



## Six steps to control *Listeria*

Key criteria that should form part of your  
*Listeria* management plan

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## Six steps to control *Listeria*

As the only UKAS accredited<sup>1</sup> provider of *Listeria monocytogenes* challenge testing in the UK, Leatherhead is well placed to assist companies in controlling this pathogenic microorganism. Here, Louise Grinyer details six steps to effectively control *Listeria* in manufacturing, catering and retail environments.

The genus *Listeria* consists of a group of several *Listeria* species, including *Listeria monocytogenes*. Responsible for nearly all cases of the bacterial disease listeriosis, *L. monocytogenes* is one of the most virulent foodborne pathogens. In the UK, 150-200 listeriosis cases are reported annually<sup>2</sup>, with pregnant women, the elderly, and those with impaired immunity being at particular risk.

*L. monocytogenes* can cause invasive disease, crossing the blood-brain barrier and the maternal-foetal barrier, resulting in meningitis and foetal death. Although the incidence of listeriosis is not as common as food poisoning caused by other pathogens, the fatality rate for listeriosis is high at 20-30%. The infective dose for *L. monocytogenes* is believed to be as few as 100 colony forming units per gram (cfu/g) of food, making it a significant foodborne pathogen of concern to the food and drink industry.

### Which foods are at risk?

Risk factors typically associated with *Listeria* outbreaks include foods which are:

- Ready-to-eat
- Stored refrigerated
- Support the growth of *L. monocytogenes*
- Have extended shelf lives
- Have no listericidal processing step
- At risk from post process contamination
- Consumed by at-risk consumer groups<sup>3</sup>

Many ready-to-eat foods have been implicated in *Listeria* outbreaks, including meat and fish, sandwiches, soft and mould-ripened cheese, ice cream and salad items. However, ready-to-eat foods are not always the culprit; there is currently a multi-country outbreak associated with frozen vegetables, which are recommended to be cooked prior to consumption. In such cases, cross-contamination in the domestic environment and consumers not using products in accordance with manufacturers' instructions, may also place them at risk of developing listeriosis.

### Where is it found?

*L. monocytogenes* is ubiquitous in the natural environment, including in food, water, plants

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<sup>1</sup> UKAS testing number 9365.

<sup>2</sup> Kanagarajah S and Byrne L (2018) *Listeria* data 2006 to 2016. PHE publications.

<sup>3</sup> The Control and Management of *Listeria monocytogenes* Contamination of Food (2005) Food Safety Authority of Ireland.

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and animals. *L. monocytogenes* can enter the production environment through multiple routes: in raw ingredients, water, on packaging, clothes and shoes, equipment or dust. It can survive on walls, floors, equipment and in drains, colonising niche environments, where it may form protective biofilms which can be resistant to some cleaning chemicals and practices. It can persist for long periods of time with minimal nutrient supply. Although well known for preferring cold, wet environments within the food production facility, *Listeria* is also relatively resistant to drying, and may survive for extended periods in dry areas too. The organism can be readily aerosolised, thus facilitating its spread around food production areas. For these reasons *Listeria* can contaminate food products repeatedly in the same facility until adequate control is restored.

### How can *Listeria* be controlled?

A *Listeria* management plan can be used to effectively control and monitor *L. monocytogenes* in manufacturing, catering and retail environments. Generally forming part of HACCP plans or food safety plans, the key steps to a *Listeria* management plan include:

1. Restrict *Listeria* entering the facility
2. Training and awareness
3. Hygienic facility and equipment design<sup>4</sup>
4. Cleaning
5. Environmental monitoring
6. Product design<sup>5</sup>

## Six steps to a *Listeria* Management Plan

### 1. Restrict entry of *Listeria*

All incoming materials including food, water, packaging materials and chemicals, are a potential source of *Listeria*. It is therefore important to restrict *Listeria* entering the facility by managing the intake of materials through a supplier quality assurance programme. This may include:

- Risk assessment of raw materials as potential sources of the organism
- Monitoring of suppliers through questionnaire or site-based auditing
- Agreeing specifications in writing which cover microbiological criteria as well as legislative requirements
- Inspection of incoming materials

Temperature control of ingredients (where applicable) during transportation and receipt, is also important.

Pests may also carry *Listeria*, therefore a pest control programme which includes proofing of the facility as well as door control practices will minimise potential ingress of *Listeria*-carrying animals and birds.

### 2. Training and awareness

An ongoing training programme for operators is essential, both to raise awareness of the organism, minimise introduction of *Listeria* to the facility, and to manage opportunities for cross contamination which could otherwise occur through improper handling, cleaning, or engineering practices.

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<sup>4</sup> Control of *Listeria monocytogenes* Guidance for the US Dairy Industry (2017) Innovation Center for US Dairy.

<sup>5</sup> Guidance for the Control of *Listeria monocytogenes* in Read-to-eat Foods Part 1: *Listeria* Management and Glossary (2017) Ministry for Primary Industries.

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### 3. Hygienic facility and equipment design

The design and layout of production facilities or food preparation areas, including water supply and drainage, should be such that segregation is maintained to prevent cross contamination. Air handling equipment should not be located directly above open product areas or food contact areas. Proper maintenance of floors, ceilings, drains, walls etc. is essential to prevent entry of *Listeria* and harbourage of the pathogen. Similarly equipment should be well designed and easy to clean to prevent niches where *Listeria* can colonise; it should also be regularly inspected for damage. Where equipment is paramount to food safety, for example equipment delivering a listericidal process such as heat, calibration is essential.

### 4. Cleaning

Effective cleaning of the production (or food preparation) environment and equipment is critical in removing *Listeria*; furthermore the efficacy of cleaning should be validated. Appropriate chemicals at appropriate concentrations should be used, and training provided on their use. Separate cleaning equipment should be provided for segregated areas, and drains; cleaning equipment must also be cleaned. Great care should be taken to prevent the creation of aerosols which can transfer *Listeria* from floors onto the production line or between segregated areas, for example through use of high pressure hoses.

### 5. Environmental monitoring

To verify the effectiveness of controls in place, an appropriate environmental monitoring programme should exist. This may include

swabbing of food contact surfaces to verify the effectiveness of cleaning i.e. testing for Enterobacteriaceae and *E. coli*. It may also include swabbing of food and non-food contact surfaces for *Listeria* spp. Typically areas swabbed will include high-risk locations such as drains, cleaning equipment, bins and floors as well as difficult to clean areas such as nooks and crannies on food contact equipment. Procedures should be in place incorporating the corrective actions to be taken in the case that *Listeria* spp. are detected on food contact and non-food contact surfaces. Where *Listeria* species other than *L. monocytogenes* are detected, this signifies that conditions are favourable for *L. monocytogenes*, so corrective action should still be carried out.

### 6. Product controls

Eliminating *Listeria* from the product is the ideal scenario. However, where possible, controls should also be built into the product's design to prevent *Listeria* from growing in the product over its shelf life. Refrigerated storage of food products will not prevent the outgrowth of *Listeria* as the organism is capable of growing at temperatures as low as -1.5°C, albeit relatively slowly. Therefore intrinsic parameters should be used to reduce the risk to the product, such as pH, water activity, or the use of preservatives, which may be combined to produce an overall hurdle effect. *Listeria* will survive freezing, however storing products frozen will prevent the outgrowth of micro-organisms including *L. monocytogenes*.

### Conclusion

Pathogen management plans can be developed for any pathogen which is

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considered to be a hazard, i.e. those that can grow or survive in your product, or that present a risk to your intended consumer groups.

Controlling pathogens such as *Listeria* is paramount to ensuring food safety.

Companies should use HACCP principles and pre-requisite programmes as a basis to formulating a *Listeria* management plan.

In addition, a suitably competent individual should manage the implementation and

upkeep of the plan, including monitoring, in order to control and reduce the risk of *Listeria* in food products. Where *Listeria* is detected in the production environment or in product, suitable corrective action must be taken to safeguard consumers, particularly those in at risk groups.

### **How Leatherhead can help**

Leatherhead can assist clients with implementing all aspects of a *Listeria* management plan, as well as similar plans for other pathogens. We offer bespoke consultancy and advice to our clients, and can help with food safety risk assessments, on site consultancy and training. Leatherhead can also help you in determining the safe shelf life of your products; we are the only UKAS accredited provider of *Listeria monocytogenes* challenge testing in the UK (UKAS testing laboratory number is 9365), giving clients added assurance that our offering meets the highest standards.

### **About the author**

Louise Grinyer manages the Food Safety Department at Leatherhead, and has been with the company for 13 years. She conducts microbiological risk assessments, and is responsible for UKAS accredited microbiological shelf life and challenge testing. She has significant expertise in microbiological analysis of a wide range of food and drink matrices, and co-ordinates numerous wide-ranging research projects, including accelerated shelf life and stability trials, and method validation trials for microbiological media and instrumentation.

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## About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drinks sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long-term commercial benefit for the food and drinks industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group (AIM:SAG) company.

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