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Guideline for the Control of Listeria in Food Service to Vulnerable Persons

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Purpose

Listeria is one of many risks to be considered by a business captured by Standard 3.3.1 or businesses that supply to these businesses. This guideline forms part of the SA Health - Food Safety Guidelines for Food Service to Vulnerable Persons, and the two guidelines should be read in conjunction with each other. As *Listeria monocytogenes* can cause serious health complications or be life threatening to vulnerable persons, businesses that prepare and/or serve food to be consumed by this population should implement specific control measures to prevent foodborne illness caused by this organism.

Food businesses that are captured by Food Safety Standard (FSS) 3.3.1 or businesses that supply to these businesses will benefit from this guideline in assisting them to develop and implement their own site-specific Listeria Management Program (LMP). For those businesses captured by FSS 3.3.1 (E.g. hospitals, aged care facilities and organisations that prepare and deliver food to vulnerable persons), their LMP forms part of their Food Safety Program (FSP) which states how they will control identified food safety hazards associated with the food handling activities of their business.

Listeria is not considered a hazard for healthy children, as healthy children are no more susceptible than the general public in regard to the effects of this organism; therefore, childcare centres are not required to implement specific control measures for Listeria.

1. Listeria Overview

Listeria monocytogenes is a bacterium that causes an uncommon but potentially life threatening infection called listeriosis and mainly affects certain vulnerable groups. This is caused by eating food contaminated with the bacteria.

Those most at risk are:

- > pregnant women, their unborn and newborn children;
- > older people (generally considered to be persons over 65 years);
- > people of all ages whose immune systems have been weakened by disease or illness (for example, cancer, leukaemia, HIV infection, diabetes & liver or kidney disease); and
- > anyone on medication that can suppress the immune system.

Organism Description

Listeria monocytogenes belongs to the genus *Listeria* along with over 10 other species, however this pathogenic species is most widely known in the food industry.

Other common non-pathogenic species include *L. innocua*, *L. welshimeri* and *L. seeligeri*, and detection of these should still be treated as serious as it identifies favourable conditions for survival of *Listeria* in the environment or product.

Listeria can also be found throughout the environment. It has been isolated from domestic and wild animals, birds, soil, vegetation, fodder, water and from floors, drains and wet areas of food processing facilities.

Please note, unless otherwise specified, all future references to 'Listeria' in this document is referring to the pathogenic organism Listeria monocytogenes.

2. Symptoms

Healthy people may be frequently exposed to *Listeria* without apparent symptoms or may only have a mild illness with an incubation period (time between infection and the symptoms) of usually 1 day (range 6 hours to 10 days).

Symptoms of listeriosis include:

- > sudden onset of fever;
- > headache;
- > muscle aches;
- > nausea, vomiting;
- > neck stiffness; and
- > gradual onset of confusion, decreased alertness.

For at risk populations, these symptoms may progress to more serious forms of the illness (invasive listeriosis), such as meningitis (brain infection), septicaemia (blood poisoning) and possible death. Infection during pregnancy can lead to miscarriage, infection of the newborn and stillbirth. After eating contaminated food the incubation period of invasive listeriosis can be anywhere between 3 to 70 days.

3. Growth and Survival Characteristics

Understanding the unique factors that enable *Listeria* to survive and multiply in food and in the food processing environment is essential for the effective management of *Listeria*. In food these include temperature, pH, water activity, salt concentration, absence of oxygen and the presence of preservatives. Under particular conditions, *Listeria* in food can rapidly grow to unsafe levels.

An important characteristic of *Listeria* is its ability to continue to multiply at cold temperatures and survive in frozen foods. Any ready to eat food that is contaminated with *Listeria* may eventually develop enough bacteria to be dangerous, even if refrigerated correctly at or below 5°C.

Listeria can multiply at temperatures as low as -1°C and as high as 45°C. *Listeria* is also able to survive for some time in low water activity environments (e.g. dry foods) and may survive drying processes. *Listeria* is not particularly heat resistant and is killed by cooking to at least 75°C (or equivalent time/temperature).

Listeria appears to be relatively tolerant to acidic conditions with a pH value less than 4.4 required to not support the growth. As a facultative anaerobe, *Listeria* can also grow in low oxygen environments such as vacuum or modified atmosphere packaging.

Listeria can prove difficult to control on food contact surfaces such as stainless steel because the bacteria can form persistent biofilms. Biofilms result in the bacteria being more resistant to physical and chemical agents intended to kill the bacteria and allow them to survive for extended periods with minimal nutrient supply. Biofilms in locations which are difficult to identify and clean can act as a persistent source of food contamination through the ongoing presence of *Listeria*. It finds harbourage in damp, cool places and as a result, will readily multiply on damp surfaces, on food processing equipment, in cracks, crevices, cool room door seals, drains and refrigeration equipment.

4. Control Measures

Listeria can be controlled but it is a continuous process where any failure to ensure that the controls are being implemented can have major consequences. The most important control measure for a

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food service facility is to prevent *Listeria* from entering the food handling area. Where preventing entry is not achievable, then minimising the impact of *Listeria* that is present is crucial.

Listeria may pose different levels of risk depending on the activities undertaken by a business.

Food businesses captured by Food Safety Standard 3.3.1 will need to:

- > identify the nature of the activities and services they provide,
- > consider any associated food safety risks; and
- > implement control measures.

The control of *Listeria* in food service facilities requires commitment at different levels. The challenges for controlling *Listeria* are considerable given its pervasive nature, salt and acidic pH tolerances, ability to grow well in low oxygen environments and arguably most importantly, its ability to grow and survive at or below normal refrigeration temperatures.

It should be understood that any surface or material which comes into contact with food is a potential source of contamination. *Listeria* poses a particular challenge as it is a common environmental pathogen that can become established in a food handling environment and continually contaminate work surfaces and food products. Due to frequent handling involved during processing and packing, and the fact there are no further process barriers i.e. cooking prior to consumption, ready to eat foods pose the greatest risk. In addition, *Listeria* growth can occur in many long shelf-life, refrigerated food products during storage and distribution.

Typical controls include:

- > implementation of menu controls for high risk foods;
- > implementation of safe food handling and preparation controls;
- > control of people entering the food handling environment;
- > environmental control through cleaning and sanitising programs;
- > maintenance of facilities and equipment;
- > implementation of use-by dates;
- > monitoring and verification; and
- > training.

Implementation of menu controls for high risk foods

Certain foods present a higher risk to vulnerable people due to increased potential for these foods to cause listeriosis. (Further detail can be found in the [FSANZ Compendium of Microbiological Criteria for Food](#)).

The principal factors that influence the risk to vulnerable people are whether:

- > the food supports the growth of *Listeria*;
- > the food is ready to eat (RTE);
- > the food will have an extended shelf life;
- > the food undergoes a processing step to kill *Listeria*;
- > there is a risk of post-process contamination; and
- > the product formulation supports the growth of *Listeria*.

Any of the above factors can influence the potential risk to vulnerable people and the factors are cumulative, meaning the more of these factors that are present, the greater the risk for vulnerable people. Raw materials and ingredients should be purchased from reputable suppliers, as per the business' approved supplier program and include *Listeria* Management Programs (LMP) if higher risk foods are purchased.

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Food items which are known to be of higher risk to Listeria contamination should be avoided and a safer alternative used (refer Table 1) with those foods listed examples and not an exhaustive list.

Table 1 identifies:

- > foods that businesses must take into consideration when designing menus for vulnerable groups;
- > foods that must be avoided (e.g. should not serve) because of the inherent Listeria risk;
- > foods where caution must be exercised (e.g. requires hazard controls, validation and or verification); and
- > possible safer food alternatives (e.g. safest option to serve).

Table 1 - Recommended Control Measures for Higher Listeria Risk Foods

Food type	Action	Control measures – options for controlling hazards
Vacuum Packaged (VP) or Modified Atmosphere (MAP) Packaged Cooked Ready-to-Eat Meat and Poultry	Avoid	> Pre-sliced meats from service delicatessens packaged or unpackaged.
	Caution	> Purchase from a licensed/accredited manufacturer with a Listeria Management Program (also applies to frozen, cooked RTE meats ⁵): <ol style="list-style-type: none"> 1) Pre-packaged, whole portions of unsliced ready-to-eat meats and poultry and slice in-house: <ul style="list-style-type: none"> ○ Limit shelf life of whole portions to 7 days¹ from opening ○ Limit shelf life of sliced and repackaged (VP or MAP) RTE meat and poultry to 7 days (if sliced from whole portion on opening)² ○ Ensure the above dates do not exceed the labelled shelf life or manufacturer's instructions; 2) Pre-packaged, pre-sliced ready-to-eat meats and poultry: <ul style="list-style-type: none"> ○ Limit shelf life to 7 days from date of packaging¹ from manufacturer or ○ Product in which the process, formulation or ingredients are designed to not support the growth of Listeria for the shelf life of the product³.
	Safer Option	> Cook meats in house; > Meats cooked in bag or post pack pasteurised (e.g. high pressure processed (HPP)); > Canned or shelf stable meats.
Fermented and/or Dry Cured Ready-to-Eat Meat⁶	Avoid	> Pre-sliced cooked or uncooked fermented and/or dry cured meats from service delicatessens packaged or unpackaged.
	Caution	> Purchase uncooked fermented meats from a licensed/accredited manufacturer with a Listeria Management Program: <ol style="list-style-type: none"> 1) Purchase uncooked fermented and/or dry cured meats in which the process, formulation or ingredients are designed to not support the growth of Listeria for the shelf life of the product³.

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Food type	Action	Control measures – options for controlling hazards
	Safer Option	<ul style="list-style-type: none"> > Purchase cooked fermented meats; > Cook uncooked fermented and/or dry cured meats before service (e.g. pizza).
Fruits, Vegetables, Herbs and Salads	Avoid	<ul style="list-style-type: none"> > Fresh produce that will be eaten raw and cannot be effectively washed e.g. seed sprouts, mushrooms, curly leaf lettuce and garnishes such as fresh curly leaf parsley; > Rockmelon, whole and cut.
	Caution	<ul style="list-style-type: none"> > Packaged & processed/pre-cut fruit, vegetables, herbs and salads, intended to be eaten raw, with a shelf life limited to 7 days from date of packaging^{1,3}; > Pre-packaged ready-to-eat salads with commercial dressing³; > Uncooked frozen vegetables⁵.
	Safer Option	<ul style="list-style-type: none"> > Cook fresh produce that cannot be effectively washed (e.g. seed sprouts, mushrooms and garnishes, such as curly leaf parsley); > Process whole, fresh fruit and vegetables intended to be eaten raw, in-house^{3,4}; > Canned or shelf stable pre-packaged fruit or vegetables.
Dairy	Avoid	<ul style="list-style-type: none"> > Dairy products from service delicatessens; > Unpasteurised dairy products; > Surface ripened soft cheeses such as brie and camembert; > Soft serve ice cream.
	Caution	<ul style="list-style-type: none"> > Soft cheeses such as feta, cottage, ricotta, mascarpone and bocconcini and other dairy foods that support the growth of <i>L.monocytogenes</i>: <ul style="list-style-type: none"> ○ Limit shelf life to 7 days from date of packaging^{1,3} ○ Purchase from a licensed/accredited manufacturer with a Listeria Management Program.
	Safer Option	<ul style="list-style-type: none"> > Cook soft cheeses before service (e.g. quiches, spinach and ricotta tarts etc.); > Hard cheeses (e.g. cheddar).
Seafood	Avoid	<ul style="list-style-type: none"> > Seafood from service delicatessens; > Raw fish, in particular raw bivalve molluscs (e.g. oysters, mussels etc.) and sashimi; > Frozen, cooked RTE seafood (e.g. prawns).
	Caution	<ul style="list-style-type: none"> > Pre-packaged cold-smoked and cooked ready-to-eat seafood with shelf life limited to 7 days from date of packaging^{1,3}.
	Safer Option	<ul style="list-style-type: none"> > Cook seafood before service; > Canned seafood or shelf stable seafood.
Pâté, Pastes and Dips	Avoid	<ul style="list-style-type: none"> > Pâté, pastes and dips from service delicatessens.

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Food type	Action	Control measures – options for controlling hazards
	Caution	> Commercially made pâté, pastes and dips with a shelf life limited to no more than 7 days from date of packaging ^{1,3} .
	Safer Option	> Pâté, pastes and dips that have been processed and cooked in-house; > Shelf stable pâté, pastes and dips (e.g. canned).
Pre-prepared sandwiches, wraps and sushi	Avoid	> Any pre-prepared sandwiches, wraps or sushi purchased in retail.
	Caution	> Purchase pre-prepared sandwiches wraps or sushi that contain any high risk fillings (mentioned in Table 1) from approved supplier with documented listeria controls consistent with this table.
	Safer Option	> Make sandwiches, wraps or sushi in house; > Purchase pre-prepared sandwiches, wraps or sushi with lower risk fillings ³ e.g. canned tuna, cheddar cheese.

Alternative control measures can be used where it can be demonstrated during an audit that the measures adequately control the hazard, such as:

- > **evidence of the formulation of the product to not support the growth of *L. monocytogenes* (e.g. predictive microbiological modelling, listericidal treatment or component);**
- > **evidence of the process used on the product to not support the growth of *L. monocytogenes* (e.g. cook in bag or high pressure process); and**
- > **certificate of analysis from the manufacturer/other validation to demonstrate item 3 below.**

1. Food with a refrigerated shelf life limited to 7 days – refer Appendix 1.
2. If you are slicing and vacuum packing or modified atmosphere packing ready-to-eat meat or poultry that supports the growth of *Listeria* (defined in 3 below), and you do not wish to be captured by Standard 4.2.2 or 4.2.3 of the Food Standards Code, then apply a shelf life of no more than 5 days to the product.
3. Applies to ready-to-eat products that will support the growth of *Listeria monocytogenes* (defined as an increase of 0.5 log cfu/g or more during the shelf life of the food) – extracted from Standard 1.6.1 of the Food Standards Code.

Foods that **do not** support the growth of *L. monocytogenes* include:

- food with a **pH value less than 4.4** (regardless of water activity);
 - food with a **water activity value less than 0.92** (regardless of pH);
 - food with a combination of factors (e.g. **pH < 5.0 and water activity < 0.94**);
 - frozen** foods;
 - food with a refrigerated **shelf life of less than 5 days**; and
 - food that has been validated to demonstrate that the level of *L. monocytogenes* will not increase by greater than 0.5 log cfu/g over the food's stated shelf life.
4. Fruit and vegetables should be inspected prior to use and dirty, cut, moldy or bruised stock should be removed before washing under running potable water.
Fruit and vegetables that will not be cooked can be sanitised in a chemical appropriate for fresh produce as an additional control measure.
 5. Frozen High-Risk *Listeria* Foods -
Although frozen foods do not support the growth of *Listeria* (as stated in point 3 above), *L. monocytogenes* has been

detected in frozen seafood, vegetables and RTE meats. Therefore, there is potential for *Listeria* growth once products are thawed. The following advice is to be considered if purchasing frozen high-risk *Listeria* products:

- a) frozen vegetables must be cooked to $\geq 75^{\circ}\text{C}$ (or equivalent) prior to consumption (or in accordance with the directions on the manufacturer's packaging); and
 - b) frozen RTE meats (intended to be eaten as ready-to-eat products/without further cooking) – purchase from a manufacturer with a *Listeria* Management Program that can demonstrate *Listeria* control measures during manufacture.
6. Fermented and/or dry cured meat protocols are designed to not support the growth of *Listeria*, but due to variation in processes, evidence of the controls is specified in Table 1.

Implementation of safe food handling and preparation controls

Control measures should be documented to include detailed instructions of food processing controls for all steps occurring onsite. *Listeria* food processing controls include:

- > storing food under temperature control (cold food $< 5^{\circ}\text{C}$ & frozen food hard frozen);
- > storing and preparing raw products and unwashed and unpeeled fruit and vegetables separately from ready-to-eat food;
- > storing packaging and single-use items in a way that prevents environmental contamination;
- > applying strict shelf-life policies for high risk *Listeria* foods;
- > using food within best-before or use-by dates;
- > cooking food thoroughly to a core temperature of 75°C (or equivalent time/temp); and
- > ensure surfaces and equipment are clean and sanitised before use for food processing.

Control of people entering the food handling environment

People entering a facility can be a significant factor in enabling *Listeria* to contaminate the food handling and preparation environment. The movement of food handlers, management, support staff, delivery drivers, contractors and visitors plays a very important part in bringing *Listeria* into a facility.

Food businesses need to assess the food safety risks associated with people entering food handling facilities while wearing clothing and footwear that has been worn outside of the facility. Consideration should be given to implementation of dress codes that includes:

- > clean and protective clothing worn daily or when excessively soiled;
- > ideally, clean and protective clothing should be put on after arrival to work;
- > areas of access for staff and visitors to be defined; and
- > all people to wash hands upon entry to food handling areas and when hands become soiled.

Environmental control through cleaning and sanitising programs

Once the organism has entered a kitchen, it can grow in hard-to-access niches and can form biofilms that enhance resistance to cleaning. It readily survives in moist and cool environments and in food processing equipment. If not controlled by systematic and diligent cleaning and sanitising practices, *Listeria* will ultimately result in contamination of foods after processing.

Cleaning and sanitising procedures and schedules must include specific measures to control *Listeria* in the environment including kitchen, storage areas (cool room, freezer and dry goods), staff access areas and raw materials receipt and dispatch areas where appropriate. Particular attention must be given to cleaning and sanitising of food contact surfaces, drains, air conditioning/refrigeration units and waste control areas.

Controls to prevent *Listeria* survival on processing surfaces include:

- > development of specific cleaning procedures for areas of your facility, e.g.
 - o kitchen, cool rooms, waste storage etc.

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- individual items of equipment that may need specialised attention and appropriate dismantling, e.g. utensils, mechanical equipment (e.g. slicers, texture modified food equipment such as blenders and mixers,) or storage containers, lids etc.;
- > regularly cleaning and sanitising of all food contact surfaces;
- > cleaning surfaces thoroughly before the application of a food-grade sanitiser;
- > using appropriate validated food-grade chemicals; and
- > consider review of the type of food-grade sanitiser used (rotating chemicals may reduce the likelihood of resistance to cleaning and sanitising procedures).

Maintenance of facilities and equipment

To prevent *Listeria* from finding niche spots to harbor and multiply, it is important that a program of routine maintenance is developed to support cleaning and sanitising programs. The procedure should include maintenance of:

- > walls, floors and ceilings to repair cracks or broken surfaces where moisture might gather;
- > drains, sumps and grease traps;
- > defrost water collection and drainage systems from refrigeration and air-conditioning units;
- > ventilation systems to prevent condensation of steam; and
- > cool room door seals, self-closing doors and plastic curtains.

Implementation of use-by dates

Food businesses must develop a system to ensure that the shelf life of food is limited to prevent *Listeria* from becoming a hazard. This can be managed by:

- > strict adherence to use-by dates declared by manufacturers, unless additional/more stringent on-site controls are required to manage the *Listeria* hazard e.g. reduction of, or short shelf life being applied to foods identified in Table 1;
- > procedures to inform staff of limits to be applied to shelf life for foods after preparation and/or opening as per Table 1; and
- > procedures to label all food returned to storage for re-use with the date of preparation and or use-by.

Monitoring and verification

Microbiological testing of product and the environment to verify the effectiveness of their *Listeria* controls may be considered by some food businesses. Each food business would need to identify if and how they monitor and verify their controls are effective.

Training

Employees involved in the production and handling of ready to eat food should have appropriate training. This includes:

- > principal factors that influence the risk to consumers and foods which are characteristically associated with *Listeria*;
- > the nature of *Listeria*, its harbourage sites and its resistance to various environmental conditions; and
- > control measures for reducing the risk of *Listeria* associated with ready to eat food (during receipt, processing, handling, storage, distribution and use).

5. References

[FSANZ Compendium of Microbiological Criteria for Food](#)

https://www.foodstandards.gov.au/sites/default/files/publications/Documents/Compendium_revised%20Dec%202022.pdf

[Listeria in food | Food Standards Australia New Zealand](#)

<https://www.foodstandards.gov.au/consumer/safety/foodborne-illness/Listeria>

[FSANZ – Agents of foodborne disease - Listeria](#)

<https://www.foodstandards.gov.au/sites/default/files/publications/Documents/listeria-monocytogenes.pdf>

[FSANZ - Guidance on the application of microbiological criteria for Listeria monocytogenes in RTE food](#)

<https://www.foodstandards.gov.au/food-standards-code/proposals/proposalp1017criteri5439>

[NSW Food Authority Guidelines For Food Service To Vulnerable Persons \(July 2018\)](#)

https://www.foodauthority.nsw.gov.au/sites/default/files/_Documents/industry/guidelines_vulnerable_persons.pdf

[FSANZ Primary Production and Processing \(PPP\) Standards \(Chapter 4\)](#)

<https://www.foodstandards.gov.au/business/primary-production-and-processing>

[The Department of Health Listeria Fact Sheet \(July 2018\)](#)

https://www.health.gov.au/diseases/listeriosis?utm_source=health.gov.au&utm_medium=callout-auto-custom&utm_campaign=digital_transformation

[Guidelines on the Application of General Principles of Food Hygiene on the Control of Listeria monocytogenes in Foods \(CAC/GL 61 - 2007\). Codex Alimentarius Commission.](#)

<https://www.fao.org/fao-who-codexalimentarius/codex-texts/guidelines/en/>

[FSANZ – Micro limits for foods \(Standard 1.6.1\)](#)

<https://www.foodstandards.gov.au/business/microbiological-limits>

[Meat and Livestock Australia, Practical Control of Listeria monocytogenes in Smallgoods](#)

<https://www.mla.com.au/research-and-development/reports/2011/practical-control-of-listeria-monocytogenes-in-smallgoods4/>

6. Glossary

TERM	DEFINITION
Approved Supplier	A person or company whom has been approved and listed by an organisation to provide products and services. Approval would generally require demonstration that the supplier meets with particular specifications or standards, including any legal requirements relating to the service or product they provide. Approved food suppliers include suppliers of food ingredients, prepared foods or ready to eat foods, who meet the specifications outlined by the purchasing organisation.
Bacteria	Microorganisms that are found in or on food, people, surfaces, untreated water, dirt, faeces, soil, plants, animals and pests.
Biofilm	A mass of bacteria which forms sticky and adhesive substances to protect it from the environment. Biofilms are difficult to remove from surfaces.
cfu/g	Colony forming units per gram.
Clean	Means clean to touch and free of extraneous visible matter and objectionable odour.
Contamination	The introduction or occurrence of a contaminant in food. Usually the transfer of the contaminant from a contaminated source to the food or food-contact surface.
Control measure	Any action or activity that can be used to prevent, eliminate or reduce a food safety hazard to an acceptable level.
Core Temperature	The temperature measured in the internal part of the food which heats more slowly or cools less quickly (usually the centre of the food).
Critical Control Point (CCP)	A point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable levels and where loss of control may lead to a food safety problem which could harm the consumer.
Facultative anaerobe	A microorganism that can grow in the presence or absence of oxygen.
Foodborne disease	A disease that is likely to be transmitted through consumption of contaminated food.
Food business	A business, enterprise or activity (other than primary food production) that involves: (a) the handling of food intended for sale, or (b) the sale of food, regardless of whether the business, enterprise or activity concerned is of a commercial, charitable or community nature or whether it involves the handling or sale of food on one occasion only.
Food handler	A person who directly engages in the handling of food, or who handles surfaces likely to come into contact with food, for a food business. The definition covers people who prepare food and/or handle surfaces likely to come into contact with food, for example a person cleaning eating and drinking utensils. Food handlers must comply with the health and hygiene requirements in Standard 3.2.2.
Food process step	A point, procedure, operation or stage in the production of food from receipt of raw foods to service of meals.

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Food safety program (FSP)	A written document retained at the food premises that systematically identify food safety hazards, control measures, means of monitoring controls and corrective actions. Records demonstrate program compliance. Refer Australia New Zealand Food Standards Code, Standard 3.2.1 Food Safety Programs.
Food Safety Standards	Standards contained in Chapter 3 of the FSANZ Food Standards Code.
Food Standards Code	Means the Australia New Zealand Food Standards Code—the requirements that control the composition, level of contaminants, labelling of the food supply and standards governing the safe production for foods.
FSANZ	‘Food Standards Australia New Zealand’ is the authority that develops and coordinates Food Safety legislation.
Hazard	A biological, chemical or physical agent in, or condition of, food that has the potential to cause an adverse health effect in humans.
High risk food	Refer Potentially Hazardous Foods (PHF).
Listeria Management Program (LMP)	A Listeria Management Plan (LMP) is a component of a business's Food Safety Program. The Plan must ensure Listeria as a food safety hazard can be managed collectively using two key indicators: <ol style="list-style-type: none"> 1. Environmental Monitoring. 2. Product Testing.
Listericidal step	A process step capable of reducing the amount of <i>L. monocytogenes</i> that may be present in food to a safe level.
Monitoring procedures	A procedure of scheduled checking (observations & measurements) to assess whether a CCP is under control and is accurately recorded for verification purposes.
Pathogen	Any microorganism (bacteria, viruses, moulds & parasites) that is able to cause disease in humans.
pH	A figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acid and higher values more alkaline.
Potentially Hazardous Food (PHF)	Means food that has to be kept at certain temperatures to minimise the growth of any pathogenic microorganisms that may be present in the food or to prevent the formation of toxins in the food. This definition clarifies that the only food that must comply with certain temperature requirements specified in Standard 3.2.2 is food that needs temperature control to minimise the growth of foodborne pathogens or the production of toxins.
Predictive microbiological modelling	A method of assessing the food safety risks during processing, transport & storage. Mathematical models are used to define growth characteristics of microorganisms and predict their behaviour over a range of conditions.
Process	In relation to food, means an activity conducted to prepare food for sale including chopping, cooking, drying, fermenting, heating, pasteurising, thawing and washing, or a combination of these activities.

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Process validation	Obtaining documented evidence that demonstrates that a specific process will consistently provide safe food. (e.g. published scientific findings or in-house trials).
Ready-to-eat food (RTE)	Food that is ordinarily consumed in the same state as that in which it is sold and does not include nuts in the shell and whole, raw fruits and vegetables that are intended for hulling, peeling or washing by the consumer. RTE food is food that can be eaten without having anything further done to it; for example, it includes raw foods prepared for consumption such as cut fruit and salads. Foods that might be just heated before serving are still considered RTE.
Sanitise	to apply heat or chemicals, heat and chemicals, or other processes, to a surface so that the number of micro-organisms on the surface is reduced to a level that: (a) does not compromise the safety of food with which it may come into contact; and (b) does not permit the transmission of infectious disease. (Standard 3.2.3).
Shelf Life	in the context of this document means the length of time food stored under prescribed conditions will remain safe and suitable for consumption and is commonly referred to as it's 'use-by' date.
Use-by date	A 'use-by' date indicates the last date on which the food may be consumed safely.
Validation	The action taken by the business to confirm that the control measures are effective in controlling the hazards (that is, they prevent, eliminate or reduce a food safety hazard to an acceptable level). Where businesses put in place controls specified in the food safety standards, food safety program guides or templates recognised by the relevant enforcement agency, businesses are not required to validate these controls. (also refer to 'Process validation').
Verification	The action taken by the business to confirm that the practices and procedures in the food safety program are happening, including reviewing, inspecting, testing & checking.
Vulnerable Person	A person who is in care, in a facility listed in Standard 3.3.1 or a client of a delivered meals organisation.
>	Greater than.
<	Less than.

Appendix 1 - Limiting Shelf Life as a Control Measure for *Listeria monocytogenes*.

(excerpt from NSW Food Authority Guidelines for food service to vulnerable persons, July 2018)

Table 1 of this guideline lists recommended control measures for higher risk foods including limiting the shelf life of some foods to a maximum of 7 days from packaging.

Most foods that are contaminated with *Listeria monocytogenes* typically have very low levels of the organism, and some growth is required in order to produce illness, even in the susceptible populations. Risk assessment data has consistently shown that the risk of Listeriosis is increased in ready-to-eat (RTE) foods which support the growth of *L.monocytogenes* and have extended shelf lives, and that cases of Listeriosis result from high levels of *L.monocytogenes* (> 100 cfu/g) in the food.

Under European Union regulations (EC 2073/2005), a RTE food or ingredient with a shelf life of less than 5 days is considered to be unable to support the growth of *L.monocytogenes*. In addition, Health Canada has a revised policy on *L.monocytogenes* in RTE foods which includes a 'Category 2A RTE foods'. This category includes RTE refrigerated foods with a shelf-life of under 5 days. The policy states that this time period would not allow sufficient time, under reasonably foreseeable conditions of distribution, storage and use, for *L.monocytogenes* to grow to levels above 100 cfu/g by the end of the stated shelf-life (Health Canada, 2010).

The FDA/UDA risk assessment in 2003 examined several 'what-if' scenarios including estimating the effect of shelf life on the predicted number of listeriosis cases. The scenarios tested included maximum storage times for deli meats of 4, 7, 10, 14, 17, 21, and 28 days. Shortening the shelf life to 10 days was found to reduce the estimated number of cases in the elderly sub-population by 32.5%. Further reducing the shelf life to 7 days resulted in approximately a 60% reduction in the number of listeriosis cases from deli meats (FDA/USDA, 2003).

Another study by Carrasco et al. (2010) examined the effect of shortening the shelf life of RTE lettuce salads on the high-risk population of Spain, with reduction of the shelf life to 7 days resulting in a 24% reduction in predicted number of listeriosis cases. A further reduction to a 5 day shelf life resulted in a 62% reduction. Along with storage temperature and serving size, shelf life was the third most important factor in determining the number of listeriosis cases.

The intent of the Authority in recommending limiting the shelf life of foods that support the growth of *L.monocytogenes* to 7 days is to reduce the risk of listeriosis compared to product that is distributed for retail sale— for example, pre-packaged RTE deli meats may have a 6-7 week shelf life which may allow the organism to grow up to infective dose levels.

References

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