

# LISTERIA

## INFORMATION AND GUIDANCE

2019



1. <i>Listeria monocytogenes</i> Information .....	2
2. <i>Listeria monocytogenes</i> .....	3
3. Growth and survival characteristics .....	3
4. Sources and routes of transmission .....	4
5. Human disease symptoms .....	4
Human disease incidence .....	5
6. Foodborne outbreaks .....	5
7. Legislation .....	5
8. Control in the food chain.....	6
9. Relevant guidance for food businesses .....	6
10. References .....	7

## 1. *Listeria monocytogenes* Information

<b>Common sources</b>	Often associated with chilled, ready to eat foods, such as deli meats and, pâté, unpasteurised milk or dairy products especially soft cheese, raw sprouts, cold smoked fish, pre-packed sandwiches
<b>Transmission mode</b>	Foodborne transmission except for foetal and neonatal infection
<b>Occurrence</b>	All age groups are affected but, mostly in vulnerable groups (pregnant women, elderly, young children and people with weakened immunity)
<b>Reservoir</b>	Environmental, human and animal
<b>Incidence of disease in Scotland</b>	Average of 15 cases reported per year
<b>Symptoms</b>	Healthy people might have mild or no symptoms, while others develop fever, stiff neck, confusion, weakness, vomiting, sometimes preceded by diarrhoea 'listeriosis'. Pregnant women may experience mild flu-like symptoms however, their offspring do not fare as well - they may abort or be stillborn, and those born alive may have illnesses such as bacteraemia and meningitis.
<b>Incubation period</b>	3-70 days (average 3 weeks)
<b>Duration of illness</b>	Days to weeks
<b>Infectious period</b>	<i>Listeria</i> is not contagious from person to person (except in pregnancy when it can be passed to the baby)
<b>Prevention tips</b>	<ul style="list-style-type: none"> <li>• Avoid consuming raw milk (unpasteurised) or raw milk products</li> <li>• Practice proper hand hygiene</li> <li>• Rinse raw products (salads or raw sprouts etc) thoroughly under a running tap</li> <li>• Thoroughly cook meat and meat products</li> <li>• Keep chilled ready-to-eat foods cold – make sure fridge is set to 5°C or below</li> <li>• Consume perishable and ready-to-eat foods as soon as possible after purchase and certainly within the use by date.</li> <li>• Use separate cutting boards/knives/tongs for raw meat and foods that are ready-to-eat</li> </ul>

## 2. *Listeria monocytogenes*

*Listeria monocytogenes* is Gram-positive, rod shaped pathogenic bacterium which was first described as a human pathogen in the 1920s<sup>1</sup>. *Listeria monocytogenes* is found widely in the environment in soil, including decaying vegetation and water and may be part of the faecal flora of a large number of mammals, including healthy human adults<sup>1</sup>.

*Listeria monocytogenes* can grow under either anaerobic or aerobic conditions and causes a group of diseases known as listeriosis<sup>2</sup>. Although listeriosis is relatively rare, *Listeria monocytogenes* can cause one of the most severe infections in humans which can have a high fatality rate, primarily in high risk populations (i.e., persons with immature or compromised immune systems)<sup>3</sup>. Consequently most healthy adults can be exposed to *Listeria monocytogenes* with little to no risk of infection and illness. At the mild end of the spectrum, listeriosis usually consists of the sudden onset of fever, chills, severe headache, vomiting and other flu type symptoms. Listeriosis is usually a self-limiting illness but for those patients with a high fever, a stool culture and antibiotic treatment may be justified for otherwise healthy individuals.

## 3. Growth and survival characteristics

Gram-positive, rod-shaped *Listeria monocytogenes* is unlike many other pathogenic bacteria because it can grow at the low temperature of the refrigerator, a range of pH values and a high salt concentration<sup>4</sup>. There are 13 known serotypes of *Listeria monocytogenes* but more than 90% of human isolates belong to only 3 serotypes (1/2a, 1/2b and 4b). Among these three, the majority of reported foodborne outbreaks in Europe have been caused by serotype 4b<sup>5</sup>.

*Listeria monocytogenes* is killed by cooking and other heat treatments such as pasteurisation<sup>6</sup>.

Table 1. Growth limits for *Listeria*<sup>7</sup>

Parameter	Growth optimum	Growth limits
Temperature (°C)	30 to 37	-0.4 to 45
Water activity (a <sub>w</sub> )	0.97	0.92 to >0.99
pH	7	4.39 to 9.5
NaCl (%)	-	<0.5 to 12

<sup>1</sup> Low JC and Donachie W. 1997. *Vet J.* **153**:9-29.

<sup>2</sup> Bortolussi R. 2008. *Canadian. Med. Assoc. J.* **179**:795-797.

<sup>3</sup> Ryser ET and Marth EH. 2007.

<sup>4</sup> EURL *Listeria monocytogenes*

[https://www.fsai.ie/uploadedFiles/Food\\_Businesses/Microbiological\\_Criteria/EURL%20Technical%20Guidance%20Listeria%20Shelf%20life%202014.pdf](https://www.fsai.ie/uploadedFiles/Food_Businesses/Microbiological_Criteria/EURL%20Technical%20Guidance%20Listeria%20Shelf%20life%202014.pdf)

<sup>5</sup> Heymann D, 2015.

<sup>6</sup> Tompkin RB. 2002. *J Food Protec.* **65**:709-725.

<sup>7</sup> Lorber B. 2001

## 4. Sources and routes of transmission

In the environment, *Listeria monocytogenes* has been found in soil, vegetation, silage, sewage, water and faeces of healthy animals and humans. Frequently present in foods of animal and plant origin, it can be endemic in food processing environment, particularly in moist areas such as drains<sup>8</sup>. Foods commonly identified as sources of *Listeria monocytogenes* infection include improperly pasteurised fluid milk, soft cheeses, ice cream, raw vegetables, fish products (e.g. pâté, smoked salmon), and cooked, ready-to-meal sliced meats<sup>9</sup>.

The main route of transmission is consumption of contaminated food. Rarely however, it can spread from infected animals directly to humans in addition to person-to-person spread from pregnant women to the foetus through the placenta<sup>10</sup>.

Due to length of incubation period, it can be difficult to determine the infective dose in foods at the time of consumption, however it is generally considered to vary with the strain and susceptibility of the host, and the food matrix involved also may affect the dose-response relationship<sup>11</sup>. Even when *Listeria monocytogenes* is initially present at a low level in a contaminated food, its ability to grow during refrigerated storage means that its levels are likely to increase during storage of those foods that can support the growth of the microorganism.

## 5. Human disease symptoms

In most healthy adults, symptoms can be mild or asymptomatic even though they are exposed to *Listeria monocytogenes*. However, vulnerable groups (young children, pregnant women, those with underlying medical conditions, or the elderly) are more likely to be affected with a higher risk of severe, life-threatening forms of listeriosis and symptoms are flu-like such as headache, fever, stiff neck, fatigue and muscle ache<sup>12</sup>.

Pregnant women with listeriosis may have only mild symptoms of the infection however, they are at increased risk of having a spontaneous abortion during the first trimester or of giving birth to a premature infant with acute sepsis if they are exposed later in the pregnancy<sup>13</sup>.

People with invasive listeriosis, meaning the bacterium has spread beyond the gut, (therefore infection is detected in blood, cerebrospinal fluid, amniotic fluid), require hospital care. People with invasive listeriosis usually report symptoms starting 1 to 4 weeks after eating food contaminated with *Listeria monocytogenes*. People with normal immune systems rarely develop invasive infection<sup>14</sup>. Listeriosis can be treated with antibiotics.

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<sup>8</sup> Ramaswamy V *et al.* 2007. *J. Microbiol. Immunol. Infect.* **40**:4-13.

<sup>9</sup> Allerberger F and Wagner M. 2010. *Clin. Microbiol. Infect.* **16**:16-23.

<sup>10</sup> Evans MR *et al.* 2004. *Appl. Environ. Microbiol.* **70**:2383-2390.

<sup>11</sup> Farber JM *et al.* 1996. *Int J Food Microbiol* **30**:145-56.

<sup>12</sup> Heymann D, 2015

<sup>13</sup> Bortolussi R. *Canadian. Med. Assoc. J.* **179**:795-797.

<sup>14</sup> Buchanan RL *et al.* 2017. *Food Cont.* **75**:1-13

## Human disease Incidence

In Scotland there is approximately an average of 15 cases of *Listeria monocytogenes* reported per year.

HPS publish updated outbreaks data and can be accessed by this link:

<https://www.hps.scot.nhs.uk/a-to-z-of-topics/listeria/>

## 6. Foodborne outbreaks

*Listeria monocytogenes* outbreaks are often linked to dairy products and ready-to-eat foods. *Listeria monocytogenes* is stable in the population and most cases are sporadic. Although the number of *Listeria monocytogenes* outbreaks in Europe are relatively low compared with other foodborne outbreaks, the rise of reported listeriosis cases is of concern as the surveillance of these infections is focused on severe forms of the disease, with higher death rates (approx. 30% among at high risk people) than other foodborne diseases<sup>15</sup>.

## 7. Legislation

The safety of foodstuffs is ensured by a preventative approach, i.e. the implementation of a food safety management system based on the principles of Hazard Analysis and Critical Control Point (HACCP).

Regulation (EC) No 2073/2005 is applicable to three categories of ready-to-eat foods and contains microbiological criteria for some specific food/*Listeria monocytogenes* combinations and the requirements to be complied with by food business operators (FBOs). Regulation (EC) No 852/2004 on the hygiene of foodstuffs, stipulates that FBOs must comply with microbiological criteria for foodstuffs, which is set down in Regulation (EC) No 2073/2005. Furthermore, Regulation (EC) No 853/2004 provides a possibility to lay down additional health standards for foods of animal origin.

Links to relevant regulation:

- Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs - <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02005R2073-20170101>
- Regulation (EC) No 852/2004 on the hygiene of foodstuffs - <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02004R0852-20090420>
- Regulation (EC) No 853/2004 laying down specific hygiene rules for food of animal origin – <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1503913655953&uri=CELEX:02004R0853-20160401>

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<sup>15</sup> Gellin BG and Broome CV. 1989. *JAMA*. **261**:1313-1320.

## 8. Control in the food chain

*Listeria monocytogenes* can contaminate at various stages of the food chain to contribute to contamination of the finished product.

Key factors that food handlers should be aware of, whether in a domestic or commercial kitchen, are:

- adherence to 'use by' dates
- advice for vulnerable groups on foods to avoid
- washing hands thoroughly and frequently using soap and warm water
- ensure food is cooked thoroughly as this will kill any bacteria present (cook until it reaches an internal temperature of 75°C)  
<http://www.foodstandards.gov.scot/consumers/food-safety/at-home/cooking-food>
- keep kitchen areas clean  
<http://www.foodstandards.gov.scot/consumers/food-safety/at-home/washing-and-preparing-food>

## 9. Relevant guidance

- Listeria tool for safe smoked fish assessment  
<http://safesmokedfish.foodstandards.gov.scot/name-your-assessment/5121>
- Shelf life of ready to eat food in relation to *L. monocytogenes*-guidance for food business operators  
<https://www.chilledfood.org/wp-content/uploads/2015/08/Shelf-life-of-RTE-foods-in-relation-to-Lm-FINAL-v1.1.1-23-3-10-with-worked-examples.pdf>
- Guidelines for assessing microbiological safety of R-T-E foods  
[https://www.fsai.ie/uploadedFiles/EU\\_Guidance\\_listeria\\_monocytogenes.pdf](https://www.fsai.ie/uploadedFiles/EU_Guidance_listeria_monocytogenes.pdf)
- Campden BRI (2012) A guide to microorganisms and their control, Guideline 68 - <https://www.campdenbri.co.uk/publications/pubDetails.php?pubsID=4577>
- FDA (2012) Bad Bug Book (2nd Edition)  
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