Guidance for the control of *Listeria monocytogenes* in ready-to-eat foods

Part 2: Good Operating Practices

July 2011

Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere

BIOSECURITY NEW ZEALAND

NEW ZEALAND FOOD SAFETY AUTHORITY

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This publication is also available on the MAF food safety website at:
www.foodsafety.govt.nz/elibrary/

Prelims

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Contents

1 Purpose

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The Ministry of Agriculture and Forestry (MAF) has developed a series of documents "Guidance for the control of *Listeria monocytogenes* in ready-to-eat foods" that cover different areas of *Listeria* management in a food manufacturing or processing environment. The guidance documents are:

Part 1: *Listeria* management

Part 2: Good operating practices (GOP)

Part 3: Monitoring

Part 4: Corrective Actions

The Guidance material is intended to be used by operators who produce ready-to-eat (RTE) foods which are not intended to be consumed immediately and which will be stored refrigerated for more than 3 days prior to consumption.

Food operations and food products not covered by this guide

This Guidance does not apply to food operators who produce RTE foods that are:

- commercially sterile (e.g. canned food);
- cooked in their retail container/packaging (e.g. cook-chill pouched food);
- aseptically filled into sterile containers preventing the recontamination of the food;
- short shelf-life food intended to be consumed immediately or within 3 days of preparation.

The production of RTE foods intended for immediate consumption and very short shelf life RTE foods e.g. food service and catering, including food provided to at risk consumers in care situations, may also require the establishment of a *Listeria* management programme and the consideration of appropriate Good Operating Practices. For food operators for whom *Listeria* management requirements and Good Operating Practices are described elsewhere, e.g. dairy and seafood industry requirements for pathogen control, this guidance may provide some useful information and reference. This guidance will also assist food operators who are developing new operations and/or product lines or ranges.

Operators with specific queries may wish to seek the advice of their Food Act Officer or Territorial Authority.

2 Scope

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2.1 WHAT IS COVERED BY THIS GUIDE

This document is Part 2 in the series of Listeria guides and provides guidance, and where appropriate provides the legal requirements for Good Operating Practice (GOP) that if implemented effectively, will control *Listeria* species and *L. monocytogenes* in the processing environment and minimise the contamination (or recontamination of RTE foods prior to the final packaging.

2.2 WHAT YOU SHOULD GET FROM THIS GUIDE

After reading this guide you should have a better understanding of how to develop, implement and improve GOP to specifically target reducing or preventing *Listeria* contamination of RTE foods.

3 Definitions

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Biofilm means a collection of microorganisms including bacteria which stick to each other on a surface and form a community. The microorganisms in a biofilm are held together and protected by a self-produced substance, a matrix or film. One benefit from forming a biofilm is increased resistance to cleaning detergents and sanitisers, as the dense matrix and the outer layer of cells protects the bacteria in the middle. Biofilms are formed on solid surfaces in the food processing area, e.g. harbourage and niche sites, drains, water pipes, etc

Exposed ready-to-eat food means the ready-to-eat food after a critical control point specific for *Listeria monocytogenes* or after the final microbiological hurdle before it has been packaging or wrapped which may be contaminated by any *Listeria* bacteria present.

Harbourage site / niche means a nook or cranny, a crack, a crevice, a scratch, a ledge etc where *Listeria monocytogenes* can survive and grow. Harbourage sites or niches are often hard to clean and sanitise.

High care area means the processing area (and refrigeration, chillers, etc.) after a critical control point for *Listeria monocytogenes* or final microbiological hurdle before the exposed ready-to-eat food is placed into the final packaging. This includes product contact and non-product contact surfaces. The high care area is equivalent to the critical hygiene area, zones 3 and 4, in the *Listeria* monitoring programme for ready-to-eat seafood.

Low care area means the processing area before the final critical control point specific for Listeria monocytogenes where the raw ingredients, materials and intermediary products are handled. This includes the production/manufacturing area, raw ingredient store rooms, packaging store rooms, chillers/refrigerators, etc. The low care area is equivalent to the standard hygiene area or zone 2 in the *Listeria* monitoring programme for ready-to-eat seafood.

Non-product contact surface means the surfaces in a high care area which an exposed ready-to-eat food does not touch prior to final packaging. This may include the floors, walls, doors, handles, switches, door jams, table legs, air-conditioning units, exposed wiring and pipes, drains, etc.

Product contact surface means the surfaces in the high care area which exposed ready-to-eat food touches prior to entering the final packaging. This may include tables, racks, trays, boxes, conveyor belts, slicers, dicers, weighing scales, packaging machines, etc.

Question for consultation:
Are there any other definitions or terms from within this document that you would like to see included and explanation provided?

4 Introduction

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4.1 AN INTRODUCTION TO GOOD OPERATING PRACTICE

Good Operating Practice (GOP) is a system made up of a collection of procedures that set out how you operate your business to produce safe and suitable food. GOP and HACCP are the fundamental components of a risk-based programme, such as a Food Safety Programme (FSP) or a Risk Management Programme (RMP).

There are a number of common elements and practices that are common to all food businesses, e.g. cleaning and sanitation. This guide intends to highlight and provide further guidance on GOP that is more specific for the control and to minimise the contamination of the processing environment, particularly the high care area and RTE foods with *Listeria*.

Further information on GOP is available from: http://foodsafety.govt.nz/industry/general/gop/

4.1.1 General references:

Australia New Zealand Food Standards Code, Standard 1.6.1 Microbiological Limits for Food (FSANZ, 2001) is available from:
http://www.foodstandards.gov.au/_srcfiles/Standard_1_6_1_Micro_v113.pdf (External website)

MAF Food Labelling Guide is available from:
http://www.foodsafety.govt.nz/elibrary/industry/nzfsa-food-labelling-guide/ and a version for printing from: http://www.foodsafety.govt.nz/elibrary/industry/nzfsa-food-labelling-guide/labelling-guide0-all-nzfsa-v2-labelling-guide-web.pdf (2 MB PDF)

Food Safety Programmes (FSP) is available from:
http://www.foodsafety.govt.nz/industry/general/fsp

Risk Management Programmes (RMP) is available from:
http://www.foodsafety.govt.nz/industry/general/rmp

Hazard analysis and critical control point (HACCP) is available from:
http://www.foodsafety.govt.nz/industry/general/haccp

4.1.2 Specific references:

Further Processing - Code of Practice

http://www.foodsafety.govt.nz/elibrary/industry/further-processing-code-part-3/index.htm

Dairy- Heat Treatment – Code of Practice:

http://www.foodsafety.govt.nz/elibrary/industry/dairy-code-practice-heat-treatment/index.htm

Pathogen Management Plan Guidance Material: Draft
http://www.foodsafety.govt.nz/elibrary/industry/Pathogen_Management-Sets_Requirements.pdf (256 KB PDF)

Dairy – Specialist Cheese – Code of Practice is available from the Specialist Cheesemakers Association: http://www.nzsca.org.nz/nzsca/index.php (External website)

Interim Code of Practice for Ice Cream

http://www.foodsafety.govt.nz/elibrary/industry/Interim_Code-Contains_Requirements.pdf (1013 KB PDF)

Guidance Material for the development of a Food Safety Programme (Food Act 1981) for Yoghurt Manufacture : http://www.foodsafety.govt.nz/elibrary/industry/Guidance_Material-Purpose_Document.pdf (89 KB pdf)

Poultry Processing – Code of Practice

http://www.foodsafety.govt.nz/elibrary/industry/processing-code-practice-poultry/index.htm

Processed Meats – Code of Practice

http://www.foodsafety.govt.nz/elibrary/industry/processed-meats-code-part-4/index.htm

Guidelines for the Production of Uncooked Comminuted Fermented Meat (UCFM) Products:

http://www.foodsafety.govt.nz/elibrary/industry/guidelines-production-uncooked-guide/ucfm-guide-july-2009-final.pdf

Separation Requirements for Ready to Eat and Raw Meat Products for Food Safety Programme Approval is available from:
http://www.foodsafety.govt.nz/elibrary/industry/Separation_Requirements-Statement_Policy.pdf (17 KB PDF)

Seafood excluding BMS Code of Practice

http://www.foodsafety.govt.nz/industry/sectors/seafood/seafood-no-bms/cop.htm

IAIS 003.9 Listeria monocytogenes, Listeria Monitoring Programme for Ready-to-Eat Seafood:

http://www.foodsafety.govt.nz/elibrary/industry/iais-003-operations-3/listeria-monitoring-programme-for-ready-to-eat-seafood.pdf (662 KB PDF)

4.2 THE IMPORTANCE OF GOP IN *LISTERIA* MANAGEMENT

In the first guide of this series (Part 1: *Listeria* Management), key factors in reducing the potential for RTE food to be the cause of consumers developing listeriosis were identified as:

- removing or reducing *Listeria* present in or on the food i.e. processing control;
- ensuring that the food does not become contaminated during processing, especially after a listericidal process has been applied;
- limiting the potential for growth to occur in the RTE food post-processing until consumed.

Operators should review the GOP that is already in place to ensure that it will provide the necessary *Listeria* control. The review needs to focus on the characteristics of *Listeria* that make it a problem for the RTE food industry. These are the widespread occurrence of the bacteria in the environment; its ability to form biofilms and to grow at low temperatures. These characteristics mean that processing environments are easily and frequently

contaminated and once present may be difficult to remove. There has to therefore be a major focus on limiting the introduction of *Listeria* into the processing environment, locating and removing *Listeria* that does get in and preventing its transfer on to the food.

GOP is the foundation of *Listeria* management, without the implementation and adherence to *Listeria*-specific GOP then HACCP, monitoring etc. has limited value. All of these are parts of the *Listeria* control jigsaw or tool box.

4.3 WHERE TO FOCUS GOP

There are eight key areas of *Listeria*-specific GOP that need to be addressed. These are:

1. People.
2. The building in which the processing and packaging takes place.
3. The equipment used to process and package the RTE food.
4. Maintenance and repair of buildings and equipment.
5. Incoming materials.
6. Process controls that are applied to the food.
7. The product.
8. Cleaning and sanitation.

It is important that all areas of GOP receive adequate attention. If any area is neglected the effectiveness of GOP applied elsewhere will be compromised. For example:

- staff taking waste from a high care hygiene area to an external disposal point and walking back without boot change or washing will contaminate the high care area;
- maintenance contractors whose previous job was working with drains, farms, etc. where there is likely to be *Listeria* present may contaminate the processing areas if there is not appropriate hygiene and protective clothing routines applied.
- a slicer used to slice a processed meat for consumer packs that is difficult to take apart and clean can become a source of contamination;
- *Listeria* can become established in damaged floor surfaces, conveyor belts etc and cleaning and sanitation regimes may be unable to completely remove the bacteria which will then intermittently lead to contamination of a food or food contact surface;
- Raw ingredients and finished product stored together allows cross contamination.

5 People

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It is important that all staff understand their contribution to the control of *Listeria* and that failure to follow the required controls could potentially compromise the food that is being produced and lead to product contamination. This would result in a cost to both the consumers of that food (illness) and the business (recalls and a loss of reputation and income).

5.1 ACCESS CONTROLS

What: Access for employees, contactors, visitors, office workers and other people to the processing environment should be controlled and monitored

Why: Employees or other people visiting processing areas may inadvertently act as a route for *Listeria* to be brought in to the processing environment.

How: The risk of entry of *Listeria* on people should be minimised by:

- controlling access, particularly to high care areas
- ensuring personal hygiene routines are strictly followed and protective clothing is managed so that it is not a source of contamination
- ensuring staff are adequately trained
- ensuring that personal items are not brought into the processing area
- visual observance of people to ensure that they follow the food operation controls and access requirements.

The access controls to be applied will depend on how the operation has been set up, e.g. whether you have used:

1. General and physical separation (best practice)
2. Separation by distance
3. Separation by time

What: The unnecessary access of people should be avoided.

Why: Employees or other people visiting processing areas may inadvertently act as a route for *Listeria* to be brought in to the processing environment.

How: Access controls for people include:

- Restricting access for people between raw/unprocessed processing areas and finished product processing areas.
- Movement of staff from the raw processing areas to the finished product processing areas should be avoided. Where this cannot be avoided, a hygiene regime should be carried out prior to access to the high care area.
- Where possible, e.g. where there is physical separation of raw and RTE areas, staff should work solely in either the low care areas or the high care areas and

not move between areas.
- Any visitor tours of the premises should start in the high care areas and follow the process in reverse order visiting low care areas last. It is strongly recommended that visitor tours into the high care areas are not allowed.
- All people entering processing areas should comply with the required procedures for hand washing and other hygiene requirements.

It is important to be aware that people who come onto the site as a result of an emergency (such as maintenance engineers) pose a particularly high risk as they may have come directly from another process area and often carry tools (which can be contaminated with movement from site to site).

5.2 PERSONAL HYGIENE

What: All people entering a process area should follow the required hygiene regime. This includes processing staff, maintenance personnel, contractors, visitors and office workers.

Why: *Listeria* can be carried on clothing and any items, including food especially unprocessed fruit and vegetables, brought into the process area.

How: Procedures should be established and implemented for access to the high care area. These should consider:
- requirements for hand washing, clothing and footwear, etc.
- restrictions on what may be brought into some process areas
- strict hygiene protocols for all people who enter, i.e. visitors, managers, and for staff working in high care hygiene areas
- there should be no access to the high care area other than going through an area that provides facilities for completing the required personal hygiene routine. Any doors leading into the high care area that don't lead people through an appropriate hygiene area should be blocked off if possible
- where possible, there should be an ante-room or boot room where outside clothing can be stored and initial hygiene routines occur
- where possible, e.g. physical separation, staff should work solely in either the low care areas or the high care area and should not move between unless there is a change of personnel protective equipment and personal hygiene procedures are followed
- any visitor tours of the premises should start in the high care areas and follow the process in reverse order visiting low care areas last. It is strongly recommended that you do not allow visitor tours into the high care areas. Records of visitors should be maintained.

5.2.1 Footwear

The risk of *Listeria* being brought into a process area on the soles of boots or other footwear is very high if no preventative measures are taken or the measures in place are ignored.

Strategies that can be implemented include:

- Not wearing footwear that has been worn outside i.e. boot exchange
- Disinfect footwear i.e. boot-dips

Covering up the footwear with a clean layer i.e. boot/shoe covers could be considered but in practice boot or shoe covers are prone to coming off or tearing and this may be more difficult to manage than the other measures.

There are therefore two recommended control measures – dedicated footwear and disinfection.

Irrespective of whether hygiene barriers, boot-dips or a combination of the two are chosen as the controls, these measures will only be effective if they are:

- used correctly (e.g. a hygiene barrier will only work if boots are changed every time)
- actively managed (e.g. boot-dips are regularly replenished; if dedicated footwear is to be used in a process area then it could be of a different colour).

5.2.2 Dedicated footwear and hygiene barriers

The most effective method available for controlling the transmission of pathogens on footwear is to use dedicated footwear combined with a 'hygiene barrier'. This barrier is a reminder that dedicated footwear are not used anywhere except in the high care area. Footwear is changed to dedicated footwear when the barrier is crossed. The barrier should be kept clean and sanitised regularly.

The hygiene barrier:

- can be a low physical barrier or an area marked out on the floor – the latter is preferable as it does not present a trip hazard
- should be located immediately by the pedestrian door into the high care area (i.e. you should pass through it to go into the high care area).

5.2.3 Disinfected footwear: Boot-dips

This is a control that may be unintentionally abused. The general principles that should be followed are:

- Boot-dips should be placed at all points of access to the high care areas. Take care that access points that are used infrequently are not overlooked
- The container should be stable and hold sufficient *Listeria* specific sanitiser to enable the foot-part of the footwear to be immersed
- The amounts of sanitiser and water added to the boot-dip container should be calculated carefully and measured

The sanitiser should be checked and replaced before it becomes ineffective. There is no standard time after which the boot-dip should be emptied and replenished, although typically a minimum of two changes per week might be expected.

5.2.4 When separation is by time or distance

In the case of separation by time or distance:

Where the same staff work in both high and low care activities and the same protective clothing is worn, the processing should be ordered with tasks involving exposed product completed first followed by tasks with raw materials. In these cases the overalls should be changed everyday.

In the case of separation by distance staff should change their protective clothing, perform their personal hygiene routines and then re-enter into the high or low care area. People should not cross the 'red line', or physical barrier to move directly from one area to the other irrespective of moving from high to low care or from low to high care.

5.2.5 Protective clothing

What: Dedicated protective clothing (overalls, boots, aprons, etc) should be used by all staff processing food, unless all activities involved in the high care area are completed prior to working with raw or unprocessed food.

Why: To minimise the risk of cross-contamination.

How: Where overalls etc. are worn over the top of street clothing, as a minimum these should reach down to just above the knees to prevent contamination from the outside onto the food or product contact surfaces. Avoid wearing uncovered street clothing and footwear.

The clothing should be identifiable (e.g. colour coded) and stored separately

When gloves are used:

- people should wash and sanitise their hands before putting on gloves.
- reusable gloves used for a number of different purposes should be washed and sanitised (e.g. alcohol gel) frequently and at least after a non-product contact surface is touched
- single use gloves should be replaced after touching a non-food contact surface e.g. floor or machine buttons
- use of gloves should be carefully monitored to ensure gloves are cleaned or replaced before they become a source of contamination.

5.3 TRAINING/COMPETENCY

What: Adequate training of personnel involved with the processing of RTE foods is **critical**

Why: Training helps to reinforce the food safety and hygiene messages and to develop a food safety culture.

How: Training of workers in high care areas, including process workers, cleaners and engineers should be tailored to the work performed and should:

- provide an understanding of likely/potential harbourage sites and resistance of *Listeria* to various environmental conditions. This should take account of the reasoning, implications, etc by using case studies and other examples of *Listeria* incidents and events
- provide an understanding of the control measures for reducing the risk of *Listeria* during processing, distribution, marketing, use and storage

- address the verification of the effectiveness of control programmes. including sampling and analytical techniques
- explain the importance and contents of records
- address the procedures developed by the operator for each operation to be undertaken
- provide an understanding of the CCPs, general process controls and why
- provide an understanding of each person's role and the responsibility.

Training may be provided internally or externally. The training programme records should include:

- frequency of training and re-training
- on-going review and peer-review and visual observation, mentoring of new staff (induction process)
- records for each staff member so that retraining can be scheduled and staff with appropriate training selected for specific tasks e.g. undertaking corrective actions, interpreting laboratory reports, training samplers.

5.4 MAINTENANCE STAFF

See section 8.4.

6 Buildings

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6.1 BUILDING LOCATION

What: Consider other activities or operations that are occurring in the area when determining where to site your operation. Identify possible sources of *Listeria* contamination in the area.

Why: *Listeria* is widespread in the environment and may enter the building if identified sources are not controlled, e.g. wildlife, agricultural areas, etc.

How: Be aware of dust, drainage and other activities and conditions that may attract pests and birds in the area; they can be a source of contamination. If the design and location enables workers to bring *Listeria* into the plant then controls should be put in place to minimise the risk, e.g. footwear and clothing changes

Other ways to minimise the bringing in of contamination from the outside include:

- tar sealed or concrete roadways or car parks
- not placing landscaped areas, e.g. shrubs, trees, grass close to the building
- minimise the storage of disused equipment outside the building.

6.2 BUILDING LAYOUT AND DESIGN

What: Buildings need to be designed and laid out in a way to promote the safe and hygienic processing of RTE foods.

Why: The design of premises will help to minimise potential sources of *Listeria* and opportunities for cross-contamination.

6.2.1 Building layout

How: When modifying existing buildings or designing new purpose-built buildings take into consideration the process and access routes to allow the movement of people, incoming materials and product traffic and flows. For example, consider:

- the movement of workers, managers, visitors, QA staff, cleaning and maintenance staff and the movement of the product, ingredients, rework and packaging materials.
- the space between and around pieces of equipment to allow effective cleaning and sanitation.
- the location of doors and windows, are there any unnecessary doors or windows that could be blocked up or sealed to prevent uncontrolled access? Consider how the position of the entrance ways affects air currents, as draughts may carry *Listeria* bacteria from the eternal or internal environment. Where possible try to ensure that there are no doors (except for fire exit purposes) and windows that

open to the outside to keep external contamination out

- the location of protective equipment including clothing, changing areas and hygienic routines should occur in a dedicated area away from where food is processed, e.g. in an ante-room
- store packaging in an ante-room to prevent contamination and access ways to bring in these to high care area without introducing a further source of contamination
- have a simple way for people to enter the processing area. Avoid people needing to enter the high care area via the low-care area or *vice versa.*
- store raw materials and ingredients, partially processed product and intermediaries and the final product separately to prevent cross-contamination. Ideally these should be stored in separate storage facilities
- minimise exposed pipe work and other overhead structures, e.g. stairs, decks and walkways so that these do not occur directly above open processing or packing equipment. Consider whether covering these with a false ceiling is a suitable option provided that this does not become a source of contamination
- there should be no access to the high care areas other than by going through an area that provides facilities for completing the required hygiene routine. Any doors leading into the high care area that don't lead people through an appropriate hygiene area should be blocked off if possible. Note emergency exits should not be blocked off
- facilities should be designed so that droplets and aerosols from condensation are not able to directly or indirectly contaminate food and/or food contact surfaces.
- separate the processing of the raw materials and ingredients from the RTE food product, e.g. physical separation, by distance or by time and design your process around this. For example, where separation is by distance all activities that occur before a *Listeria* control step should occur in one area and those following such as slicing and packing in a separate area.

Figures 1 and 2 provide an example of good and poor design of RTE food operations.

Figure 1: Examples of good design

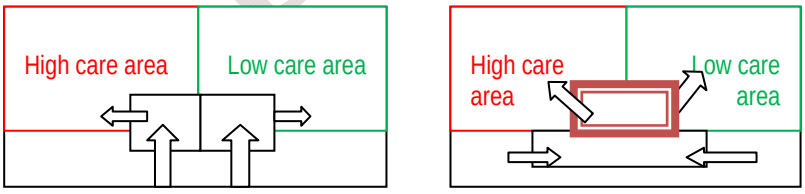
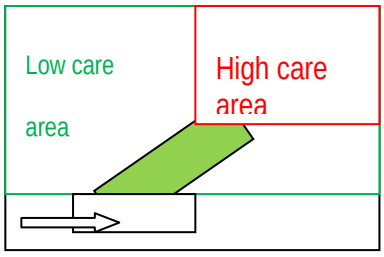


Figure 2: An example of poor design



Equipment and the process should be physically positioned to enable product to flow in one direction from the start of the process to the end. The process should occur in a logical sequence and should not cross-over or backtrack as this may introduce a source of *Listeria* contamination, e.g. avoid raw ingredients passing over the top of or close-by product following a *Listeria* control step or processing raw ingredients between RTE-product on the same surface. Where the shape of buildings and rooms allows, the processes before a critical control point (listericidal step) should be separated from those afterwards, (e.g. cook step), using physical separation.

6.2.2 Building design

How: Buildings should be designed so that:

- the internal surfaces (floors, walls and ceilings) are impervious, i.e. no gaps exist between the floor and the wall or between coving junctions, that these are properly sealed, and made of non-absorbent materials that prevent water uptake
- the surfaces should be free from depressions, pits, cracks and crevices and other niches where *Listeria* may grow, e.g. in poly-board, within a hollow door or in pre-formed coving with a hollow cavity.

Major incidents involving *Listeria* and other pathogens have been traced to cracked floors or within walls where *Listeria* has formed biofilms and been unable to be removed. *Listeria* may be transferred from these sites by the likes of trolley wheels, renovations or construction or through the water used for cleaning due to splashing and drips. If poly-board is being used avoid drilling holes into this as water and bacteria may be able to travel through the screw or bolt and enter the space behind

Design and construction elements that are important for the control of *Listeria* include:

- floors should be easily cleaned, smooth and not prone to damage from equipment
- prevent water accumulation by using sloping floors to drain water to spot drains instead of using open drains across the floor which may be a source of contamination due to splash. The US FDA recommends that the floor should slope by 2.1 cm for every 1 m
- use coved floor/wall joints (that are solid not hollow behind the coving) in any wet processing areas to allow effective cleaning and prevent contaminants building up behind the coving that could then seep out and contaminant the area.
- doors, door jams and frames should be sealed and there should be no crevices between these and the adjoining wall, and if applicable the floor. Doors into and within the high care area should be self-closing, except where there is a conflict with the emergency exit requirements
- avoid doors that are difficult to clean, e.g. slide over doors, concertina doors, folding doors and other multi-section doors
- ensure that processing (and storage) areas for RTE foods are as dry as possible (e.g. avoid damp areas and ensure adequate drainage from air-conditioning and condensing units) and that there are no leaks from pipe work
- ensure that there is good control for entry and access to the high care areas, e.g. limit the number of access and entry points to keep external contamination out, limit entry to high care area staff only and prevent direct access from the outside or low care areas

- ensure that all surfaces within the building can be accessed for cleaning. Any nooks and crannies have the potential to become harbourage sites for *Listeria*.
- place vents so that humid air can be exhausted outside
- put filters on all incoming air vents, e.g. use UV light.

6.3 DESIGN, OPERATION AND USE OF DRAINS

What: Water pooling in processing areas should be avoided and if present, removed as soon as possible

Why: Water and moisture in the processing areas can assist with the growth and movement of *Listeria* and contamination of the RTE food.

How:
- All water and waste liquids in processing areas should be ducted directly into a drain where possible.
- Direct the condensation from air conditioning/cooling/freezing units to drains via a hose or drip pan.
- Drains should be sealed, especially if they move through areas where water is not used, and located away from the processing line where possible.
- Drain traps and access to drains should be located outside the high care area and should be regularly cleaned and sanitised.
- The drains from the low care area (e.g. raw unprocessed ingredients) and high care area process lines should be separate where possible and there should be no interconnecting pipe-work. Where this is not possible, you should ensure that backflow preventative mechanisms are used.
- Drains and traps should be made of materials that are compatible with the temperature and corrosive nature of the material being removed, e.g. be able to withstand high temperatures, such materials include stainless steel in the high care area or polypropylene, PVC, CPVC, PVDF. The use of corrosion-resistant materials will avoid deterioration which would otherwise enhance the formation of harbourage sites and make materials harder to clean.
- Floor drains in the process area should have basket strainers to collect solid waste which should be emptied, cleaned and sanitised at each full clean down. Refer to the cleaning and sanitation section.

6.4 BUILDING MAINTENANCE

- Refer to section 8.

7 Equipment

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7.1 EQUIPMENT DESIGN

What: The equipment should be designed to minimise the formation of niches for *Listeria* and to facilitate cleaning and sanitation.

Why: Good hygienic design and construction of processing equipment will help to reduce the risk of *Listeria* contamination in the finished product by minimising niches and harbourage sites that allow *Listeria* to grow and survive

How: Design, purchase and install equipment to minimise cracks, crevices, chips, rough welds, joints between different surfaces and materials or hollow tubes and supports.

Where possible equipment should be designed so that all surfaces can be cleaned and sanitised, this may include having hinged sections to get behind, under or on top of equipment

When designing, purchasing or installing equipment it is important to consider the following points:

	Key Feature(s)
Design	Avoid corners/dead spaces or sites where product can collect during processing (e.g. open seams, gaps, corroded areas, recesses, protruding ledges, inside threads, bolt rivets and crevices). Avoid ledges, flat surfaces that prevent waste food or liquid to falling directly onto the floor
Design	Contour surfaces to allow for drainage of liquid
Design	Construct from non-porous, non-absorbent materials
Design	Welds should be continuous, fully penetrating, ground and polished where appropriate
Design	Bolts and rivets should not be used in the high-care areas
Design	In the low care area if bolts and rivets are used these should not penetrate through or be located above product contact surfaces (e.g. name plates, end caps etc)
Design	Moveable equipment if possible, to allow easy access for cleaning and sanitation
Design	Allow easy maintenance, e.g. easy to dissemble by hand or with simple tools
Design	Simple, fewer moving parts
Design	Pipe waste liquids direct to drain
Design	Shield aerosol generating equipment (pumps, air/water sprays, etc)
Design	Keep product contact surfaces or any surfaces that could come in contact with product contact surfaces off the floor. Conveyor belts should not touch the floor and should be located far enough off the ground to prevent any impact from splash.
Design	Personnel hygiene equipment should be non-hand operated where possible to prevent cross-contamination (e.g. wash basins, foot baths)

Design	Cover wheels and other moving parts, e.g. motors, with easily cleaned cover guards
Design	Electrical cords, etc. to machines should enter from the roof
Design	Minimise dropped product which could build up and be source of contamination or would need additional procedures to remove without being source of contamination
Design	Look for equipment manufacturers who design equipment with *Listeria* management in their mind
Design	Be aware if modifying equipment or installing modified equipment that unexpected design error, may be introduced. When purchasing or installing equipment in high care areas, thoroughly investigate all aspects of sanitary design
Design	Any sensitive electronic systems should be able to be cleaned and sanitised. Electronic systems can be designed to be protected during processing, cleaning and sanitation or the application of steam, so this can not be used as an excuse not to clean, e.g. electrical control panels, chain guards, gear enclosures, junction boxes, push buttons, valve handles, switches, touch screens should be designed and maintained to prevent entry and accumulation of product, water and waste, etc.
Design	Conveyor belts should use rollers that are solid or sealed at both ends in high care areas
Design	Conveyor belts should be made of non-absorbent material that is hygienic and easy to clean. Do not use fabric or nylon
Design	Eliminate hollow areas of equipment (e.g. frames) or permanently seal the ends
Design	Cooling units should have dehumidifying capability

7.2 EQUIPMENT OPERATION

Operation	Don't place cooling units, refrigerators, insect control devices or anything that could be a source of contamination above exposed product
Operation	Where possible equipment should be installed hygienically and not during processing. Equipment should not be brought through the low care to the high care zones. Consider potential contamination from second hand/rented equipment prior to installation
Operation	Dedicated equipment should be used for processing raw and RTE foods
Operation	Consider covering exposed product and process lines with hygienic packaging, etc
Operation	Use food grade lubricants with preservative properties
Operation	Empty, clean and sanitise any drip pans at least daily
Operation	Replace worn seals or gaskets as they provide niches or harbourage sites that are hard to clean and sanitise allow *Listeria* to survive and grow. Even if fixed seals etc are new, check that they remain firmly in place are not allowing contaminants to build up behind or around them
Operation	Prevent insulation on equipment from becoming damp or wet
Operation	Use steam to clean difficult to sanitise equipment (e.g. slicers) after a thorough clean down
Operation	Make sure equipment is positioned to be able to cleaned and sanitised easily (e.g. elevated)
Operation	Locate food processing equipment away from sources of contamination, e.g. drain flows, evaporators, air flows from raw material intake
Operation	Only authorised people should be permitted alter the environmental temperature, air extraction and intake and humidity settings
Operation	Use filtered and dry compressed air

7.3 EQUIPMENT MAINTENANCE

For Repairs and Maintenance of equipment see section 8.

8 Repairs and Maintenance

Amendment 0

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8.1 GENERAL CONSTRUCTION, REPAIRS AND MAINTENANCE

What: Regular preventative maintenance of the process equipment and buildings should minimise unscheduled repairs during processing when food is exposed.

Why: RTE food exposed during maintenance may be at risk from *Listeria* contamination. Maintenance may disturb harbourage sites.

Preventative maintenance of floors and other surfaces including those on equipment to minimise cracks and exposed rough areas will reduce the number of attachment sites for *Listeria*.

How: Before commencing repairs and maintenance, consider:

- The type and extent of the work, e.g. could it cause airborne contamination or splashes, could it affect items or equipment above where the work is taking place.
- Exposure of ingredients, products, packaging, or equipment to contamination, and controls for protecting them e.g. removing them from the affected area.
- Type of product and processing area affected.
- Movement and access of maintenance staff and contractors.
- Maintenance equipment, tools and materials to be used i.e. could they be a source of contamination.
- It can be very difficult to maintain hygienic conditions during construction, repairs and maintenance activities. Where possible these activities should be carried out only when processing is not occurring.
- Particular attention should be given to ensure that cleaning and sanitation after construction or maintenance has been carried out as these activities may inadvertently release *Listeria* from niches deep inside equipment or the building infrastructure.

8.2 TOOLS

What: Tools used for repairs and maintenance in the high care areas should be dedicated for that purpose.

Why: Tools may be a source of *Listeria,* other harmful micro-organisms and physical hazards

How:

- Where tools, including scaffolding, tool bags and boxes, used in construction and maintenance are not dedicated for use in the high care areas, these should be cleaned before being brought into the processing room.
- Tool bags and boxes used by maintenance staff and contractors should be made of a material that can be easily cleaned, i.e. not fabric.

8.3 ROUTINE MAINTENANCE

8.3.1 Frequency of routine maintenance checks

Routinely inspect and systematically review the buildings, infrastructure and equipment to identify sites that require preventative maintenance and repair.

The operator should consider how frequently maintenance checks need to occur e.g. daily, weekly, and periodically:

- for example, daily maintenance checks include equipment that is used as part of a Listeria control step (i.e. forms part of a critical control point) and other key equipment, e.g. conveyor belt rollers, slicer, vacuum packaging machine, etc.
- examples of weekly maintenance checks may include building maintenance (e.g. flaking paint, light covers, gaskets, conveyor belts rust or condensate on overhead pipe-work)
- examples of items that may require a periodic maintenance checks include roofs and gutters, pumps and motors
- repetitive problems or breakdowns may indicate that the maintenance frequency needs to be increased or that equipment and the facilities may need replacing.

8.3.2 Routine maintenance

What: Routine maintenance of the high care area should take place when processing has finished for the day

Why: This reduces the possibility of contaminating exposed product, equipment, surfaces, personnel, packaging etc.

How: Contractors and maintenance personnel should be briefed and managed to prevent the contamination of the processing area. For further information see Section 5 People.

If routine maintenance cannot occur at the end of the day, it should take place at a normal work break. All products and packaging should be removed, or covered and the specific area/equipment isolated when maintenance or repairs are conducted in the high care area.

- After repairs and maintenance, clean and sanitise the area and run through the pre-operation check before processing resumes.
- Taking additional microbiological samples of the product and environment in the high care area should be considered after cleaning and sanitation as this may identify if *Listeria* harbourage sites and niches have been disturbed and remain a source of contamination.

8.3.3 Building Maintenance

What: The walls, floors and ceilings should be subject to periodic maintenance checks and scheduled repairs

Why: *Listeria* may survive in niches behind flaking paint or rust on walls or equipment, behind boards of fibreboard that are damaged or in cracked or chipped floors as these are not able to be effectively cleaned and sanitised

How:
- Determine the impact of the maintenance or repair will have on the safety of the product:

a. Repair or maintain immediately if it has a direct or immediate impact on product safety (e.g. resulting in a CCP failure).
b. Repair or maintain at the earliest opportunity (i.e. at the end of a processing period) if the problem has a direct effect on product safety by introducing a conflicting hygiene status.
c. Repair or maintain as the opportunity arises problems that do not affect the safety of the RTE food.

- By designing and implementing an effective preventative maintenance programme which includes a schedule and frequencies for the maintenance and repair of the building and facilities.
- Cracks or breaks in the floor, coving and in the wall lining require sealing as a priority of plant maintenance, particularly in high risk areas.
- Inspect the completed maintenance work and where necessary take additional microbiological samples for analysis before processing recommences.
- Undertake extensive cleaning and sanitation before the routine pre-operation checks and enhanced environmental monitoring if significant or major maintenance and repairs have occurred.

8.3.4 Equipment maintenance

What: An effective preventative maintenance programme should be implemented

Why: Equipment failures during processing increase the risk of *Listeria* contamination as a result of both the failure and any repair work that may be required.

How: Schedule routine inspections and systematically look at all the equipment to identify items for repair, replacement and maintenance of the equipment.
Equipment maintenance checks should include cover:

a. The equipment's overall condition and integrity, i.e. is it working properly
b. For harbourage sites, e.g. loose / flaking paint, rust, worn parts, worn or frayed hoses, gaskets or belts, porous welds, contaminants behind joints and seals, damage to product contact surfaces, etc.
c. For loose, damaged or broken parts, nuts and bolts (especially on equipment that is subject to vibration)

Repetitive equipment problems or breakdowns may indicate that the maintenance frequency should be reviewed and adjusted accordingly, or that the equipment needs to be replaced.
Areas to check include:

- conveyor belts, seals, wheels, pneumatic equipment and rollers (e.g. worn or frayed conveyors and belts should be replaced because they are impossible to clean effectively; as are rollers if water and food scraps get inside them)
- equipment such as sealing machines (especially those that pull a vacuum during operations) and utensils
- attachments to walls/floors and other equipment, e.g. metal-to-metal or plastic-to-plastic sandwiches
- wear strips on metal conveyors
- fabric equipment covers (e.g. electrical boxes)
- rubber foot mats

- hoses, taps, etc. to eliminate leaks
- maintain air filters as per the manufacturers' instructions. Place dirty external air filters and other pieces of potentially contaminated equipment in a sealed bag when moving through the high care area
- seals and gaskets should be replaced on a routine basis and not just when worn

ventilation systems should be maintained and the filters replaced frequently in high care areas as these may be a source of contamination. The dirty filters should be changed when processing is not occurring. The filters should be placed in a protective covering when removed from the high care area to prevent contamination. No short cuts should be taken that breach the hygienic envelope.

8.3.5 Returning equipment to use

What: Have a procedure to ensure that when the equipment is brought back into use

Why: Equipment that has not been used use for a period or following repairs and maintenance or re-commissioning may be a source of *Listeria* contamination

How: The procedure should include steps to ensure that:

- equipment (including that which has been stored or repaired outside processing areas) is cleaned and sanitised before being returned to a processing area
- equipment should be cleaned and sanitised before use, or processing re-commences (e.g. pre-operational hygiene check).

8.3.6 Construction, Renovations and Emergency Maintenance

What: The emergency repair and maintenance of equipment and machinery should not have any adverse effect on the safety of the RTE food.

Construction and renovation should not occur in unless the area can be completely isolated from areas where food processing continues.

Why: Product which is exposed at the time of construction, renovation or an equipment breakdown may be at risk from contamination as repairs and building work may introduce or disturb existing *Listeria* harbourage sites. For example, contamination may occur due to the dust produced or through the disturbance of existing *Listeria* niches, e.g. replacing floor drains, walls or cooling units.

How:

- Determine the urgency of the emergency repairs and maintenance by assessing the potential risk
- Determine the impact of the breakdown and equipment defect on product safety. Refer to section 8.3.4.
- When conducting emergency repairs and maintenance: all exposed product should be removed wherever possible from the high care area before maintenance occurs. If not, cover and isolate any product and/or intermediary products. Record the batch number(s) of RTE product affected
- thoroughly clean and sanitise the equipment and high care area and conduct any pre-operation checks before processing resumes

Floors and drains should always be considered to be contaminated with *Listeria*

- Product and environmental monitoring programmes should be temporarily modified after the completion of the work by increasing the number of samples,

sample sites or frequency of sampling to verify that *L. monocytogenes* has not been disturbed or introduced and that control is being maintained.

For more information on how to conduct product and environmental monitoring programmes see Part 3: Monitoring.

8.4 MAINTENANCE STAFF

What: It is important that the activities of the company engineer or contracted tradesmen do not contaminate the processing area, and if unavoidable, appropriate actions are taken prior to recommencing processing.

Why: Maintenance staff and their equipment may introduce *Listeria* or disturb harbourage sites.

How: Construction, renovation, maintenance or emergency repairs should be agreed and approval given for access to the high care area.

Develop and implement a policy for maintenance staff and contractors.

Ensure that maintenance staff and other contractors have not come from a previous job where there may be high levels of *Listeria* present, e.g. working with drains, farms, external environment, etc. without changing clothes, appropriate hygiene routines, etc.

Maintenance staff should be briefed and/or trained to do their job whilst minimising contamination of the equipment and facilities, in particular they should be trained in:

- appropriate personal hygiene including the use of clean protective clothing and a change of footwear
- waste removal and adequate clean-up upon completion of the work
- the use of dedicated tools for the high care area or at least a sanitation step to minimise cross-contamination
- normal and acceptable behaviours
- access restrictions.

8.5 RECORDS

What: The operator should record when and where repairs, maintenance and breakdowns have occurred, whether unpackaged product was exposed during repairs (batch number, shelf-life or other distinguishing features, etc).

Why: This information may be useful in the event of a food safety incident or trace back situation and may help to reduce the risk to the business. It can also be verified to see whether the procedures are being followed, that staff know what to do, and the procedures are appropriate.

How: Items to record may include:

- maintenance staff log
- what tools and other materials and equipment was taken and taken out of the process areas

- which processing lines were affected and whether processing continued or was halted
- what was fixed and how
- whether any product was exposed, batch numbers, etc.
- what cleaning and sanitation occurred after the work was completed, how and by whom
- what checks were done after the work was completed (maintenance sign-off, prep-op checks).

During the routine review of the repairs and maintenance systems and records. The following areas should be checked:

- staff training in repairs and maintenance procedures
- new equipment has been added to the maintenance schedule
- whether there is any trends with equipment regularly breaking downs or other issues.
- hygiene and sanitation requirements have been met.
- monitoring results, of any analysis conducted as part of the *Listeria* monitoring programme (see part 3: Monitoring) and during the pre-operative hygiene checks, etc.

8.6 CORRECTIVE ACTIONS

What: Take corrective action whenever non-compliance with the repairs and maintenance programme occurs.

Why: The continued non-compliance with the repairs and maintenance programme may result in the contamination of RTE food with *Listeria*.

How: Action to prevent any non-compliance from occurring again may include:

- increasing maintenance checks frequency
- replacing equipment or facilities
- re-training of maintenance staff, including contractors
- reviewing and updating maintenance procedures accordingly.

9 Incoming materials

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Incoming materials include all the ingredients and components of the food, packaging materials, water and air used during processing and manufacture.

9.1 RAW MATERIALS

What: When producing RTE foods, extra attention should be given to the quality, storage and handling of the raw materials used.

Why: Raw materials are a potential source of *L. monocytogenes* contamination even if they have been processed or if the final product is subject to a listericidal treatment.

How: The supplier of the raw materials should be able to provide you with:

- the source of the raw material/inputs
- any processing information
- any controls or practices at the primary production level, e.g. GAP for fresh produce
- any application of GOP / risk based management programmes
- any specific controls for the management of *Listeria*
- what analysis of the raw material(s) has been conducted by and whether it meets your specifications

As a food operator you should:

- if appropriate, consider testing the raw materials and inputs for general microbiology and *Listeria*, and carry out trend analysis. Alternatively, consider that everything that enters the premises is contaminated.
- store raw materials/inputs as per the manufacturer's instructions. Refrigerated raw materials and inputs that support *Listeria* should be stored in storage rooms designed so that the product temperature does not exceed 6°C, (preferably 2-4 °C) unless frozen
- store raw materials/inputs separately from finished, processed products
- discard the raw material/input if it becomes contaminated, is no longer suitable for use or if information that should be available is lost e.g. identity, storage instructions, shelf-life
- raw materials/inputs should be used before the end of any use-by date as defined in the Food Standards Code
- determine whether the raw material or input is suitable for use in the low care or high care areas, i.e. whether it is RTE, or requires particular handling or further processing to reduce or control *Listeria* risk. For example, raw unprocessed vegetables received unwashed or unpeeled, may be a source of *Listeria* and should be prepared separately, and not in high care areas or areas where there is exposed product

- from the hazard analysis of your operation a list of all the ingredients used and those likely to be contaminated with *Listeria* will be known, for each ingredient, raw material or intermediary consider what kind of control that you should put in place.

The following ingredients that are processed as follows are not likely to be contaminated with *Listeria*:

- aseptically processed and packaged
- retorted (e.g. canned)
- pasteurised (or equivalent treatment) in the final packaging.

9.2 PACKAGING MATERIALS

What: Packaging materials used for the RTE-product should be kept clean, dry and stored under hygienic conditions.

Processes should be in place to ensure that the exterior wrappers, packaging or containers surrounding raw materials and inputs do not enter the high care area.

Why: Packaging materials often come into direct contact with the finished product and may be a source of contamination.

How:
- Packaging materials should be stored off the floor and kept clean and dry.
- The storage area should be kept dry and clean and there should be minimal human and vehicle traffic, i.e. it shouldn't be used as a walkway/thoroughfare.
- Depending on the size and scale of the food operation, it may be good practice to have a dedicated storage area, sanitation of packaging materials and controlled access.
- Bins, pails and other containers used in food processing should be kept off the floor in storage and during processing.
- Packaging materials should be removed from their external carton, etc. before entering the high care area.

9.3 WATER AND AIR

9.3.1 Water

Water is used for a lot of different purposes within the food processing environment.

What: Water used for the processing of food should be fit for purpose.

Why: Water is an ideal medium for transferring contamination throughout processing areas.

The control of moisture is important because bacteria cannot grow without water.

How:
- Minimise the amount water used during processing.
- Consider the source of the water used for processing of each particular RTE food and whether it is appropriate.
- Avoid recirculating water unless this has had a filtration and bactericidal treatment, e.g. chlorine levels checked, ozone, UV treatment, etc
- Equipment that uses water may have hidden surfaces or areas that could provide *L. monocytogenes* a niche or harbourage site and form a biofilm. Bacteria cells from this biofilm may occasionally contaminate the product.

Refer to your specific industry guidance for further information on the use, type and quality of water.

9.3.2 Air

What: Air quality and ventilation should be controlled to minimise the formation of visible condensation.

Why: Air has not been identified as a direct source of *Listeria* contamination in food however *Listeria* can survive in aerosols.

How:
- Facilities should be designed so that droplets and aerosols from condensation are not able to directly or indirectly contaminate food and/or food contact surfaces.
- Food contact air should be fit for purpose. The equipment should be maintained to prevent the introduction of *Listeria*.

10 Process Control

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What: Process control refers to the on-line process that is designed to:
- consistently produce food that is safe and suitable for its intended use; and
- comply with regulatory standards.

Why: It is important to control whatever you are able to, e.g. quality and weight of raw ingredients, source of ingredients, time and temperature parameters, the source of water, measure any additives, ingredients or preservatives, calibrate equipment, pressure, chill times, etc., as there will always a number of variables that are beyond your control.

How: Note: the level of detail required in your procedure will vary depending on:
- how complicated the process is; how variable the inputs are, and
- how much information is available that can be referred to (e.g. FSP, RMP, instructions from equipment suppliers, or in customer product specifications, etc.).

10.1 HOW WELL DO YOU KNOW YOUR PROCESS AND CONTROLS?

- Refer to the MAF HACCP guide.
- Revisit your HACCP plan and consider whether it is able to control *Listeria*

Listeria can be eliminated or controlled in RTE foods through the application of heat and a variety of microbiological hurdles (see Part 1). However contamination can also introduce *Listeria* into the food during processing. Thus control applies to both *Listeria* already in the food and ingredients as well as that introduced at any point from the commencement of manufacture to the dispatch of the finished product.

All process steps designed to control pathogens including *Listeria* should be identified and validated to ensure that the treatments are effective and performance criteria documented.

Note that processes that provide the desired quality product may not always give the required degree of *Listeria* control. **Food safety should be the driver of the process control parameters.**

Question for consultation:

MAF asks whether further guidance should be provided in a section on the controls for essential parts of the process e.g. pasteurisation, limits, non-conformance and records, corrective actions?

And, if so what processes, controls and parameters should be included in this section?

10.2 MINIMISING CROSS CONTAMINATION

What: Control measures that reduce the potential for contamination to occur

Why: Foods that enter the factory free of *Listeria* can become contaminated in the processing environment.

It is critical to prevent the recontamination of an exposed RTE food after a listericidal treatment (a CCP), or final microbiological hurdle before the packing, i.e. in the period when the unpackaged food can be contaminated.

How: To avoid microbiological cross contamination the following should be considered:

- the movement of employees, food and equipment between raw processing, storage and finished product areas should be controlled and processing scheduled to avoid build up of intermediary products. The process flow in the premises should avoid crossing back and forth between different surfaces and areas.
- avoid having raw/unprocessed food operations in the finished product area or vice versa as this creates greater opportunity for cross-contamination. Similar operations should be grouped together and incompatible activities segregated
- dedicated utensils and equipment etc. should be used in either the raw or the finished product areas, where a single area is used the utensils and equipment should be thoroughly cleaned and sanitised between uses
- once the finished product is no longer exposed (e.g. it is packaged) separation to minimise contamination is no longer necessary through the remainder of the process, e.g. weighing, labelling, etc.

10.2.1 Access Controls – People and Equipment

What: Access for personnel and equipment moving between raw/unprocessed food and finished food products should be controlled

Why: To minimise the risk of *L. monocytogenes* cross-contamination.

How: Identify pathogen transfer pathways (particularly between the high and low care areas).

Pathogen transfer pathways include:

- people
- equipment,
- tools,
- vehicles
- pallets
- crates
- bins
- raw materials, ingredients and intermediary products
- packaging.

10.2.2 Access Controls – Pest Management

What: Pest management controls should be in place.

Why: *Listeria* are unable to enter a processing area unless they are carried by something else, e.g. pests such as insects, rodents, birds, etc.

How: Review the pest management controls in place and any requirements or guidelines.

Check:
- Bait stations position and efficiency
- Any pest management contract in place
- The structural integrity of the building to ensure that there are limited opportunities for pests to enter
- That electrical fly killers and zappers are not positioned directly over the processing line or preparation tables.

10.3 PROCESS FLOW – SEPARATION OF ACTIVITIES

Establishing the process flow or separation of activities is a way of grouping common activities together, such as activities involving the handling of unprocessed raw ingredients and those that focus on the exposed RTE food prior to final packaging.

There are three ways by which separation of activities can be achieved:

1. Physical separation
2. Separation by distance
3. Separation by time

10.3.1 Physical Separation

What: Premises and facilities need to be designed in new builds, and wherever possible in existing facilities, to allow the physical separation during the processing and storage of raw ingredients through to finished RTE food. Food operators should wherever possible use dedicated personnel and separate equipment for raw ingredients and finished RTE product.

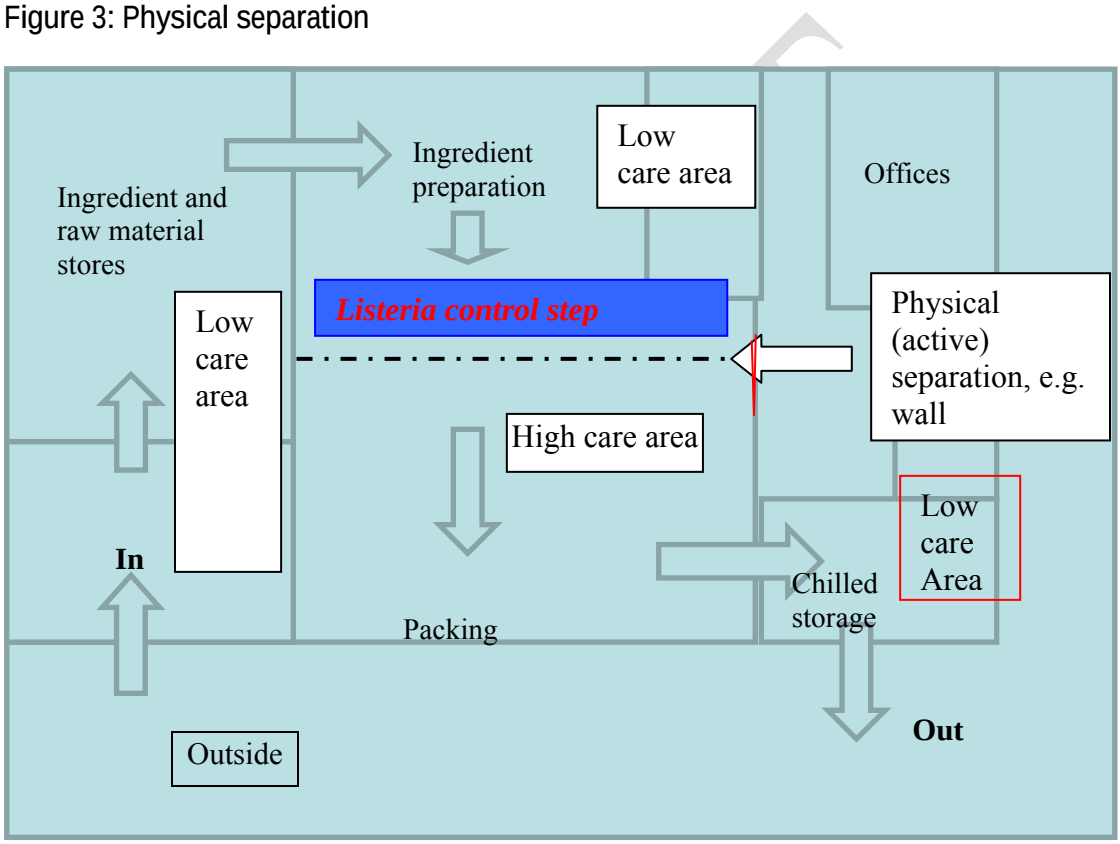
Why If not adequately separated, the finished RTE food may be contaminated with *Listeria* from raw products or ingredients as well as from equipment or staff that handle these.

How: It is good practice to have:
- Linear process flow, failing that the process should be designed to avoid backtracking.
- Separate locker rooms, and separate break and lunch rooms for low (raw) and high care (post *Listeria* control step) staff.
- Separate equipment, storage, staff, waste collection including drains, protective clothing for each area.

How:

- Hygiene facilities available on entry to the high care such as an ante-room (locker room) with boot and clothing exchanges and at least hand and boot washing facilities and the inclusion of barriers that prevent entry without the completion of hygiene routines.
- Positive air pressure in the rooms or areas where RTE food is being handled prior to packaging. The high care areas should be maintained at a higher air pressure (i.e. above atmospheric air pressure) than low care/raw food areas as this will prevent contaminated air entering the hygiene high care area.
- Calibrated pressure measuring and recording devices should be used to monitor the air pressure and the response and corrective actions should be pre-determined in the event of a failure.
- See figure 3 for an example of physical separation.

Figure 3: Physical separation



10.3.2 Separation by distance

What: Separate processing operations by distance when they occur in the same room and space permits, to allow the separation of raw ingredients through to finished RTE product areas.

Why: The finished RTE food may be contaminated with *Listeria* from raw products or ingredients as well as equipment or personnel that handle these during any stage of processing exposed food.

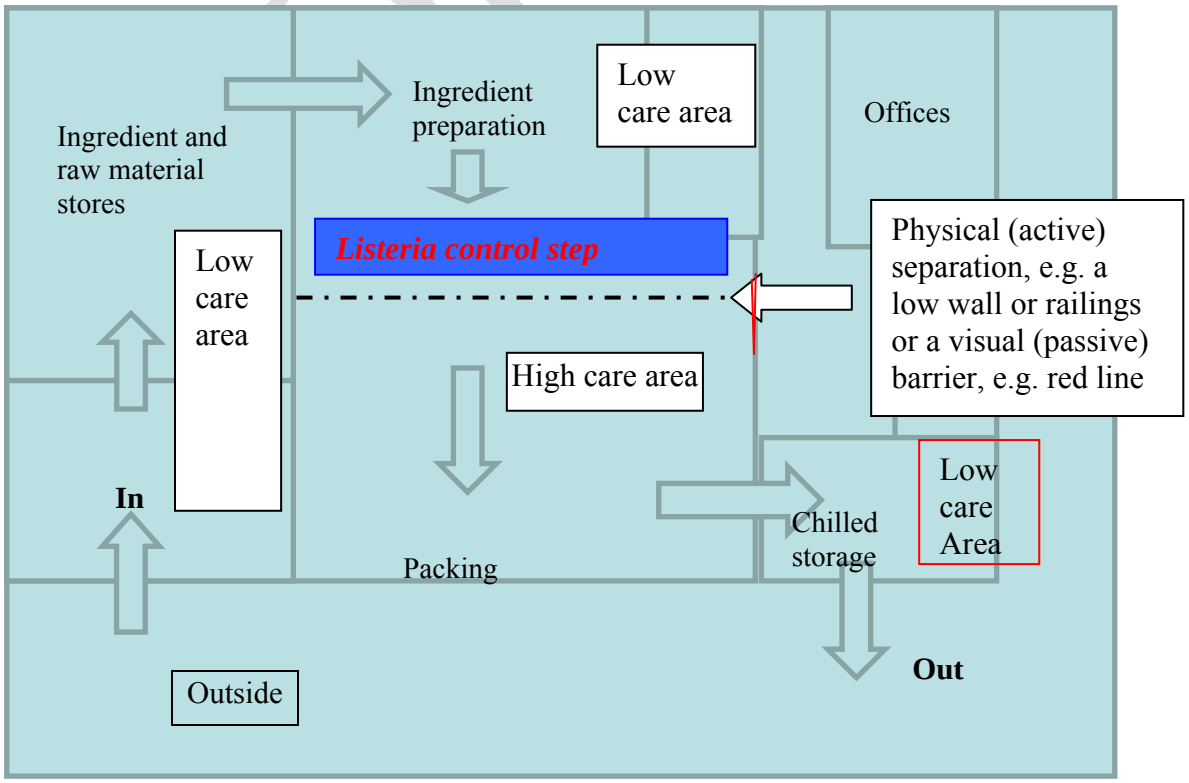
How:

- Linear process flow is ideal, failing that the process should be designed to avoid backtracking and movement between the low-care and high-care areas.
- Use dedicated staff and equipment for operations in the low-care or high-care areas to prevent cross-contamination.
- Use separate storage areas, waste collection, protective clothing and operations for each area.
- Clearly delineate the high-care area from the low-care areas, e.g. physical barriers such as a fence or bar, or passive barriers such as a red line on the floor or different coloured floor tiles.
- Where possible there should be two entry doors to the processing room, one for each of the low-care and high-care areas. The doors should be clearly labelled and/or colour coded.
- Where there is only one access door into the processing room, this should ideally open onto a 'safe' zone from where access to the low-care and high-care areas can be made.
- Avoid the use of 'high-care corridors' through the low-care area.

- Have separate locker rooms and/or anterooms for staff that process the raw or RTE food.
- Ensure there are separate hygiene facilities available on entry to the high-care and low-care areas, such as an ante-room with boot and clothing exchanges and at least hand and boot washing facilities.
- Include barriers that help ensure the completion of hygiene routines prior to entry.

- See figure 4 for an example of separation by distance.

Figure 4: Separation by distance



10.3.3 Separation by time

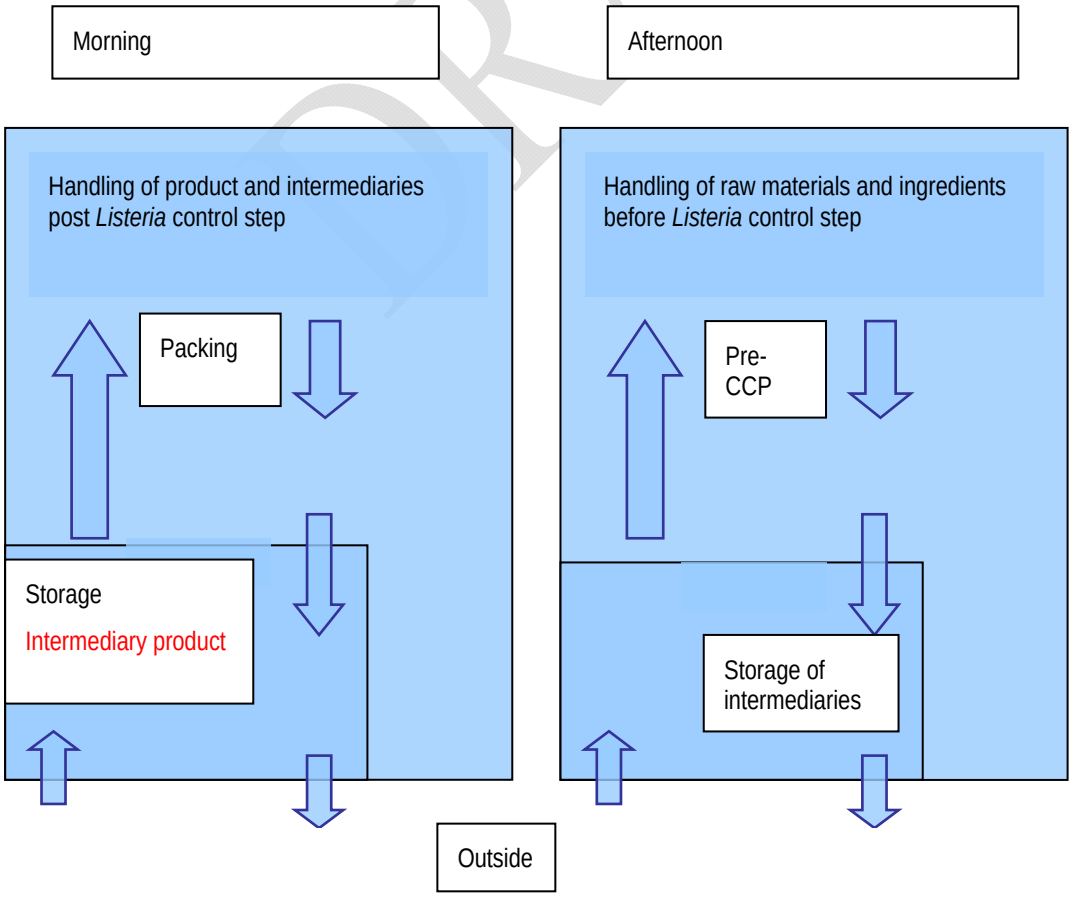
What: Separate processing operations by time when they occur in the same room and space is limited. Process raw ingredients after finished RTE product.

Where possible use dedicated personnel and separate equipment for different tasks or schedule similar tasks for similar times.

Why: The finished RTE food may be contaminated with *Listeria* from raw products or ingredients as well as equipment or personnel that handle these during any stage of processing.

How:
- Schedule tasks with the same processing stage to occur at the same time. Perform tasks with the RTE food, e.g. slicing and packing before those with raw product and ingredients, e.g. mixing, cooking or smoking, etc.
- Where a number of different products are produced in the same room, try to schedule the tasks and products so that the RTE foods are handled first and where possible raw ingredients according to the level of risk.
- Clean and sanitise the work surfaces in between processing products
- Ensure there are hygiene facilities available on entry, such as hand and boot washing facilities, boot and clothing exchanges and barriers to entry without completing hygiene routines.
- Figure 5 shows how separation by time may occur

Figure 5: Separation by time



10.4 PRE-OPERATIONAL HYGIENE CHECK

What: The pre-operational hygiene check or pre-op or the pre-start up checks is the inspection and checks of the equipment and settings prior to the start of processing

Why: The equipment may be a source of contamination if it has not be cleaned and sanitised thoroughly and correctly. If the settings for temperature and times have been altered then this may not result in a CCP specific to eliminate *Listeria*, a *Listeria* control step, similarly if the pH meter or measuring scales are not regularly calibrated this may not result in the appropriate microbiological hurdles.

How:

- The (pre-operational hygiene) checks of facilities and equipment should be conducted by a responsible employee who has the authority to delay the start of processing until any problems identified have been rectified. This check should ensure that operations only begin after cleaning and sanitation requirements have been met.
- The pre-operational hygiene check is a systematic check of all the equipment and surfaces and should include any problems that you've identified as problems or failures on previous occasions.
- A comprehensive check-sheet should be developed, for example with the assistance of a consultant etc. to ensure that all equipment and surfaces are covered.
- Staff responsible for cleaning and sanitising and the pre-operational hygiene checks should be trained and periodically conduct further training.
- Observations made during pre-operational hygiene inspection and corrective actions for any deficiencies identified should be documented in an appropriate check sheet or record form and should be included in further assessments.
- Repetitive failures of the cleaning and sanitation programme should be investigated and the causes corrected.
- Where problems are identified during the pre-operation hygiene check, the area or equipment should be cleaned and sanitised again as appropriate and then checked before processing commences, e.g. spot clean. When spot cleaning it is important to consider the risk to other equipment and surfaces from the use of water or from the dismantling of equipment, e.g. use a cloth impregnated with sanitiser or isolate the area using sheets to avoid contaminating the surrounding area. The corrected item should be rechecked before operation begins, and should be recorded.

10.4.1 Calibration of equipment

What: Equipment used for critical measurements should be calibrated, e.g. thermometers, temperature recorders, etc

Why: Non-calibrated equipment may not be functioning correctly and if this forms part of a *Listeria* control step then it may result in the survival of *Listeria*.

How: Items requiring calibration may include thermometers, temperature recorders, scales, pressure sensors, heat sensors, chemical assessment equipment and flow meters, etc.

10.5 CONTROL OF INPUTS

What: Visual checks and monitoring to ensure the quality and safety of the inputs used in the processing of RTE-foods.

Why: The inputs including raw unprocessed ingredients, intermediaries, water, air and packaging may all be a source of *Listeria.*

How:
- Visually check for signs of deterioration, damage to packaging and/or seals
- Check the quantities required
- Check and ensure that the ingredients and intermediaries are within the best-before and use-by dates
- Record the batch numbers used of the ingredients and packaging
- Check the information provided by your supplier including any operator specifications and test results
- Microbiological monitoring of the incoming material should be considered if the incoming material is from a new supplier or the operator has doubts about the origin or safety. Consider whether the material will receive a listericidal treatment (a CCP specific to eliminate *Listeria*) or will be added to or in contact to the RTE food, e.g. a fruit sauce added to ice-cream, or the packaging materials, etc.
- Monitoring of the intermediaries or packaging per batch may include rapid testing or laboratory analysis for *L. monocytogenes* or *Listeria spp*. It is recommended that the sampling plan includes 5 samples (n=5). When using a new supplier or before a history is established of the safety of the material, batches should be sampled at a greater frequency. Once the history is established the frequency can be become less frequent.

10.6 CONTROL OF THE PROCESS

What: To ensure that the process or product parameters are met during processing

Why: If the processing parameters, e.g. time and temperature for cooking or refrigeration, etc. are not achieved then any *Listeria* present will not be eliminated and may be able to grow to levels that could cause listeriosis.

If the microbiological hurdles or product parameters, e.g. aqueous salt concentration, water activity, pH, nitrite, phenol, lactic acid, gas concentration and mix in any sealed packaging, etc. parameters are not achieved then this may permit any *Listeria* bacteria to survive and grow in the RTE food.

How:
- The settings on the equipment should be checked during pre-operational hygiene checks and calibration of equipment, e.g. ovens and measuring equipment
- The amounts of ingredients added should be checked to ensure the correct amounts are used each time and concentration is achieved in the end product
- The time/temperature, pH, time to achieve the required pH drop, etc. should be monitored during processing and throughout storage. (Note: The processes and parameters that should be recorded are likely to be specific to the RTE food

that you are processing).

- The information should be recorded.

Questions during consultation:

Should guidance related to the validation of CCPs as being listericidal be included in this document? And, if so what level of stringency should be included, is a 6D reduction appropriate?

Should further guidance on the validation of high pressure processing, in-pack pasteurisation, fermentation, microbiological hurdles and other further processing techniques be provided in relation to *Listeria* control?

10.7 END PRODUCT

What: Visually check the RTE food (end product) and process controls and parameters

Why: The results from microbiological monitoring of the RTE food will usually take a number of days to return from the laboratory. A visual check of the product and review of the process controls will provide an early indication as to whether there have been any problems that may not have resulted in a *Listeria* control step or contamination.

How:

- Visually inspect the RTE food. Check that the integrity of the seals on the packaging where appropriate.
- Check the processing parameters, e.g. time and temperature, etc. and records for each batch to ensure that nothing untoward occurred.
- Consider product testing using rapid tests or laboratory analysis to ensure that the specified limits or parameters have been achieved. The specified limits/parameters may be established in legislation (e.g. Food Standards Code 1.6.1), operator own limits or customer limits.

10.8 CORRECTIVE ACTIONS

What: The handling of affected product and procedures to avoid the reoccurrence of the failure

Why: To allow changes to be made to a process to prevent it from occurring again will prevent an unnecessary and costly RTE food recall.

How:

- Determine the effect of the process control failure. Each process control failure should be treated on a case-by-case basis.
- Consider how the affected (or at risk) product will be handled, e.g. place on hold and prevent distribution such as through clear labelling

10.8.1 Handling of Rework (reprocessed products)

What: Food operators should develop an action policy for handling of product to be reworked or reprocessed, including food that falls on the floor.

Why: Product that has either been returned to the processor or has failed in-house checks should be treated as high-risk material and a source of *Listeria* (for example during storage *Listeria* may grow and could contaminate any unpackaged food that it comes into contact with either in store or during a processing run).

How:
- The reprocessing of product should be conducted using a validated process that has been shown will eliminate *Listeria.*
- Food that falls onto the floor during processing, processing, catering, retail sale should be considered as waste and should not reprocessed as rework.
- Re-grade – could the RTE food be provided as a raw ingredient for a food that would receive a listericidal treatment, e.g. cooking.
- If *Listeria* is present, consider whether it is possible to enumerate the levels of *Listeria* present. Refer to Part 4: Corrective Actions for further guidance on the handling of RTE-foods contaminated with *Listeria.*
- Depending on the storage conditions, shelf-life established with respect to *Listeria*, instructions for use and general knowledge about whether a food is assumed to always be ready-to-eat consider whether it can be provided to the general population for consumption rather than to a specific vulnerable group.
- Dispose.
- Prevent the reoccurrence of the failure. Amend the procedures, retrain staff, repair or replace equipment and amend the source of ingredients.

11 End product

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11.1 LABELLING AND PRODUCT INFORMATION

What: The labels should comply with the requirements of the Food Standards Code.

Dates either 'best before' or 'use by'.

Where appropriate product labels should include information on safe handling practices and/or advice on the time frames in which product should be eaten.

Why: Although food operator's should have a number of controls in place to prevent the contamination of RTE food with *Listeria*, the storage conditions may be a key factor and it will be important to inform the consumer so that they do not become ill.

How: Issues to consider include:

- shelf-life with respect to *Listeria* not only quality ;
- instructions for storage and consumption;
- reheating or storage instructions

Consumer education and information should be directed at:

- at risk groups
- caterers, food retail etc. to provide instructions on how best to store and present the RTE food for consumption.

11.2 STORAGE AND TRANSPORT

Question for consultation:

Would the provision of a graph to show the growth rate/of Lsiteria at different temperatures be a useful addition to this guide to illustrate the importance of temperature control?]

What: Products should be stored and transported appropriately e.g. chilled or frozen as soon as possible after processing.

It is important to maintain the separation of raw from RTE foods during storage and transportation

Why: Raw ingredients or foods may be a source of contamination.

Listeria can grow under refrigeration temperatures it is important to maintain the chill chain to prevent the growth of any bacteria present

How:

- Use data loggers to monitor transport temperatures
- It is necessary to establish the time/ temperature combination used for refrigerated storage, < 6°C (preferred temperature 2-4°C). The temperature of refrigeration units should be monitored and corrective actions determined in case of failure.
- The temperatures of freezers used for storage should be monitored and controlled continuously.

12 Cleaning and Sanitation – high care

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12.1 INTRODUCTION TO CLEANING AND SANITATION

What: This cleaning and sanitation section is intended for use by RTE food operators in the following circumstances:

- where there is physical separation:
  - in the high-care area ,immediately after a validated *Listeria* control step treatment and where these are exposed before packaging, where there is physical separation or;
  - In the high care area, for RTE foods that are not subject to a control step where these are exposed before packaging;
- where separation occurs by distance; and
- where separation occurs by time.

Why: More stringent controls, including the effective implementation of cleaning and sanitation procedures, are required in these areas to prevent or minimise post-process contamination of RTE foods. Controls are particularly targeted to prevent *Listeria* contamination of, food, product contact surfaces and the processing environment.

How: A RTE food operator producing should:

- thoroughly clean and sanitise all product contact and non-product contact surfaces, utensils, equipment, fixtures and fittings:
  - after raw foods and/or ingredients have been handled or processed and maybe considered to be contaminated;
  - between processing of raw and RTE foods; and
  - as determined by your assessment of cleaning procedures and frequency.
- when slicing and packing RTE foods, the slicer, work tables and other product contact surfaces should be checked as part of the pre-op process and sprayed with a non-rinse sanitiser before starting slicing at the start of each day and at regular intervals during the day (e.g. before breaks).
- cleaning detergents and sanitisers that have good activity against *Listeria* should be used for cleaning and sanitising (Check with the chemical manufacturer).

12.2 GENERAL CLEANING AND SANITATION

What: Effective cleaning and sanitising is one of the key risk mitigation tools to manage *Listeria*.

Why: Bacteria have specific requirements for growth and survival, such as water, temperature and nutrition. Inadequate or inefficient cleaning and sanitation can

provide bacteria with these requirements.

When *Listeria* is able to grow in a niche or as a biofilm normal cleaning and sanitation is less effective at removing them. Any *Listeria* present can contaminate food directly or indirectly by building up on product contact surfaces and contamination may spread.

Contamination of the RTE food with *Listeria* is unacceptable.

How:
- Cleaning and sanitation should ensure that all areas within the premises, including buildings, facilities and equipment, are maintained in a hygienic and sanitary condition by implementing an effective cleaning (and sanitation) procedures.
- The operator should have documented cleaning and sanitation procedures.
- The procedures should be made available and ensure that cleaning staff have been trained in the application of these.
- It is recommended that the operator has a system to monitor the effectiveness of the cleaning and sanitation programme, i.e. how well the building and equipment has been cleaned and sanitised.
- Heating the high care area after cleaning will help to facilitate drying and may help to reduce levels of *Listeria* present and minimise potential contamination

12.2.1 What method of cleaning should be used?

What: Minimise the amount of wet cleaning undertaken in the high care area and try to avoid the use of high pressure hoses.

Why: Cleaning should be carried out in a way that prevents the contamination of products, equipment and other product contact surfaces and materials (e.g. packaging materials); or previously cleaned areas, facilities or equipment.

When cleaning, it is important to pay close attention to surfaces, areas and equipment used to handle exposed product after a listericidal step, e.g. cooking, pasteurisation etc., to prevent contamination.

Bacteria require moisture to be able to grow; the food processing area has food, water if added and is warm. Minimising the use of water will prevent *Listeria* bacteria from surviving.

How:
- The cleaning programme should be designed and developed according to the nature of the product and the processing environment.
- Most high care processing areas will require a wet cleaning routine.
- Dry cleaning will be more appropriate for areas where dry materials are handled and stored (e.g. dry store room, dry ingredient weighing or batching areas).
- Other areas will require a combination of both methods, for example, the packing areas should be kept dry during operations and therefore should only be dry cleaned during processing, but will require wet cleaning at the end of the processing day
- For example, where dried products are produced, e.g. dried powders, water should not be used and areas will be likely to be cleaned using vacuum

cleaners.

- Alternatively some food operators may have closed processing systems, e.g. pasteurising milk, where Cleaning in Place (CIP) will be used.

12.3 SETTING UP A CLEANING AND SANITATION PROGRAMME

12.3.1 Cleaning and sanitising chemicals used

1. Discuss your particular process and needs with the chemical supplier so ensure that the cleaning and sanitation chemicals are correct for the intended purpose. Consider how the chemicals will be applied, what you are cleaning, the hardness of the water, the particular RTE foods processed (e.g. blood, fat, starch, cooked-on product, e.g. in a premises handling animal products the cleaning detergents will typically contain alkali (to remove protein) and chlorine (to remove fat)).
2. Avoid using a combined cleaning and sanitising.
3. Follow the instructions provided by the manufacturer and supplier of cleaning and sanitiser chemicals.

The chemicals should be used at the concentrations and contact times specified by the manufacturer for them to be effective and to remove source of nutrition and contamination.

12.3.2 What should be cleaned?

What: Make an assessment of all equipment and surfaces in the premises to determine what needs to be cleaned and how.

Why: Equipment in the high care area may be complex and have hidden surfaces which are difficult to clean and could provide harbourage sites for microbial growth

How:

- Consider the complexity of the equipment used during processing and determine how it may be dismantled and cleaned and sanitised thoroughly.
- Check the equipment manufacturer's specifications for the areas of the equipment that require cleaning and compare these with your own assessment of areas that require cleaning.
- Run the equipment and then determine where waste food and water accumulates and how these will be tackled.

It will be important to be able to take apart the equipment to target those hidden areas that may collect a build-up of waste and residues. These are ideal harbourage sites for *Listeria*

The following table may help to identify areas and equipment that should be cleaned:

Area	Example
Ancillary items	Rubbish bins, skips
Ancillary	Compressed air lines, worn or cracked rubber seals around doors, hollow bump guards on

services	bottoms of doors, Plexiglas shields
High care	Ovens, packing room, freezers, refrigerators/chillers, the ante-room or staff changing room, etc
Personnel hygiene	Wash basins, aprons, gloves
Premises	Cracked walls, floors, ceilings, wet insulation, standing water, switches, handles
Equipment	Trolleys, racks, conveyor belts, slicers, dicers, mincers, brine injection equipment, weighing scales, switches, rubber seals, open bearings, equipment motor housing, hollow frames, ice makers, damaged pipe/hoses, hollow box cutters, packaging equipment including vacuum packaging machines, hand tools, hoppers, on-off valves, the space between close-fitting metal-to-metal or metal-to-plastic parts, cracked tubular supports

12.3.3 Frequency of cleaning and sanitation

What: The frequency that each surface will be cleaned and sanitised will depend on things such as the process, the product, the ability of *Listeria* to grow on the product surfaces and product, the operation temperature of the room, the down times and product range.

Why: Some surfaces will require:
- in-process cleaning, e.g. between handling raw and RTE foods
- cleaning between batches
- cleaning at the end of the shift, and
- a major clean down at the end of the day

How:
- Determine the frequency of cleaning of sanitation for all the different surfaces (equipment and infrastructure) that require cleaning and sanitising.
- Any special instructions or operating procedure as to how these items should be cleaned and whether they require dismantling, tackled in a specific order or the electrical systems protected should be recorded.
- Table 1 provides an indication of suggested frequencies.

Table 1. An example of a table showing how and when cleaning and sanitation should occur for different surfaces

	In-process cleaning	End-of-day cleaning	Pre-operational check
High-care area – product contact surfaces			
Equipment and surfaces	When? How? Any special instructions?	When? How? Any special instructions?	When? How? Any special instructions?
Non-product contact surfaces (high and low care areas)			
Equipment and surfaces	When? How? Any special instructions?	When? How? Any special instructions?	When? How? Any special instructions?

Examples of cleaning and sanitation frequencies

Product contact surfaces, including processing and conveying equipment (e.g. tubs, trolleys, trays), should be cleaned:

- at least at the end of each working day;
  - whenever surfaces become unacceptable or come into contact with waste; and
  - whenever necessary to prevent cross contamination between raw and RTE-products.
- Any equipment or machinery which has been used but is temporarily idle should be cleaned prior to reuse if the delay is in excess of 4 hours. When equipment is located in a non-refrigerated processing area, more frequent cleaning should be considered as bacteria will grow faster at these temperatures.

Floors

- Floors in the high care area should be cleaned daily.
- Particular attention should be given to cleaning and sanitising cracks or damage to the floor or coving seals. Damage should also be repaired by the maintenance staff.
- Cracks are potential for reservoir for *L. monocytogenes*, and if food scraps are also ground into a crack, the bacteria can grow to dangerous numbers.

Drains, covers and sieves in processing areas should be cleaned and sanitised daily.

- During processing, waste water should be directly removed to the drains.
- Drains should be cleaned daily as part of the daily major clean down (including sanitising) but they should also receive more intensive weekly clean using chemicals that are able to remove any build-up of residues and micro-organisms.

Visible contamination on **walls and doors** should be removed by using foam, etc. Avoid using high pressure hoses in the high care area.

Benches, tables and framing

- All surfaces of benches, tables, racks and frame should be cleaned and sanitised daily.
- Particular attention should be given to the underside, the legs, wheels and rollers and other areas where dirt and food scraps can accumulate, e.g. attachments to the walls or floors.

Conveyor belts used for transferring exposed product should be cleaned and sanitised at the same frequency as product contact surfaces in any food area.

- Conveyors are usually difficult to clean because of crevices which are part of the design. Particular attention should be given to the following areas:
  - Underside of belts
  - Under drive motor covers
  - Supports for plastic and fibre belts
  - Hollow rollers
  - Points where dirt and food scraps can accumulate.
- One way to deal with conveyors is for them to be pre-cleaned to remove build-up of waste and food, followed by low pressure rinsing and application of foam detergent/sanitiser.

The **ceiling, overhead pipes and other structures** in the high care areas should be inspected regularly and cleaned as appropriate to prevent contamination of food from condensation and other contaminants.

- Daily procedures should include the removal of obvious contaminants
- Where any overhead structure is a constant source of contamination, it should be regarded as a product contact surface and cleaned according to the requirements of those surfaces.
- Clean, sanitise and maintain heating, ventilation and air conditioning units on a scheduled basis.

Waste collected during the day should be removed from the area and disposed of appropriately.

- Avoid moving uncovered waste bins through the high care area whilst product is exposed. Where possible waste should be covered and moved during breaks or prior to the major clean down.
- The containers should be clean and dry before being returned to the high care area

When **footbaths** are used, they should be maintained properly with effective concentrations of sanitiser so that they do not become a source of contamination.

- An automated foam disinfectant spray may be used on the floor where people, carts, trolleys, etc. enter the high care area.
- Products, packaging material and other materials that may be contaminated during wash down should be removed from the high care area and stored in appropriate locations, or they should be protected by covers, before wet cleaning is started.
- Cleaning water and steam should be contained within the immediate area that is being wet cleaned.
- Floors should be cleaned by a low-pressure water hose or other effective means. Product contact surfaces should be allowed to dry before use.

Appendix 1 includes an example of a cleaning and sanitation programme

12.3.4 How to avoid cross-contamination

What: Avoid contaminating the high care area during cleaning and sanitation.

Why: Cleaning and sanitation may introduce *Listeria* bacteria from low care or external areas if control measures are not taken.

How:
- Only use low to medium pressure water hoses. High pressure water hoses cause splashing, and can create aerosols which can carry contaminants and micro-organisms for considerable distances.
- Any pooling of water should be swept into the drain as soon as possible.
- Any cloths and scourers that have been used should be disposed of or sanitised immediately after use.
- All brushes, scrapers and other tools should be cleaned, sanitised and hygienically stored
- Condensation on the ceiling and overhead structures due to the use of hot water or steam during cleaning should be removed before the start of operation.
- When steam cleaning pieces of equipment, cover in a tarpaulin and seal. This will retain the steam and encourage it to penetrate into the hidden surfaces.
- For metal pieces of equipment, e.g. trolleys and racks, etc. These can be placed into the oven/smoke house as part of the routine cleaning and sanitation regime.
- Make sure that equipment and surfaces are dry before operation commences

12.4 CLEANING EQUIPMENT

12.4.1 Use of different cleaning equipment

What: Dedicated cleaning equipment should be used:

1. In the high care area,
2. To clean the floors and drains,
3. for product contact surfaces and non-product contact surfaces

Why: This prevents the cross-contamination and introduction of *Listeria* from other areas to any product, packaging or product contact surface.

How:
- The colour coding of cleaning equipment and supplies helps to differentiate those used in different areas, and those used to clean the floor and drains.
- Clean and sanitise the cleaning equipment following use.
- Cleaning and sanitising equipment used for the high and low care areas should be stored separately.

> The cleaning and sanitation equipment has been found to be the source of a *Listeria* incident in a RTE food operation. *L. monocytogenes* was detected in the inside of a hose that had been used to clean the high care area.

12.4.2 What should the cleaning equipment be made of?

What: The cleaning equipment should be easily cleaned and non-absorbent.

Why: Hoses and other cleaning equipment have been sources of *Listeria* contamination in past food incidents

Porous and absorbent items (e.g. rags, wooden handled tools) are difficult to clean and they harbour bacteria.

How:
- Cleaning equipment that is re-used (e.g. brushes, buckets) should be sanitised prior to reuse, and maintained in a good state of repair.
- The use of steel wool should be avoided. If used, the affected area should be thoroughly washed and checked for contamination by metal fibres.
- Hoses should be stored on reels and racks when not in use.
- Reusable cleaning equipment may be stored in a container of sanitiser solution.

12.5 CLEANING OF SPECIFIC FACILITIES AND EQUIPMENT

12.5.1 High-care chillers and blast freezers

What: Chillers, refrigerators and blast freezers should be emptied, and cleaned and sanitised periodically.

Why: Chillers, refrigerators and blast freezers may be an in-direct source of *Listeria* contamination, as the cool environment will allow *Listeria* to survive and access to these may introduce further sources of contamination.

How:
- If the chillers, blast freezers and refrigerators are shared by the high and low care areas, i.e. they are used to store raw ingredients, work in-progress and unpackaged and packaged product.
- Work in progress chillers and refrigerators should be included in the cleaning and sanitation programme as high care areas. The outside door handles and rails should be cleaned and sanitised during every major clean-down. It may be appropriate to clean and sanitise the shelving and handles inside chillers, refrigerators and blast freezers less frequently.
- The frequency of cleaning fans, evaporators and/or fumigating the room should be determined according to the nature of the food and microbiological monitoring
- In the absence of microbiological monitoring, the fans and evaporators should be cleaned at least once [each season] and whenever any substantial maintenance work is carried out in the chiller, refrigerator or blast freezer or to its refrigeration equipment.
- Using an industrial drier following cleaning and sanitation will not only dry the room, and remove moisture but it will also help to reduce Listeria contamination.

12.5.2 Air conditioning and refrigeration units

What: The cleaning coils, fans, drip trays, drainage pipes, and vents for every air conditioning unit should be cleaned regularly.

Why: Damp and warm areas may form a niche environment for *Listeria* to grow and form a niche or harbourage site.

How:
- The frequency of cleaning should be linked with the process, type of RTE food, the hygiene area and the environment conditions. For low care areas, monthly cleaning may be sufficient but for high care areas cleaning may need to be done more frequently.
- It is usually impossible to get into ducts which transport cold air from the refrigeration unit out to vents. Sanitising is best done using a fogging machine. If possible, place the fogger in the ducting system and allow sanitiser to be blown through the overheads and down into the room.
- Filters of the cold air ducting system should be replaced regularly.

12.6 RECORDS

What: Cleaning records should be maintained and signed off by the responsible person.

Why: Having a record helps to demonstrate that procedures are operating correctly and may provide an indication of a possible source of *L. monocytogenes* in the event during the routine microbiological monitoring.

See Part 3: Monitoring and Part 4: Corrective Actions for more information

How: As a minimum the cleaning record should include:
- what was cleaned and sanitised,
- date and time
- an indication of whether it was a full clean-down or in-process cleaning during staff breaks etc
- results of pre-operative hygiene checks, any deficiencies and the corrective action taken
- results of the cleaning and sanitation verification and monitoring and any corrective actions taken
- record of cleaning and cleaning monitoring training

12.7 CORRECTIVE ACTION

Refer to your procedures.

Consider:
- Retraining periodically
- Investigation of the source of problems

Refer to Part 4: Corrective Actions for more information when *Listeria spp.* is detected in the RTE food or high care area.

12.8 MONITORING, REVIEW AND VALIDATION OF CLEANING AND SANITATION

What: The cleaning and sanitation programme should be subject to monitoring and review to determine compliance with documented procedures, the effectiveness of the cleaning and sanitation programme and to modify as necessary.

Why: The frequency of monitoring and review should be sufficient to give confidence that the cleaning and sanitation programme is operating effectively as it is only as good as the staff that apply it.

12.8.1 Monitoring

How:

- Options for monitoring and other in-house checks should include:
  - Visual and other sensory assessment made during preoperational checks
  - Visual checks of the cleaning programme in action to ensure correct measurement and mixing of cleaning chemicals, correct strength of prepared cleaning solutions and proper observance of contact times
  - Observation of the cleaning staff to ensure that cleaning and sanitation is conducted properly including dismantling of equipment, dedicated cleaning equipment, etc.

This should occur even when the cleaning and sanitation programme is contracted to external workers

- For additional assurances it is recommended that you consider environmental analysis:
  - microbiological testing, e.g. Aerobic Plate Count (APC); taking swabs or contact slides for laboratory analysis; and
  - hygiene test swabs designed for operator use, analysis and interpretation such as ATP monitoring, protein testing or specific allergen tests.
  - contact slides and hygiene test swabs should be used in accordance with the manufacturers' instructions for application and, where appropriate, calibration.

- Record the results of the environmental analysis in a spreadsheet or table. Reviewing the results will provide a baseline level from which it is possible to determine if a usual event occurs, e.g. cleaning is not carried out as efficiently as expected. It is possible to take corrective actions before the RTE product or product contact surfaces are contaminated. This is trend analysis.
- Environmental monitoring can also be used to verify the effectiveness of cleaning and sanitation programmes

12.8.2 Review

How: The cleaning and sanitation programme should be reviewed:

- Every month or less frequently as experience is gained to ensure that it is operating effectively
- After any change:
  - in the chemicals used, as these may have different contact times, or
  - in the process. Consider new product, new equipment, and change in layout or product or waste flow

12.8.3 Validation of the cleaning and sanitation programme

How:

- It is important to validate that the cleaning and sanitation programme is effective at removing waste food and residues but also is effective at preventing *L. monocytogenes* from finding a suitable niche or harbourage site.
- Run the process line for a month and look for a build up of materials in unexpected areas, e.g. behind guards, etc. then review the cleaning and sanitation procedures until you are satisfied that the procedures are effective

13 Specific food issues

Amendment 0

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Question for consultation"

This guidance document was intended to focus on providing generic Listeria-specific GOP that apply to all/most RTE food processors and manufacturers. Are there any specific Listeria-specific GOP for a specific food industry that should be included here, especially where these are not included in other MAF Codes of Practice?

14 References

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Tompkin, R.B. (2002) Control of *Listeria monocytogenes* in the food processing environment. J. Food Prot, 65, 709-725

15 Appendix 1

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15.1 AN EXAMPLE CLEANING AND SANITATION PROGRAMME

A typical cleaning and sanitation programme for food operators processing RTE foods, such as cooked meats, smoked fish, fresh-cut pre-packaged salads, sandwiches, cheeses, etc may include the following steps:

1. Dry Clean – remove food scraps
    - Use a brush or vacuum to physically remove soil, dirt or scraps from the area. Wipe with detergent/disinfectant dampened cloths to increase removal.
2. Dismantle equipment
    - Dismantle complicated equipment
    - All equipment and machines should be disassembled in accordance with manufacturer's instructions and the operator's own investigations before thorough cleaning and sanitising of all parts and surfaces. Particular attention should be given to areas where food and water waste builds up and other areas that are hard to reach areas, e.g. slicers.
    - The equipment may require more extensive dismantling on a scheduled basis, e.g. weekly to ensure that all areas of concern have been addressed.
    - Cleaned equipment parts should be placed on clean tables, trolleys or shelves while drying.
3. Pre-rinse
    - Rinse with warm water.
4. Apply the cleaning detergent
    - The method of applying the cleaning detergents will depend upon the specific area/surface/equipment.
    - Apply a detergent via cleaning tool such as a cleaning cloth, scourers, brushes or via automated foaming system.
    - Some pieces of equipment may also be put into soak before scrubbing
5. Leave the detergent and scrub
    - Leave the cleaning detergent solution, foam or gel on all surfaces for the time specified by the manufacturer to allow the chemical reactions to take place.
    - Scrub the surfaces using a brush or scourer (or other mechanical action) to loosen and remove dirt.
6. Rinse and inspect
    - Rinse the detergent solution off the surfaces with potable [warm] water
7. Apply the sanitiser and leave for the required contact time

The surfaces should be free of food, soil, or scraps and chemical residues for the sanitiser (disinfectant) to work effectively.

- The sanitiser should be effective against *L. monocytogenes* or *Listeria spp*. or any other micro-organism of concern. Methods of sanitising include:
  - Soak sanitiser, e.g. using hot water and the sanitising chemicals – for a specified time and temperature, usually for knives, gloves and small utensils
  - Spray sanitiser, e.g. chemicals – application of approved sanitisers (e.g. halogens, quaternary ammonium compounds) at the concentration and leave it on all surfaces for the time recommended by the manufacturer.
  - Steam – all surfaces should be heated for a specific time and temperature
  - Aerial sanitising or fogging – it can be useful in high care area and should only take place once all cleaning and sanitisation of food contact surfaces has taken place
  - Place appropriate metal equipment into the oven/smokehouse. This is an effective way of sanitising the equipment when incorporated into the routine cleaning and sanitation regime

8. Rinse – if required
   - Rinse off the chemical sanitiser with potable [warm] water and drain (not needed if a non-rinse sanitiser is used);
9. Reassemble and leave equipment so that it's dry at the start-up
   - Ideally all equipment and food contact surfaces that have been wet cleaned should be dry before processing (e.g. slicing, packing) starts wherever possible as it is known to reduce cross-contamination.
   - The use of driers in the high care areas will assist in drying equipment and floors. This will help to reduce any possible *Listeria* contamination
10. Pre-operational check
    - The pre-operational (pre-op) checks of facilities and equipment should be conducted by a responsible employee who has the authority to delay the start of processing until any problems identified have been rectified. This check should ensure that operations only begin after cleaning and sanitation requirements have been met.
    - You should investigate and correct the causes of repetitive failures of the cleaning and sanitation programme.