul>
<b>Onset period</b>	<ul style="list-style-type: none"> <li>• 2-3 days for gastroenteritis</li> <li>• Invasive form – 3 days to 3 months</li> </ul>
<b>At risk groups</b>	<ul style="list-style-type: none"> <li>• Pregnant women</li> <li>• Elderly</li> <li>• Those who are immunocompromised</li> <li>• Those suffering from cancer (particularly leukemia)</li> </ul>
<b>Illness, Symptoms, Complications</b>	<ul style="list-style-type: none"> <li>• Diarrhoea</li> <li>• Fever</li> <li>• Vomiting</li> <li>• Serious cases can result in meningitis and blood poisoning</li> <li>• In pregnant women it can lead to spontaneous abortion or premature delivery</li> </ul>
<b>Controls</b>	<ul style="list-style-type: none"> <li>• Cook food to 70°C. for 2 minutes</li> <li>• Have an adequate cleaning and sanitising program in place</li> <li>• Adequate drainage in food manufacturing facilities</li> <li>• Gloves</li> <li>• Personal Protective Clothing</li> </ul>
<b>Published Risk Assessments</b>	<ul style="list-style-type: none"> <li>• WHO: Risk Assessment of <i>Listeria monocytogenes</i> in RTE foods <a href="http://www.who.int/foodsafety/publications/mra4-risk-listeria/en/">http://www.who.int/foodsafety/publications/mra4-risk-listeria/en/</a></li> <li>• FDA: Quantitative Assessment of Relative Risk to Public Health From Foodborne <i>Listeria monocytogenes</i> Among Selected Categories of Ready-to-Eat Foods <a href="https://www.fda.gov/downloads/Food/FoodScienceResearch/UCM197330.pdf">https://www.fda.gov/downloads/Food/FoodScienceResearch/UCM197330.pdf</a></li> <li>• Wiley Online Library: Risk Assessment and Management of <i>Listeria monocytogenes</i> in RTE Lettuce Salads <a href="http://onlinelibrary.wiley.com/doi/10.1111/j.1541-4337.2010.00123.x/full">http://onlinelibrary.wiley.com/doi/10.1111/j.1541-4337.2010.00123.x/full</a></li> </ul>

## References

1. Ministry for Primary Industries. 2018. *Bacteria & viruses in food* | MPI - Ministry for Primary Industries. A New Zealand Government Department. [ONLINE] Available at: <http://www.mpi.govt.nz/food-safety/whats-in-our-food/bacteria-and-viruses-in-food/listeria-monocytogenes/> [Accessed 31 January 2018].
2. Bad Bug Book (Second Edition). 2018. *Bad Bug Book (Second Edition)*. [ONLINE] Available at: <https://www.fda.gov/downloads/Food/FoodborneIllnessContaminants/UCM297627.pdf> [Accessed 31 January 2018].
3. CDC.gov. 2018. *Multistate Outbreak of Listeriosis Linked to Whole Cantaloupes from Jensen Farms, Colorado* | *Listeria* | CDC. [ONLINE] Available at: <https://www.cdc.gov/listeria/outbreaks/cantaloupes-jensen-farms/index.html>. [Accessed 02 February 2018].
4. A., R., 2018. *Supervising Food Safety (level 3)*. Highfield.
5. Listeria. 2018. *Listeria*. [ONLINE] Available at: [http://textbookofbacteriology.net/Listeria\\_2.html](http://textbookofbacteriology.net/Listeria_2.html) [Accessed 06 February 2018].
6. Food Safety Authority of Ireland 2018 *Listeria insert.indd - The Food Safety Authority of Ireland* <https://www.fsai.ie/WorkArea/DownloadAsset.aspx?id=1234> [Accessed 15 February 2018].
7. Public Health Agency of Canada. 2018. *Pathogen Safety Data Sheets: Infectious Substances – Listeria monocytogenes - Canada.ca*. [ONLINE] Available at: <https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/listeria-monocytogenes.html>. [Accessed 15 February 2018].