

ADASC

Australian Dairy Authorities'
Standards Committee

Australian Manual for Control of

Listeria

in the Dairy Industry

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1. Foreword

The Australian Dairy Authorities' Standards Committee (ADASC) members are responsible for developing and administering legislation and inspection procedures to ensure that dairy products are hygienically manufactured and do not present a health risk to the consuming public.

The *Australian Manual For Control Of Listeria In The Dairy Industry* (Listeria Manual) has been developed in consultation with dairy companies and the State Dairy Authorities. This edition of the Listeria Manual was reviewed by a team of dairy company and authority representatives who have particular experience in the area of *Listeria* and its control in the dairy industry.

ADASC has adopted the Listeria Manual for use in the Australian dairy industry.

This edition of the Manual replaces in full the July 1996 edition.

The Listeria Manual is distributed and maintained by the Victorian Dairy Industry Authority. Copies of the manual can be obtained from your State Dairy Authority or by contacting:

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2. Purpose and Scope

The *Listeria Manual* has been developed to assist the dairy industry in the control of *Listeria* spp in the dairy processing environment. The *Listeria Manual* sets out the procedures to be adopted for the monitoring of *Listeria* spp, as well as the activities to be followed if *Listeria* spp is detected in dairy products or the environment.

The **mandatory** clearance procedures and procedures for disposal of contaminated product detailed in the Manual (white pages) apply to dairy products manufactured in all States and Territories in Australia. Formal approval to vary any aspect of these procedures is required. Applications for approval must be submitted to the ADASC member of the State in which the establishment is located. The addresses for the ADASC members of each State are listed in Appendix 1.

The procedures described in this Manual for the prevention of *Listeria* spp contamination and for cleaning and sanitising are for **guideline** purposes only (yellow pages). They are suggestions offered to dairy companies to assist in the control of *Listeria* spp in the dairy processing environment.

3. Summary of Company Responsibilities

The company **must**:

- (a) notify the State Dairy Authority (SDA) Representative of all *Listeria monocytogenes* isolations from product immediately. This is to be followed by written confirmation within 7 days. It is **strongly recommended** that the company notify their State Dairy Authority when *Listeria* spp is isolated from product. This applies as soon as the genus is known even though the species is not yet identified. It is also **strongly recommended** that the SDA Representative is advised of *Listeria monocytogenes* isolations in environmental samples;
- (b) notify the Health Department, or other relevant authorities, according to state regulation;
- (c) segregate contaminated product from other non-contaminated product;
- (d) ensure that contaminated product is labelled accordingly and clearly identified;
- (e) have in place a product recall procedure, as the detection of *Listeria monocytogenes* in product may necessitate a product recall; and
- (f) obtain approval from the SDA Representative for the disposal or reprocessing of contaminated product.

4. Background on *Listeria*

4.1 Introduction

Listeria monocytogenes is a foodborne pathogen that is capable of causing foodborne illness called Listeriosis. It presents a hazard to particular groups of consumers such as: the elderly, new born, pregnant women and those whose resistance to infection is weakened (eg. those with HIV, leukaemia etc). Listeriosis has a mortality rate of about 30%.

Listeria spp are commonly found in many environments including soil, dirt, water and can be carried by both domestic and wild animals. The *Listeria* bacterium is widespread throughout the environment and is thus a contaminant of raw foods. Some features of *Listeria* spp include:

- (a) small, Gram-positive rods;
- (b) non-sporeformers;
- (c) can produce cholera-like toxins;
- (d) aerobic, it can grow in the presence of oxygen and carbon dioxide and in the absence of oxygen;
- (e) psychrotrophic (grows between 3°C and 45°C);
- (f) hardy organisms (survive for months in moist soil, and can survive freezing);
- (g) do not survive pasteurisation at 72°C for 15 seconds;
- (h) tolerate a wide pH range, pH 4.6-9.5;
- (i) can grow in up to 20% sodium chloride;
- (j) ubiquitous in nature, found in silage, sewage, vegetable matter, wild and domestic animals, birds, and raw milk.

There are six known species of *Listeria*. These are:

Listeria monocytogenes

Listeria innocua

Listeria ivanovii

Listeria seeligeri

Listeria welshimeri

Listeria grayi

L. monocytogenes can be pathogenic to humans. There is some concern that *L. ivanovii* may also be pathogenic to humans. None of the other species have been shown to be pathogenic to humans.

Its wide distribution and the ease with which it becomes established in food processing plants suggests that *L. monocytogenes* may have long been a common contaminant of our food supply. The relative rarity of foodborne Listeriosis and its severity in susceptible individuals may indicate either that very few are susceptible to it or that the infective dose, even in those at risk, is high. It has been suggested that this dose may be 100 to 1000 cells.

L. monocytogenes is killed by the pasteurisation process and therefore it is most likely that the contamination of milk and dairy products would occur at the post pasteurisation stage.

A most important property of *L. monocytogenes* is its ability to multiply slowly in foods at chill temperatures and most foods incriminated in Listeriosis have been held under refrigeration. Thus, any ready to eat food that is contaminated with *Listeria monocytogenes* which is held under refrigeration may eventually develop a population of these bacteria that is a danger to susceptible consumers.

The risk of foodborne listeriosis to consumers other than those in susceptible groups listed above appears to be minimal. Many of us may carry *Listeria* spp in our intestinal tracts without any signs of illness. However susceptible consumers should avoid foods known to have caused the disease. These include soft cheese, pre-cooked meat and poultry products and prepared salads which have been refrigerated for long periods. Fresh vegetables may be contaminated with *Listeria* spp from soil and should be well washed and sanitised before being eaten raw by at-risk consumers.

It must be stressed that *L. monocytogenes* is common in many foods, yet appears to pose a hazard only to particular groups of consumers.

4.2 Significance in the Dairy Industry

Extensive surveys have shown that *Listeria* is widely distributed in a variety of dairy products and is commonly found in dairy processing environments. Although there has not been a dairy related Listeriosis outbreak in Australia, *Listeria* has caused significant problems for the Australian dairy industry. The presence of *Listeria* in dairy products has led to product recalls, destruction of contaminated product, short term plant closures and extensive clean up procedures. These incidents can cause substantial losses for the factories involved and can result in a loss of consumer confidence in the safety of dairy products.

4.3 Prevalence of *Listeria* in the Dairy Industry

4.3.1 On Farm

On the farm, the environmental conditions for the growth of *Listeria* is ideal. The organism can grow in soil, muddy and dusty conditions, in water and in dams. Cows can be carriers and mastitis can result from a *Listeria* infection. The feeding of poor quality silage is another problem area, as the organism can grow in poorly fermented silage.

4.3.2 Factory Environments

L. monocytogenes is quite well adapted to dairy factory environments. It is generally more common in the type of factory where conditions tend to be wet and cool with areas of pooled water or liquid. The organic load on the floors and in the drains if high can also contribute to the growth and survival of *Listeria*. Use of high pressure hoses can spread the organism by fine water sprays, known as aerosols, and dilute sanitisers in areas such as drains rendering them ineffective.

Factories producing primarily liquid milk products have been found to have the highest incidence of *Listeria* spp - up to 59%. Despite the high incidence, most production in these areas are enclosed and thus the risk of *Listeria* contamination after pasteurisation is limited to a few critical steps such as pumping and filling/cartoning.

4.3.3 Milk and Dairy Products

Most dairy products are susceptible to *Listeria* spp contamination if hygiene is not good during manufacture. *Listeria* spp has been detected in Australia in a range of products which include: pate, cheese, ice cream, take-away foods, pre-cooked frozen foods and manufactured meat.

While the incidence of detection of *Listeria* spp in dairy products in Australia is low, *Listeria* is capable of growing at refrigeration temperatures, and can be enhanced in the presence of another bacterial species called Pseudomonads which are naturally present in milk's bacterial population. In most cases, contamination has been found to result from contact with an environmental source within the factory premises after the milk has undergone pasteurisation.

Listeria has been isolated from many dairy products, including ice-cream and certain types of cheese. In soft ripened cheese contamination is limited to the first few millimetres under the rind or surface. Hard cheese such as parmesan do not favour growth, and other cheese such as colby, swiss, provolone, Munster, fetta and limbeger show gradual die-off of the bacteria. In mozzarella, the bacteria will survive the making process but not the stretching temperatures. *Listeria monocytogenes* will not grow in cottage cheese, but can survive. *Listeria* has also been isolated on a few occasions in yoghurt, as post processing contamination, but it will not survive in yoghurt with a pH <4.6.

Dairy products most at risk are: processed milk, high moisture-low acid cheese, surface-ripened cheese, blue vein cheese, sliced, shredded and grated cheese, cream, ice cream and other products in refrigerated storage conditions.

4.4 Occurrence of *Listeria* in Dairy Factory Environments

Areas that have been identified as the major sources of the organism are those associated with transport of product, cooling and storage areas. Within these areas the most likely sources have been determined as transport into the factory, drains, floors, conveyors and crate wash lines. Work practices of factory personnel and the dispersal of the organisms in water sprays and droplets have also been identified as significant carriers of the organism throughout a factory.

5. *Listeria* Prevention Procedures

5.1 Introduction

Listeria spp can be carried by animals, birds and insects and may be found in soil, water, silage, dust and manure, any of which can lead to daily contamination of raw milk, bulk milk collection tankers and the boots and clothing worn by tanker drivers.

The transfer of *Listeria* spp from the farm to the factory milk receival areas is therefore difficult to prevent. While total elimination of *Listeria* spp from raw products is an improbable task, its presence in processed food can be controlled. Spread of *Listeria* spp can be controlled at a farm, factory and distribution level, and there are steps that can be taken to minimise or prevent the organisms proceeding further into the factory.

5.2 Steps to Control *Listeria* Entry to Plant Areas

Specific aspects which require special attention for the control of *Listeria* spp are:

- (a) isolate the receival area and associated personnel from the processing and packaging areas. Restrict and control anyone or anything having contact with receival and from outside the factory from going into, passing through or working in the processing area. This includes drivers, laboratory staff, maintenance personnel, management, sales representatives, visitors and anyone or anything else that has had contact with the raw milk and other raw materials;
- (b) as far as possible have no unsealed openings into the manufacturing area from other areas;
- (c) as far as possible ensure that no raw product comes into contact with the floor anywhere around the processing and packaging equipment;
- (d) isolate raw milk and do not have any cross-connections to finished products either through product or CIP (Cleaning-In-Place) lines;
- (e) keep the receival area walls and floors clean and in good repair;
- (f) all drains, no matter what type, must be properly constructed and cleaned and sanitised daily;
- (g) instruct tanker drivers to avoid contact with all parts of the farm except the milk room area; and
- (h) it is advisable that raw materials and/or ingredients, such as fish, fruit and vegetables, are heat treated or sanitised before use.

5.3 Steps to Control *Listeria* in the Processing Area

5.3.1 Effective Pasteurisation

Pasteurisation is the key step to control *Listeria* spp in the processing area. Pasteurisation is the process which assures that every particle of milk is heated to at least a minimum temperature and held at that temperature for the minimum specific time in properly designed, installed and operated equipment.

In the case of HTST (high temperature short time) pasteurisation of milk, a minimum of 72°C for 15 seconds is essential. Products containing higher fat or sugar levels require higher temperatures to ensure effective kill of *Listeria* spp. It is recommended that all products be heated to 75°C for 15 seconds to be safe.

A properly designed, installed and operating flow diversion valve and properly operated pressure controls for regeneration systems must be integral parts of HTST systems. Sweet water or glycerol systems should be maintained at a pressure below that of the milk to minimise the risk of contamination from the coolant side. Regular checks for leaks in the pasteuriser must be carried out.

In the case of milk for cheese making, it is strongly advised that the HTST pasteurisation method is used. The lesser heat treatment of 62°C for 15 seconds with subsequent storage of the cheese for 90 days at or above 2°C will not provide assurance that the cheese is free of *Listeria* spp. This method would be especially risky in the manufacture of relatively high pH cheese.

If the holding method of pasteurisation is used, there are special precautions which should be taken:

- (a) the vat should never be operated without a lid;
- (b) the vat must be designed to prevent (or minimise) the formation of froth on the surface; and
- (c) adequate, accurate temperature recording should be fitted to the vat to ensure all milk receives the minimum heat treatment.

The fitting of air-space heaters which maintain the air-space at a temperature of 2-3°C above the holding temperature is strongly advised. This will prevent any froth on the liquid surface cooling below the required pasteurising temperature of 63°C for 30 minutes.

The pasteurisation method used must comply with the relevant legislative requirements. All continuous flow pasteurisers should meet the requirements of AS 3993.1 - 1992, *Equipment for the Pasteurisation of Milk and Other Liquid Dairy Products - Part 1: Continuous Flow Systems*. This should be confirmed with the relevant State Dairy Authority as mandatory conformance to this standard is required in some States.

5.3.2 Post-Pasteurisation Contamination

On the evidence available to date, post-pasteurisation contamination is the major source of *Listeria* spp in dairy products.

Potential areas of post-pasteurisation contamination should be determined and corrective action taken when necessary. The areas to consider are:

(a) Cooling Systems

A thorough check should be made of sweetwater and glycol cooling systems. A scheduled review program should be initiated to ensure they are properly protected and do not contain any pathogenic organisms.

All equipment such as storage tanks, jacketed vessels and cooling plates that utilise sweetwater or glycol solutions should be monitored for leaks and cracks regularly. Contamination of product has been caused by *Listeria* spp contaminated sweetwater as a result of leaking plates.

(b) Cracks and Crevices

Cracks and crevices in storage tanks, leaking valves, agitator shafts, shielding and venting are all areas where pathogenic organisms have been found.

Improper welds and similar irregular surfaces, which may cause ineffective cleaning and sanitising, should be eliminated. These areas should be monitored on a scheduled basis.

(c) Cleaning and Sanitising

Cleaning and sanitising programs are vital in ensuring that post-pasteurisation contamination does not occur. This is outlined in detail in Section 12 of this Manual.

(d) Product Handling

Processors should minimise the amount of product handling, product exposure to the plant environment, and time or temperature abuse of the product after pasteurisation. This can be accomplished by minimising post-pasteurisation handling and storage time prior to final packaging.

(e) Absorbent Items

The use of absorbent items, such as rags and sponges, should be eliminated to reduce potential harbourage and spreading of micro-organisms in the plant environment.

Separate brushes should be used for product contact and non-product contact surfaces. Brushes should be maintained in good repair, cleaned, sanitised and stored correctly between uses.

Use of impervious materials, (eg. plastic or metal) is mandatory. Porous equipment such as wooden handled brushes, tools or paddles, or sponges and cloths, must not be used in production areas.

(f) Filling and Packaging

Filling and packaging operations are areas where product contamination has occurred. Mandrels, drip shields, bottom and top breakers, prefilling coding equipment and deflector bars are critical areas where environmental contamination may occur.

Overhead shielding, conveyors, conveyor belts, chain rollers, supports, and lubricants should be constantly monitored.

It is important to incorporate a cleaning and sanitising regime for all conveyors. Blow moulding operations and handling of packaging materials should be examined regularly, particularly where open containers are conveyed through non-processing areas.

(g) Cross Contamination

Cross-connections between pasteurised milk lines and other sections of the plant such as raw milk or CIP lines are hazardous.

Pipework plans should be reviewed on a periodic basis and updated to reflect existing piping arrangements. This can be accomplished only by "walking" the plans through the plant and physically ensuring that they are accurate.

Internal plant controls are needed to prevent any piping changes without prior review by qualified authorities.

(h) Airborne Contamination and Refrigerated Areas

Contamination occurs via aerosols generated by high pressure hosing and via condensates in areas where product is exposed.

Airborne contamination is strongly suspected as a vehicle for allowing pathogenic organisms to contaminate product. A comprehensive assessment of both processing and ventilating air utilised within the plant should be conducted.

Heating, Ventilating and Air Conditioning (HVAC) systems should be designed for easy cleaning and should be periodically cleaned.

Condensate drip pans and drain lines should be periodically checked and cleaned to ensure they are not providing favourable environments for the growth of pathogenic organisms.

Air systems in refrigerated areas should also be designed for ease of cleaning and should be routinely cleaned.

HVAC systems should be properly designed and adjusted to maintain positive pressure in areas where product is exposed, such as batching, filling and packaging operations. Air transfer to processing or packaging areas from potentially contaminated areas, such as raw product receiving, ingredient and supply storage areas should be minimised.

Outside air should be filtered and free of condensate. Where possible and practicable, air flow should be controlled to minimise air blowing onto product, product contact surfaces or filling and packaging areas. Air filters should be of the type effective in removing particulate matter and condensate thus, reducing the potential for dispersion of micro-organisms. Filters should be kept clean and replaced according to an established maintenance schedule.

Processing systems such as air agitation systems which incorporate air directly into the product, must be designed to reduce potential contamination and should be easily cleanable. Process air systems should contain appropriate filters to remove undesirable particulate matter.

Sanitary check valves should be provided as necessary to prevent product backup into air lines.

Agitation equipment should be checked routinely for proper assembly and cleanliness. Most air agitation equipment is not satisfactorily cleaned by usual CIP methods and should therefore be dismantled and manually cleaned and sanitised routinely.

(i) Plant Environment

The general plant environment should be recognised as having a significant impact on the safety of finished product. Particular emphasis is required for general plant conditions.

Special consideration of refrigerated areas is necessary, in light of the growth potential of *Listeria* spp at refrigeration temperatures.

Keeping floors, walls and ceilings clean, relatively dry and free from condensate build up is imperative in order to minimise product contamination.

Special attention should be given to the cleaning and sanitising of all conveyor track and belt systems throughout the plant. These areas are difficult to keep clean, and should be incorporated into a routine plant cleaning schedule.

Equipment cleaning should not take place during production runs when product or product contact surfaces are exposed to contamination from the cleaning procedure.

Pools of milk, water or other processing wastes, such as in ducts, floor plating, grouting, cracks, holes and other areas should be minimised.

Pits for conveyor drive motors should be routinely cleaned. Product and containers in storage should be protected from splash during cleaning.

Coolers should be examined and any necessary corrective action taken.

Returned goods should be isolated in a properly identified holding area.

Practices which may lead to formation of aerosols, such as condensate formation and the use of high pressure hoses and unshielded pumps, should be minimised.

These aerosols may act as vehicles in which pathogenic organisms such as *Listeria* spp may contaminate exposed product and product contact surfaces.

Listeria spp have been frequently isolated from floor drains in processing and other areas. Floor drains should not be located under or near filling and packaging equipment because of the potential for contamination. Floors and drains should be constructed and maintained to ensure proper drainage.

Brushes used for cleaning floor drains should not be used for any other purposes and should be cleaned and stored in proper strength sanitising solution between uses. Floor drains should be frequently cleaned and periodically flushed with a sanitising solution.

Floor drain covers and baskets should be cleaned and sanitised after each production run. Under no circumstances should high pressure hoses be used to clean drains.

A routine cleaning, sanitising and inspection program should be established for casers, cappers, stackers, underside of equipment, undersides and brackets for packaging guide rails, and utility equipment.

Use of hot water in processing areas during production should be minimised to prevent the formation of condensate while product is exposed. Condensate forms on cold surfaces in the presence of high humidity, which is created by wide temperature variations found in many dairy processing areas.

(j) Plant Traffic

Employees should be trained to recognise the importance of cross contamination problems within the plant.

Special emphasis is needed in training employees to avoid the spread of pathogens within the plant environment from outside the plant (eg. home, farm) or from areas such as the machine shop or raw milk receiving area. Employees should understand that bacteria can be carried on their clothing, boots, skin and hair.

A traffic pattern that restricts access to processing areas should be in place. Milk carriers and all other non-processing operations people should be restricted from entering the processing areas.

If footbaths are used they must be monitored routinely for proper disinfectant strength and cleanliness.

A continuing review and restriction of the movement of pallets, forklifts and other similar equipment from raw milk areas into processing and packaging areas is needed. Wooden pallets have been shown to be contaminated with pathogenic organisms such as *Listeria* spp.

(k) Crossflow Contamination

Crossflow contamination is defined as the contamination resulting from the crossing of two streams, one of which is contaminated. In a dairy factory it is important to be aware of the pathways which may result in the transfer of bacteria from external sources to the internal factory environment and then possibly to the product. The major cross flow pathways of concern to the dairy plant are:

(i) Liquid to liquid

- Bacterial colonisation in drains is common and the bacteria present are easily spread by high pressure hosing of the drain. Drains may block and the back water then builds up in the processing area.
- Hosing areas where milk is returned, or where milk crates are concentrated for cleaning.
- Interconnection of raw fluid products with pasteurised products.
- Refrigerant and heating solutions leaking into processed product.
- Condensation on the outside of cool rooms may connect to drains or form a connection to the inside of the cool room via broken insulation or sealants.

(ii) Air to air

- Transfer of contamination may be via air conditioning units with improper filters fitted, and possibly from filter changing methods.

(iii) Air-Water-Air

- Aerosol formation may result from high pressure hosing of drains, wind blowing over contaminated water or drains, CIP rinses of tankers, water cooled condenser towers, washing trucks and tankers, conveyor chains and belt drives.

(iv) Vectors

- Rodents, insects, birds, trucks and tankers, forklifts, pallets and dry goods, floor chain drives, overhead chain drives, hooks, gantries, belt carriers, flat bed carriers and humans, may cause cross contamination.

(l) Personnel Cleanliness

Employees with obvious illnesses, infected cuts or abrasions should be excluded from working in processing areas or performing other functions which can contaminate product, product-contact surfaces or packaging material.

The use of tobacco products, chewing gum, or other food for employee consumption should not be permitted in any production area.

Employees should not be allowed to wear hairpins, rings, watches or other jewellery in production areas.

Special attention is needed to ensure that street clothes are not allowed in the processing areas and that plant clothing (including rubber boots) does not leave the plant. It is recommended that the laundering of all work clothing should be the plant's responsibility, and proper procedures for storing and issuing clean clothing need to be developed. Of equal concern is the potential problem of plant maintenance personnel working in raw milk areas and then working on pasteurised milk equipment without adequate cleaning of hands or clothing.

It is recommended that uniforms be colour-coded by department to control movement of employees into restricted areas.

When the use of disposable single service gloves is necessary to handle exposed product or product contact surfaces during a manufacture, they must be maintained in an intact, clean and sanitary condition. Single service gloves should be thrown away whenever they become torn, contaminated or if removed for any reason.

Handwashing facilities must be properly designed and conveniently located near work stations. Employees should be encouraged to use them frequently.

(m) Product and Container Returns

All possible points of entry of *Listeria* spp into a plant must be covered.

As a manufacturer has little, if any, control over product or equipment (including vehicles) once they have left the premises, returns of equipment or product present a significant danger.

Generally, products that have left the manufacturing premises should not be permitted back into the manufacturing or packaging area. Where their return cannot be avoided, special handling procedures should be adopted.

Equipment returns should not be received into a manufacturing or packaging area unless they have been sanitised. Unloading and vehicle cleaning should be undertaken in an isolated area.

Particular care must be taken with milk crates. The large numbers involved often require handling and storage of them outside of the manufacturing premises, they are a significant source of *Listeria* spp contamination.

Crate washing facilities must be provided remote from manufacturing and packaging areas. It should be assumed effluent from washing processes is contaminated with *Listeria* spp and drains appropriately sanitised and aerosols contained. Staff must not move between washing and production areas.

Crate washing machines need to be designed to ensure thorough cleaning action with appropriate sanitisers/detergents, be capable of maintaining correct wash temperatures, have proper access for maintenance and cleaning, effluent control and aerosol containment.

Distribution vehicles, especially refrigerated transports, may be a source of *Listeria* spp. They should be maintained in a clean and dry condition and be included in plant sanitation and maintenance procedures.

Cargon trolleys can transfer contamination and are known to be a source of *Listeria* spp. Special cleaning and sanitising of cargons should be undertaken on a regular schedule.

(n) Sampling and Testing

Environmental sampling and testing are particularly important when trying to detect *Listeria* spp within a premises. Section 10 of this Manual gives guidelines to environmental testing.

5.3.3 A Check List for Post-Pasteurisation Contamination

Remember these important checks:

- (a) Cooling Systems - LEAKS
- (b) Cracks and Crevices - IN EQUIPMENT
- (c) Cleaning and Sanitising - EFFECTIVE STRENGTH/USE
- (d) Product Handling - MINIMISE
- (e) Absorbent Items - BAN USE OF
- (f) Filling and Packaging - CRITICAL ATTENTION
- (g) Cross-contamination - ELIMINATION/ACCURATE PLANS
- (h) Refrigerated Areas - PREVENT CONDENSATION
- (i) Airborne Contamination - POSITIVE PRESSURE/FILTRATION
- (j) Conveyor Systems - DIFFICULT TO CLEAN
- (k) Milk, Water Pooling - SPLASHING/AEROSOL FORMATION
- (l) Floor Drains - SPECIAL CLEANING
- (m) Traffic Flow - CONTROL
- (n) Personnel - CLEAN CLOTHING/RESTRICT TRAFFIC BETWEEN AREAS
- (o) Product/Container Returns - STRICT CONTROL NEEDED

6. Management of *Listeria* Contamination

6.1 Notification

The SDA Representative **must** be verbally notified of all positive *Listeria monocytogenes* isolations from product immediately. This is to be followed by written confirmation within 7 days. It is **strongly recommended** that the SDA Representative be notified when *Listeria* spp is isolated from product. This applies as soon as the genus is known even though the species is not yet identified. As soon as the SDA Representative is notified of a contamination with *Listeria* spp, they will supervise investigations into the possible cause of the contamination, and supervise the required procedures for dealing with the product, the plant and the environment at the establishment.

The procedures below **must** be followed if *Listeria* spp is found in dairy products.

If the genus *Listeria* is detected by a rapid test method, the result must be confirmed using the reference test method, or it may be confirmed using the gene probe provided that this method has been fully validated within the laboratory (as described in Section 11).

6.2 Clearance Program

When product is found to be contaminated with *Listeria* spp a clearance program **must** be carried out by the dairy company according to the procedures in this Manual.

Testing **must** be conducted in accordance with the reference test method AS 1766.2.14 - 1998, *Examination for specific organisms - Listeria monocytogenes in dairy products*, by a NATA laboratory accredited for *Listeria* spp testing.

6.2.1 *Listeria* spp in Product

Refer to the flow chart in Appendix 3.

When advised that a particular product is contaminated with *Listeria* spp, and the species of *Listeria* is not yet identified or when *Listeria monocytogenes* has been identified using a rapid method but has not yet been confirmed:

- (a) it is **strongly recommended** that contaminated product is withheld from sale or retrieved pending species identification. In the event that *L. monocytogenes* is confirmed a product recall may be necessary;
- (b) stop production on the affected production line;
- (c) clean and sanitise the affected manufacturing area and equipment. The need for a supervised clean-up should be based on the type of product being manufactured, cleaning procedures and relevant history;
- (d) complete the identification of the *Listeria* spp isolates to species level;
- (e) except in the case of pasteurised milk and pasteurised cream, withhold from sale all product manufactured on the affected line from the day of contamination up to

the day of supervised cleaning until tested and cleared at 25 samples x 25 g or mL per batch;

- (f) in the case of pasteurised milk and pasteurised cream manufactured on the line from the day of contamination up to the day of supervised cleaning, test available product at the rate of 25 samples x 25 g or mL per batch;
- (g) it is at the company's discretion whether this product is withheld from sale or retrieved prior to receipt of test results; and
- (h) carry out a clearance program of the affected production line from which the *Listeria* spp was isolated. The **minimum** clearance program is to be as follows:

Day 1 25 samples x 25 g or mL per batch.

Take at least 15 environmental samples and test individually (at least 5 samples to be taken from outside, inner-far and inner-near, as outlined in Section 10)

Day 3 25 samples x 25 g or mL per batch

Day 5 25 samples x 25 g or mL per batch

Day 12 25 samples x 25 g or mL per batch

This clearance program **must** be completed in full even if the species is other than *L. monocytogenes*.

If any code is found to be positive the clearance program **must** be recommenced.

NOTE:

- The 25 samples of each batch may be tested:
 - (i) individually; or
 - (ii) 5 composites of 5 samples x 25 g or mL; or
 - (iii) 1 composite of 10 samples x 25 g or mL and 15 samples x 25 g or mL.

6.2.2 *Listeria monocytogenes* in Product

Refer to flow chart in Appendix 4.

If *Listeria monocytogenes* is detected in product, the following action must be taken:

- (a) a SDA Representative will secure that product and implicated product in accordance with the procedure in Section 6.3;
- (b) the clearance program described in Section 6.2.1 must be completed. It is the company's responsibility to take the samples, with the SDA Representative providing the assistance when needed. The clearance program will be deemed complete when the results of all tests are negative. Should a positive result be obtained at any stage, the program is recommenced;

- (c) the company must recover all product from the contaminated batch;

As the detection of *Listeria monocytogenes* may involve a product recall it is strongly advised that manufacturers have a recall procedure in place. This document should include actions in the event of a recall, responsible parties and a list of names, addresses and phone numbers of organisations that need to be contacted. Further details of what should be included in the recall document are outlined in the *Food Industry Recall Protocol* (ANZFA, 1997).

If a recall procedure is not defined, the State Health Department should be contacted and the State Dairy Authority informed.

- (d) if any product from the same line which was manufactured prior to the original contamination is available (*ie.* still within the distribution chain), this must be tested at 25 samples x 25 g or mL per batch and withheld until cleared;

Product must be tested back to a clearance point, which may be a previous plant clearance, or 3 consecutive days production from that line which has been tested and cleared at 25 samples x 25 g or mL per batch.

- (e) it is strongly advised that all product from other production lines in the same manufacturing room be tested for *Listeria* spp at a minimum of 5 samples x 25 g or mL per batch, on the day of, day before and day after the original contamination; and

It is **strongly recommended** that the company recovers any implicated product.

- (f) product may be disposed of, or reprocessed according to procedures detailed in Section 8. Clearance of product following reprocessing is at 25 samples x 25 g or mL per batch.

Disposal and reprocessing the product must be done under the supervision of the State Dairy Authority.

The State Dairy Authority will liaise with other Authorities such as the Health Department and Commonwealth Minister for Consumer Affairs to keep them informed about the contamination and its control, as per the requirements outlined in the *Food Industry Recall Protocol* (ANZFA, 1997).

An example of a routine clearance program, following the detection of *Listeria* spp in product, is shown in Appendix 5.

6.3 Procedure for Securing Contaminated Product

Upon receipt of information that product has *L. monocytogenes* contamination, the SDA Representative will take the following action:

- (a) verify the test results and locate the product and any other product referred to in Section 6.2.2 which is available;
- (b) verify quantities of product involved and all identifying marks; and

- (c) issue to the owner of the product a notice prohibiting the removal of the contaminated product, as well as any other implicated product within the premises. All product will be detained until a NATA certificate, showing product is clear of *Listeria monocytogenes*, is provided. Any implicated product will be treated as outlined in Section 8.

7. Export Requirements

The occupier of an establishment registered to export dairy products **must** advise the State Dairy Authority or Australian Quarantine and Inspection Service (AQIS) Representative (depending on state agreements this may be the SDA Representative) within 24 hours of the product testing positive for *Listeria monocytogenes*.

Upon notification that *Listeria monocytogenes* has been detected in a dairy product and the product has been placed under order, the State Dairy Authority or AQIS will resume responsibility for issuing export certification until satisfied that operations are being carried out in a suitable manner.

If any implicated product has already left Australia, AQIS will consult with the exporter regarding the action to be taken to prevent a health risk to consumers of the importing country. This may involve notifying the importing country authorities of any implicated product which has already left Australia.

8. Disposal of Contaminated Product

Approval for the release of contaminated product under order for reprocessing or disposal must be obtained from the SDA Representative in writing. Where possible, contaminated product **must** be identified and segregated while being held.

8.1 Product Reprocessing

8.1.1 General Principles

Contaminated product may be reprocessed if approved by the State Dairy Authority. Any contaminated product under order must be regarded as a potential source of further contamination and **must** be segregated from other non-contaminated stock for safety reasons. It is required that contaminated product be labelled accordingly and be clearly identified. If any contaminated product is to be reprocessed, strict precautions are needed to prevent the spread of the contaminant during this reprocessing operation.

The critical stage is the opening of the units of contaminated product and the tipping into the reprocessing equipment. It is here that the risk of air-borne spread or contamination is increased and also its spread by contact with the personnel involved is a major concern.

Reprocessing by the use of heat treatment to kill *Listeria* spp is the only acceptable form of reprocessing, regardless of product type.

8.1.2 Conditions for Approval

Depending on the product and the nature of the manufacturing process, specific requirements will be laid down in each case before the SDA representative will consider an application for approval to reprocess. These requirements will include some or all of the following:

- (a) the location of the reprocessing facility;
- (b) details of the reprocessing facility such as:
 - (i) aerosol minimisation precautions;
 - (ii) ventilation; and
 - (iii) footbaths and other control methods.
- (c) details of the processing to be used, such as:
 - (i) equipment to be used;
 - (ii) flow diagram of the process;
 - (iii) heat treatment (and controls);
 - (iv) arrangements for disposal of waste packing materials and reject product (if any);
 - (v) quantity of product for reprocessing;
 - (vi) period during which this will occur;

- (vii) personnel operating instructions, protective clothing handling procedures, hygiene standards and security for the reprocessing area;
- (viii) end product specifications; and
- (ix) product storage details to any clearance.

8.1.3 Procedure

When approval has been received, reprocessing may begin subject to any conditions that may have been imposed by the SDA Representative. Any variation from the procedure must be approved before being adopted.

The SDA Representative will need to be satisfied that the procedures proposed cover the following factors:

- (a) that personnel will be supplied with protective clothing (which shall not leave the reprocessing area) and that the rules for movement about the plant site are comprehensive;
- (b) the reprocessing area will have signs at all entry points advising the restrictions and that proper security measures are in place to enforce same;
- (c) procedures for sanitising all equipment and surfaces (including drains) during operation and following operation are in place;
- (d) that the method for handling the product for reprocessing and the reprocessing procedure is appropriate for that particular product type;
- (e) that the proposed method of disposal of contaminated packaging and/or waste product will prevent the spread of contamination; and
- (f) that a specific microbiological testing program for the environment in the reprocessing, and the immediate surrounding area will be put in place.

Each product reprocessing situation will require specific approval from the relevant State Dairy Authority.

8.2 Sale of Reprocessed Product

Reprocessed product is only fit for sale once it has been cleared and approved by the State Dairy Authority.

8.3 Destruction of *Listeria monocytogenes* Contaminated Product

Product may be placed in a dumpster, crushed or delivered to the tip under the supervision of a SDA Representative. It is vital that all contaminated product is destroyed, this may occur by various methods including crushing, burying or dyeing/colouring contaminated units.

9. Sampling for *Listeria* Testing

9.1 Introduction

Australian Standard procedures must be used when sampling dairy products for the detection of *Listeria* spp. Refer to AS 1166 - 1992, *Milk and Milk Products - Methods of Sampling*, and the Food Standards Code (ANZFA).

NOTE:

- Samples must be transported and stored as per AS 1166 - 1992.
- Aseptic techniques and sterilised equipment and containers are to be used.
- Samples should be forwarded to the laboratory as soon as possible.

9.2 Sample Size and Compositing

The minimum sample size for product is 100 g or mL. Five separate samples x 25 g or mL from the same batch are recommended for routine monitoring testing. Samples may be submitted individually to the laboratory or composited at the point of sampling. Up to 15 samples may be composited together.

NOTE:

- The sampling implement must be cleaned and sterilised between composites.

By submitting whole product units to the laboratory for analysis the risk of contamination at the point of sampling is removed. Where possible it is recommended to sample product in sequence, as this may provide useful information if positives are isolated.

9.3 Cheese

Samples may be whole units or portions of whole units, but should be taken to include the exterior surface except in the case of waxed or cloth wrapped cheeses. Sub-samples may be composited at the point of sampling. A wedge sample is preferable to a plug sample to ensure that a part of the surface area is included in the sample. This is because if cheese is contaminated with *Listeria* spp it can most often be found on the surface of the cheese.

9.4 Pasteurised Milk

Separate units from a particular batch may be submitted, except in the case of bulk milk, where sub-sampling will suffice. A minimum of 25 mL for each sub-sample is required. The sub-samples may be composited at the point of sampling.

9.5 Other Products

Five samples x 25 g from separate units of a given batch should be tested (whole units if convenient). Samples may be composited at point of sampling or submitted separately.

9.6 Stage of Manufacture for Sampling

Products with short shelf life should be sampled as soon after manufacture as possible. Other products should be sampled at a stage in manufacture or ripening, after which the risk of contamination with *Listeria* spp has most likely occurred.

9.6.1 Consumer Packs

Sampling should be performed after the final stage of manufacture which will usually be packing.

9.6.2 Bulk Product

Sampling may be performed just prior to or after filling into the bulk container. Where sampling occurs prior to filling additional routine environmental samples are to be taken of the filling area. Monitoring this area will reduce the risk of contamination occurring at a stage past the sampling point.

9.6.3 Mould Ripened Cheese

Sampling should be performed at the time of packaging.

NOTE:

- Samples may be whole units or portions of whole units, but should be taken to include the exterior surface except in the case of waxed or cloth wrapped cheeses.

9.7 Environmental Samples

Samples may be taken as swabs or as portions of material. Details regarding environmental sampling guidelines are outlined in Section 10 and Appendix 7 of this Manual.

10. Environmental Testing

10.1 Introduction

Environmental and in-line sampling has played a large role in pin pointing trouble areas and revealing factory conditions that may contribute to final product contamination. They typically involve swabbing or exposure plating techniques to determine the presence of the organism.

Environmental sampling plans initially should include total coverage of the environment to determine “hot spots” for the organism. Relationships between point sources may become apparent, sources may have a common link, operator practices may contribute to or spread the organism, along with equipment design or layout. “Hot spots” should be monitored on a routine basis.

Regular monitoring of the environment in and around the plant can be an effective early warning system for identifying potential sources of *Listeria* contamination of product. A regular program should include all the critical points, including inner-near and inner-far areas around the processing area. These points will be determined from experience in the plant and from advice received from SDA Representatives and other expert and experienced industry contacts.

10.2 Classification of Environmental Samples

Level	Typical Examples
1 Outside	Roofs, gutters, traffic areas, waste pits, vehicles, pallets
2 Inner-Far (<i>non-product contact surfaces</i>)	Floors, walls, ceilings, drain outlets, pools of water (floors of manufacture and cool rooms), condensate of refrigeration evaporators (cool rooms), cheese storage room walls and shelves, floor joints/crevices.
3 Inner-Near (<i>direct or indirect product contact surfaces</i>)	Filling heads/mandrels, product conveyors, seals/gaskets, mixers/hoppers, storage vats, filter material, internal surfaces of air ducts, water to process plant, residues on equipment, packaging materials, product sampling equipment, brining vats, vats, fruit and flavour feeders, filling machines (cups and consumer packs), rotary and in-line continuous novelty and stick machines, chocolate shrouding machines or section, homogenisers.

10.3 Action Required for Positive Environmental Samples

If *Listeria* spp is detected in the environment, the following action should be taken:

(a) Positive Level 1 - Outside

Sample and test at least 5 samples from Level 2. If negative, no further action is required except to tighten hygiene controls.

(b) Positive Level 2 - Inner-Far

- (i) If the result was from a composited sample, the individual areas should be resampled prior to cleaning of the areas and the samples should be tested individually.
- (ii) The suspect areas should be cleaned and sanitised immediately.
- (iii) The same areas should be sampled again during the next production run. These samples may be composited for testing.
- (iv) If there are no test results available of relevant inner-near sites, sample and test at least 5 samples from Level 3 sites. If negative, no further action is required except to tighten hygiene controls.

(c) Positive Level 3 - Inner-Near

- (i) If the result was from a composited sample, the individual areas should be resampled prior to cleaning of the areas and the samples should be tested individually.
- (ii) The suspect areas must be cleaned and sanitised immediately.
- (iii) The same areas must be sampled again during the next production run. These samples may be composited for testing.
- (iv) If the environmental positive is *L. monocytogenes* and is an inner-near environment sample the following additional action must be taken:
 - any batches of product associated with the area manufactured on the day of, day before and day after the positive result must be tested at 25 samples x 25 g or mL per batch. If any codes are positive, then the relevant clearance program must be implemented; and
 - if there is no such product as listed above, the next available batch of product manufactured after the date of the environmental positive must be tested at 25 samples x 25 g or mL.

NOTE:

- The recommended procedure on how environmental samples should be taken is documented in Appendix 6.

11. Test Methods

11.1 Introduction

Although there has been significant progress in the area of *Listeria* spp isolation techniques, there is still no universal acceptance of one particular method. The development of detection methods for *Listeria* spp has not just been confined to the traditional cultural methods. There have also been great advances in new rapid methods that reduce the time to obtain detection and that are sensitive and specific.

11.2 Reference Test Method

The required reference method is AS 1766.2.14 - 1998, *Examination for specific organisms - Listeria monocytogenes in dairy products*. This standard provides a reference method suitable for determining that dairy products comply with microbiological requirements. The method incorporates the use of enrichment in selective liquid medium, isolation and presumptive identification and subsequent morphological, physiological and biochemical confirmation.

11.3 Alternative Test Methods - Rapid Kits

There are many rapid test kits available in the dairy industry, for the detection of *Listeria* spp. Any alternative test method or rapid test kit for the detection of *Listeria* **must** be validated in the laboratory according to the Australian Standard, *Guide to validation of food microbiology test methods* (in draft format at the time this document was issued). Alternative test methods and rapid test kits are to be used as a screening method only. Any positive *Listeria* spp test results are to be confirmed using the reference test method. *L. monocytogenes* may be confirmed using a gene probe provided that this method has been fully validated within the testing laboratory.

The local State Dairy Authority should also be consulted when using an alternative method, as specific approved methods may apply.

12. Cleaning and Sanitising

12.1 Introduction

Every dairy factory, no matter how small, should have a documented cleaning and sanitation program in place with staff member(s) responsible for the operation of the program.

Effective cleaning, disinfection and post-rinsing are all important in eliminating microorganisms. Inadequate cleaning can leave behind soil residues that may not be visible to the naked eye, but can lower the effectiveness of sanitisers used. A low level of surviving cells present on equipment surfaces, after the sanitation step, can then easily grow and multiply in the presence of these organic materials, which provide nutrients for the cells, especially if subsequent post-rinsing is inadequate.

AS1162 - 1991, *Cleaning and Sanitising Dairy Factory Equipment* sets out accepted practices for cleaning and sanitising dairy factory equipment and should be referred to when programs are being prepared.

Larger establishments may require a special manual detailing, cleaning and sanitation procedures for various product contact surfaces as well as for environmental or non product surfaces. Equipment such as filling heads, undersides of equipment and packaging guide rails should not be forgotten in any cleaning and sanitation program. Procedures should cover:

- (a) instructions on frequency of and methods used for cleaning the plant, including cleaning of equipment and surrounds while the plant is operational, cleaning and sanitising the plant at the end of day or prior to start-up and less frequent major clean-ups;
- (b) specifications and concentrations for detergents and sanitisers used;
- (c) specific instructions for cleaning individual items of equipment, where appropriate; and
- (d) cleaning and sanitation of areas not directly associated with manufacture.

The use of steam and hot water in processing areas during production should be minimised to prevent the formation of condensate. High pressure hoses should not be used for cleaning purposes because of possible widespread splashing and formation of aerosols. It is recommended that a flooding technique be used as an alternative.

Cleaning procedures must be conducted in a systematic way to avoid possible recontamination of treated surfaces. For this reason, buildings should be cleaned before equipment and equipment should be cleaned from highest point to lowest.

12.2 Cleaning

12.2.1 Liquid Product Contact Surfaces

All items of equipment coming into contact with liquid product, eg. pipelines and pumps, should be cleaned in-place with detergent daily, or after each production run.

12.2.2 Dry Cleaning

Where dry cleaning is the means of cleaning, all surfaces are to be dry cleaned using brooms, brushes, scrapers or by vacuum, as required. Broom, brushes, etc., should be sanitised and dried before use. Bristles should be non-absorbent, easily cleaned and firmly secured.

Sanitised equipment should be stored to avoid contamination when not in use. All cleaning tools and cleaning equipment should be confined to specific areas.

12.2.3 Cleaning In Place (CIP) Systems

CIP systems must be specifically designed to provide for maximum efficiency at all times. General information is provided in AS 1162 - 1991, *Cleaning and Sanitising Dairy Factory Equipment*, on such systems.

While every step from preparatory operations through to the sanitising is important in CIP systems, the following are of paramount importance:

- (a) pre-rinse solutions should not be recirculated but run to waste;
- (b) the correct solution velocity must always be maintained during CIP;
- (c) the temperature of detergent solution must be maintained during the cleaning cycle. Recommended detergent strength must be maintained throughout the cleaning cycle;
- (d) acid type detergents should be used every fourth day the equipment is cleaned in order to remove any adhering residues of alkaline detergent or milk stone;
- (e) items of equipment which cannot be effectively cleaned by circulation CIP or which restrict the velocity of the cleaning solution must be removed and cleaned separately. It may be useful to regularly dismantle equipment and manually clean;
- (f) the plant must be thoroughly rinsed with water following the detergent cycle and prior to sanitising. This solution must not be recirculated; and
- (g) all detergents and sanitisers should be used in accordance with the manufacturer's recommendations with particular attention to correct use dilutions, temperatures and contact times.

12.2.4 Manual Cleaning

It may often be necessary to dismantle and manually clean to ensure equipment is thoroughly cleaned.

12.3 Sanitation

Steam, hot water or chemical sanitisers may be used to sanitise the plant and equipment. If steam is used, care must be taken to minimise condensate because excess condensate will lower the temperature and hence effective sanitation will not be obtained. Chemical sanitisers are to be used for non product contact surfaces (eg. floors, drains, conveyors).

The cleaned equipment should be sanitised no more than 30 minutes before use, by one of the following techniques as outlined in AS 1162 - 1991, *Cleaning and Sanitising Dairy Factory Equipment*:

- (a) circulation of potable water at a minimum temperature of 82°C at the discharge point for a minimum of 5 minutes; or
- (b) injection of steam into the system until a minimum condensate temperature is attained at the drainage outlet of 92°C for 5 minutes, or a suitable equivalent; or
- (c) application to all product contact surfaces of an aqueous solution chemical sanitiser at recommended concentration and temperature.

Consultation with suppliers of sanitising compounds is highly recommended to ensure the compound applied is effective against the organisms of concern, and is being used to the correct specifications. Further advice from the factory's engineering and technical staff should also be sought prior to the application of sanitisers on a broad scale. Electrical and mechanical failure/damage could result if due care is not exercised when using sanitisers within factory buildings.

12.4 Water Quality

Water used in cleaning and sanitation programs must meet specific requirements as set out in the *Export Control (Processed Food) Orders*, Schedule 2. These Orders outline the need for an ample water supply which must be potable, and should be referred to.

Water hardness may necessitate the use of special detergents and excessive alkalinity may need to be neutralised.

It is also important that any water being re-used or re-circulated within a premises should be treated and maintained in a condition that is not a health hazard, and must be potable if it comes into direct contact with food.

12.5 Verification

It is important that cleaning and sanitation procedures are verified as a check of the effectiveness of cleaning procedures, and to ensure that residual material is removed during cleaning operations. This should be done by visual inspection to ensure that parts show an absence of contaminants, and also by regular hygiene monitoring. Hygiene monitoring should involve, for example, regular swabbing of recently cleaned and sanitised areas, allowing for the detection of residual bacteria. Verification of cleaning procedures ensures that problem areas which may otherwise go undetected are highlighted, further ensuring a reduction in product losses.

References

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Australian Quarantine Inspection Service, *Export Control (Processed Food) Orders*, 1992

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International Commission on Microbiological Specifications for Foods (ICMSF), *Microorganisms in Foods 2, Sampling for microbiological analysis: Principles and specific applications*, 1978

International Dairy Federation, *Milk and Milk Products, Detection of Listeria monocytogenes*, Standard 143:190

Pacific Analysis, *Water and Environmental Methods Manual (2.4): Examination of Swabs: Detection of Pathogens*, 2.4.1.S2P, Pages 1-3

Standards Australia, AS 1162 - 1992, *Cleaning and Sanitising Dairy Factory Equipment*

Standards Australia, AS 1166 - 1992, *Milk and Milk Products - Methods of Sampling*

Standards Australia, AS 1766.1 - 1991, *General Procedures and Techniques*

Standards Australia, AS 1766.2.15 - 1998, *Listeria monocytogenes*

Standards Australia, AS 3993.1 - 1992, *Equipment for the Pasteurisation of Milk and other Liquid Dairy Products, Part 1: Continuous Flow Systems*

Standards Australia/Standards New Zealand, Committee FT/4 - Food Microbiology, *Guide to validation of food microbiology test methods (draft)*, November 1996

Sutherland, P., *Contaminants: Reducing the Risk: Listeria*, Dairy Industry Quality Centre Seminar, 1996

Appendix 1

Address List for ADASC Members

Commonwealth

Australian Quarantine and Inspection Service

GPO Box 858
CANBERRA ACT 2601

Phone: (06) 9272 3933
Facsimile: (06) 9272 5697

State Dairy Authorities

Victorian Dairy Industry Authority

PO Box 548
RICHMOND VIC 3121

Phone: (03) 9426 1600
Facsimile: (03) 9428 6111

Tasmanian Dairy Industry Authority

PO Box 68
HADSPEN TAS 7290

Phone: (03) 6393 6202
Facsimile: (03) 6393 6404

Dairy Industry Authority of Western Australia

PO Box 75
CLAREMONT WA 6010

Phone: (08) 9384 4111
Facsimile: (08) 9384 4877

New South Wales Dairy Corporation

PO Box A2613
SYDNEY SOUTH NSW 2000

Phone: (02) 9295 5777
Facsimile: (02) 9261 2434

Queensland Dairy Authority

Private Bag 5
Roma Street
BRISBANE QLD 4003

Phone: (07) 3236 1100
Facsimile: (07) 3236 1212

Dairy Authority of South Australia

33 Hutt Street
ADELAIDE SA 5000

Phone: (08) 8223 2277
Facsimile: (08) 8232 2463

Appendix 2

Definitions

ADASC member - the officer in charge of the Commonwealth or State Authority having jurisdiction to implement legislation relating to dairy produce and standards

Approved - written agreement by the ADASC member (or delegate)

Cleaning - an operation designed to remove all foreign deposits or residues from equipment surfaces using physical, chemical or mechanical means

Cleared (Clearance) - *Listeria monocytogenes* not detected under the procedures required in this Manual

Code / Batch - up to 24 hours continuous production of product or products from any specific line or a lesser period of continuous production between complete cleaning and sanitising procedures

Confirmed Positive - when suspect colonies on the selective agar plates have undergone biological and serological confirmation

Detergents - chemicals or blends of chemicals capable of assisting cleaning when added to water

Production Line - all the processing and packaging equipment used for the manufacture, processing and packaging of a particular product

Sanitising - a process which reduces the number of microorganisms in the dairy plant and on utensils to an acceptable level

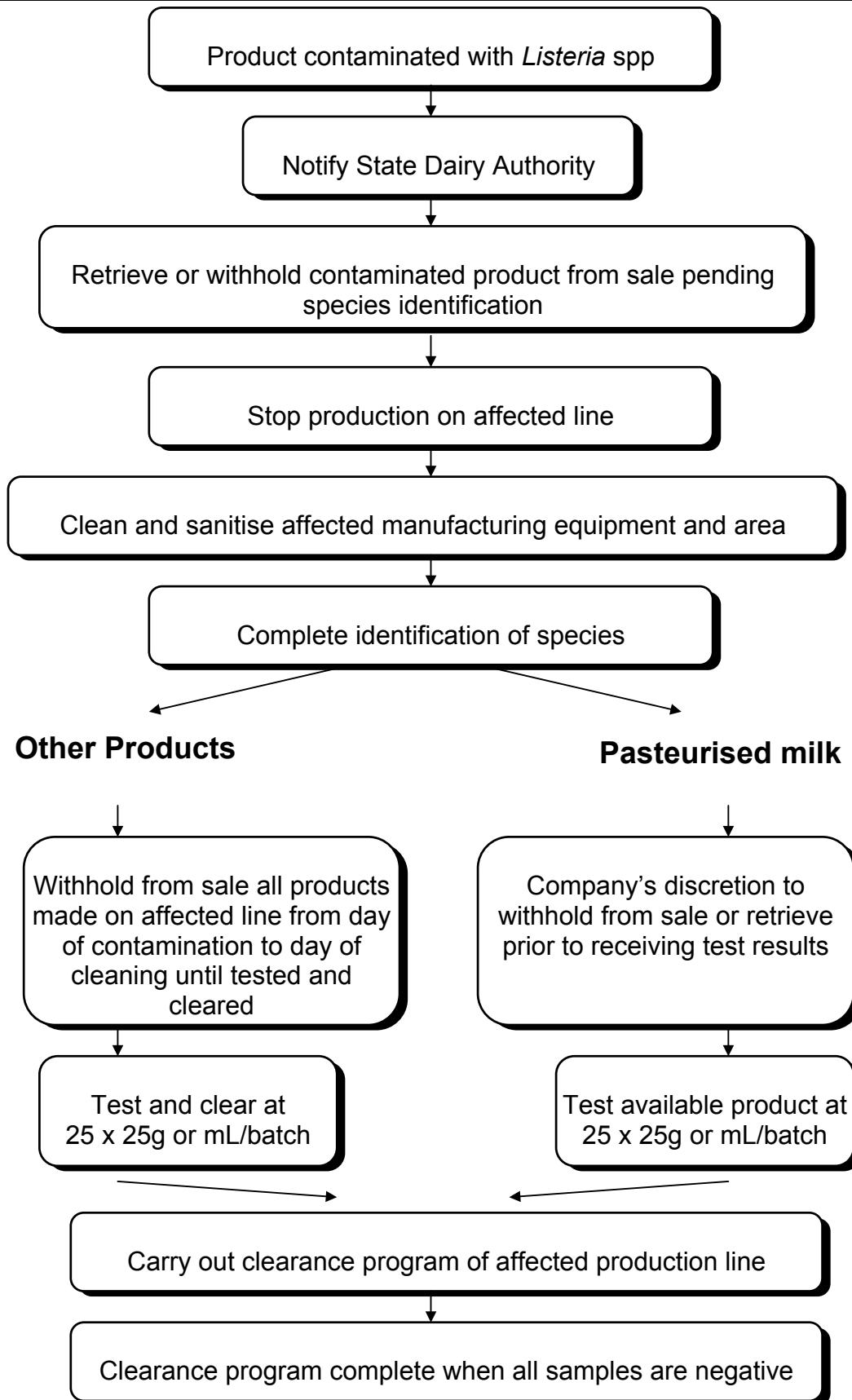
State Dairy Authority (SDA) Representative - any person appointed by the ADASC member to supervise the implementation of these procedures

Supervise - to provide advice and/or monitor the implementation of these procedures

Under Order(s) - product which is subject to a written order by a SDA Representative which prohibits the removal of that product from the licensed premises at which the order was imposed

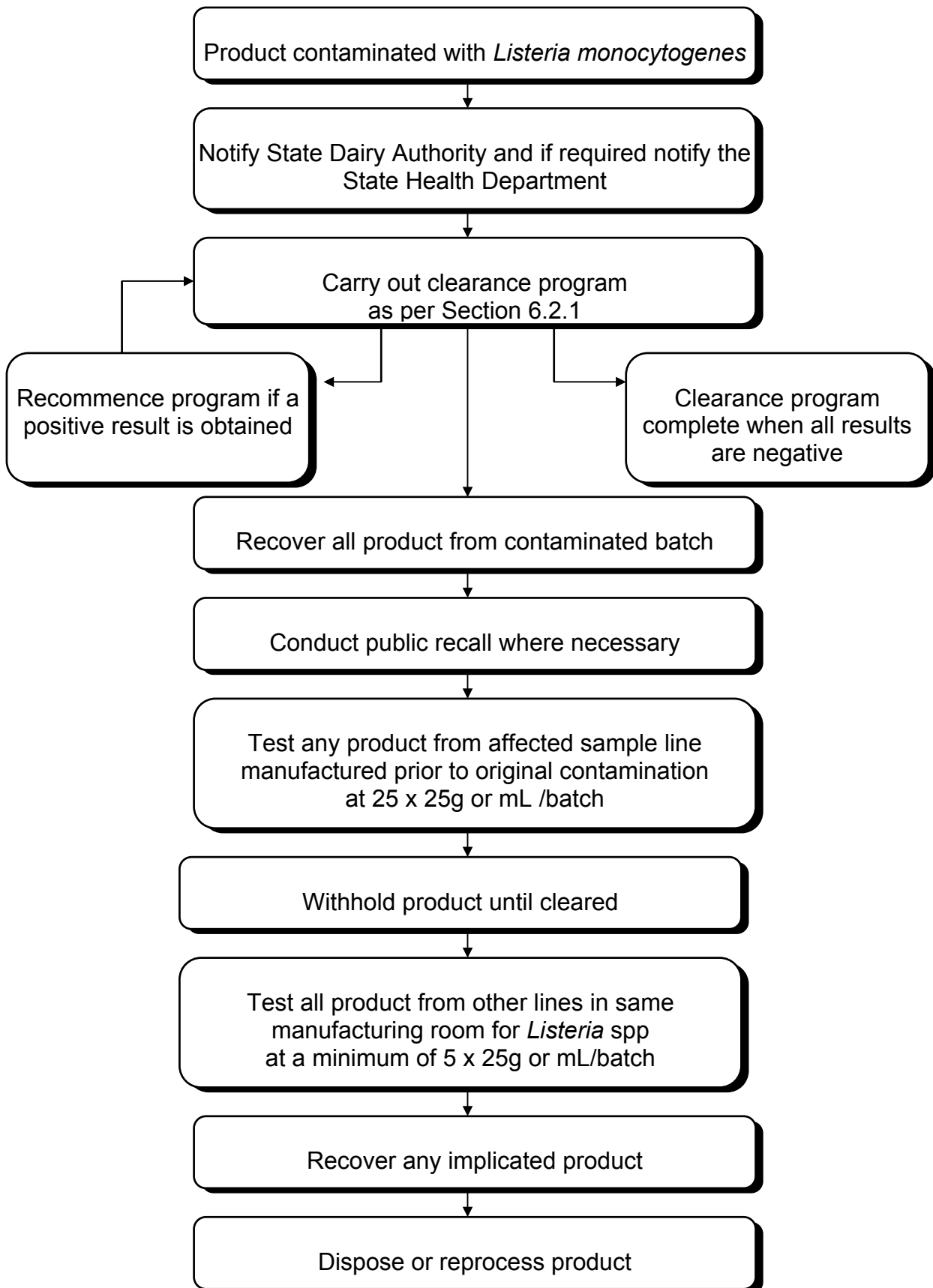
Appendix 3

Procedure Following *Listeria* spp Contamination in Product



Appendix 4

Procedure Following *Listeria monocytogenes* Contamination in Product



Appendix 5

Example of a Routine Clearance Program

Mon 10	Normal production - sample taken for <i>Listeria</i> spp testing
Tue 11	Normal production
Wed 12	Normal production
	PM - advice of positive <i>Listeria</i> spp received. Production ceases.
Thur 13	Clean and sanitise the affected manufacturing area and equipment
Fri 14	Day 1 Begin clearance program. 25 samples x 25 g or mL per batch & 15 environmental samples
Sat 15	Day 2 Normal production
Sun 16	Day 3 25 samples x 25 g or mL per batch
Mon 17	Day 4 Normal production
Tue 18	Day 5 25 samples x 25 g or mL per batch
Wed 19	Day 6 Normal production
Thur 20	Day 7 Normal production
Fri 21	Day 8 Normal production
Sat 22	Day 9 Normal production
Sun 23	Day 10 Normal production
Mon 24	Day 11 Normal production
Tue 25	Day 12 25 samples x 25 g or mL per batch
Wed 26	Normal production
Thur 27	Normal production

NOTE:

- This example uses a 7 day production week.
- Production on the affected line from the 10th - 13th is to be tested at 25 samples x 25 g or mL per batch and withheld from sale until cleared. In the case of pasteurised milk it will be at the company's discretion whether to withhold the product from sale.
- It is at the company's discretion whether the contaminated product is withheld from sale or retrieved prior to species identification. In the event that *L. monocytogenes* is confirmed a product recall may be necessary.
- When results of the clearance program are available, and all are negative, the plant and product is cleared. If any batches are found to be positive then the clearance program is to begin again. Product is withheld from sale if the species is *L. monocytogenes*, or until results of the clearance program are negative.
- The clearance program must be completed in full even if the species is other than *L. monocytogenes*. If the species is *L. monocytogenes*, product manufactured in the same room as the contaminated batch from Mon 10th, is to be tested at 5 samples x 25 g or mL per batch for days Sun 9th, Mon 10th and Tue 11th.

Appendix 6

Procedure for *Listeria* spp Environmental Sampling

1. Environmental Sampling

Swabs can be taken over any area size with any suitable implement as long as it is sterile and clean. Suitable swabbing implements include cotton buds, eye patches, gauze squares, etc. The surface area swabbed can vary depending upon the size of the areas being examined.

Precautions should be taken that the area to be swabbed does not contain any chemical residues that may inhibit or interfere with the growth of *Listeria*. If the person taking the samples suspects that chemical residues may be present, then they should either abort the sampling or take notes regarding their suspicion to be submitted with the sample.

Environmental swabs can be taken from inner-near (product contact surfaces) or inner-far location in the factory.

An initial survey of inner-far locations should be undertaken of the processing area to determine potential hot spots where *Listeria* contamination may be spread from. Once these hot spots are identified, procedures should be put in place to ensure control of the occurrence and spread of *Listeria*.

On a routine basis inner-near locations should be monitored to ensure that control measures are effective.

2. Swabbing Techniques

2.1 When taking environmental samples the following protocol is to be used:

- (a) Wherever possible swabs should be taken during full production or prior to equipment clean up. Swabs should never be taken immediately after cleaning of equipment as residues of detergents and sanitisers will reduce the viability of any *Listeria* present. If samples must be taken during non-production, several hours should have elapsed since cleaning or sanitising.
- (b) Use one jar of nutrient broth or 0.1% peptone per sampling. Open broth jar and place lid, face up on a **clean** bench.
- (c) Undo the swab from its tube and lightly touch the end of the swab to the surface of the solution. Do not immerse the swab completely in the solution.
- (d) Rub the swab slowly over / in the surface to be sampled. A surface area of up to 50 cm² can be swabbed.
- (e) Return the swab to the transport medium container.
- (f) Use one jar of broth per sampling. Once you have taken all swabs needed discard the broth. **DO NOT REUSE.**

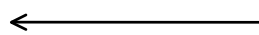
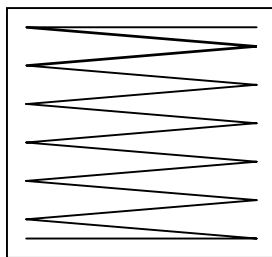
(g) All swabs should be held at 4°C during transportation.

2.2 If gauze swabs are used then this procedure is followed:

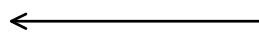
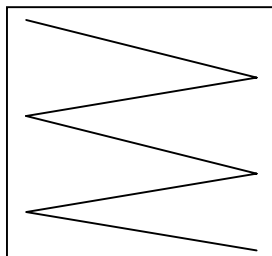
- (a) If larger surface areas need to be swabbed, sterile gauze can be used.
- (b) Aseptically open the individually wrapped gauze pads. Open a vial of rinse solution and moisten pad with 10 mL of solution.
- (c) Holding the pad aseptically with sterile gloves, swab the surface by vigorously rubbing over the designated area. An area of several square metres may be effectively swabbed.
- (d) After sampling, aseptically place swab into a sterile container for transport.
- (e) All swabs should be held at 4°C during transportation.

3. Swabbing Techniques

Care should be taken when taking swabs to use the correct technique. Swabs should be taken by wiping the swab in a zig zag motion across the surface area. The zig zags should be close together to cover as much of the surface area as possible. This technique is illustrated below. If using cotton bud for a swab, the bud should be rotated as it is wiped across the area. Once the swab has been drawn over the surface area once, it is then reswabbed at 90° rotation to the original swab, before being placed in the transport vessel.



Correct swabbing method
(up to 50 cm²)



Incorrect swabbing method

4. Transport of Samples

Transport media varies depending on the microorganism being examined. *Listeria* should be transported in an appropriate transport media, which is designed to prolong the life of pathogenic organisms. *Listeria* swabs should be transported in empty sterile test tubes and placed in buffered peptone upon reaching the laboratory.

Appendix 7

Explanatory Notes

Explanatory notes aim to provide a brief explanation and justification of the changes made to the *Listeria Manual*.

Section 2 Purpose and Scope

- Includes references to various Sections as regulatory or advisory. This aims to serve as a quick reference to separate which parts of the manual are required to be performed by dairy companies and those which are to serve as guidance only.
- The *Listeria Manual* serves as a quality assurance document for the dairy industry. It is not a replacement to the Food Standards Code, which sets end product standards.

Section 3 Summary of Company Responsibilities

- This Section has been included in the revised edition so that it can be used as a quick reference for manufacturers. The manufacturer will be able to open to this Section and read a brief summary of direct responsibilities in the event of a contamination with *Listeria* spp.

Section 4 Background on *Listeria*

- The information in this Section has been expanded and updated to include relevant information on characteristics of *Listeria* spp, as well as significance, prevalence and occurrence in the dairy industry.

Section 5 *Listeria* Prevention Procedures

- Previously the lesser heat treatment referred to in 5.3.1 was prohibited in New South Wales. As all states are now using the Food Standards Code, New South Wales comply with the same standards as other states.

Section 6 Management of *Listeria* Contamination

- Previously this Section was called *Action Following Listeria Contamination*.
- Relevant reference to the *ANZFA Food Industry Recall Protocol* have been included.
- An amendment was made to Section 6.3 to include the need for a NATA certificate for all product on hand - previously this requirement was unclear.
- It is important to note that it is important to follow up all *Listeria* spp isolations, for example experience has shown that when *L. innocua* has been isolated in a sample, *L. monocytogenes* has on occasions, also subsequently been isolated. For reasons such as these it is important that all isolations of *Listeria* spp in product be notified and clearance procedures conducted.

Section 7 Export Requirements

- *Export Requirements* have been included as it is important that notification be received by AQIS and the SDA so that immediate action can be taken, particularly if product has already left the country.

Section 8 Disposal of Contaminated Product

- This Section of the Manual has been expanded to include more detailed information, particularly relating to condition for approval, and procedures to reprocess contaminated product. Also included are details on destruction of contaminated product - this will allow those that do not wish to, or do not have the facilities available to reprocess, the option to destroy and dispose of implicated product in another manner.

Section 9 Sampling for *Listeria* Testing

- This Section of the Manual has been expanded to further clarify specific areas.
- It is important that the correct procedure be used to take, store and transport samples.
- *Notes* have been included as a means to highlight areas to take note of when sampling.
- Section 9.6, *Stage of Manufacture of Sampling*, has been split into separate areas so that the manufacturer can easily identify which stage of their process is most appropriate, and therefore take samples at the stage after which the risk of *Listeria* spp contamination has most likely occurred.

Section 10 Environmental Testing

- *Environmental Testing* has been separated into a new Section, as information previously outlined was very brief. This new Section gives details on the importance of environmental sampling and gives examples of areas which might be sampled as part of an environmental sampling regime. Action and procedures to be undertaken after a positive environmental sample is detected, is described.
- This Section aims to assist the manufacturer in deciding how, when, and where to take environmental samples, and in the event of a positive, what to do.

Section 11 Test Methods

- A Section on *Test Methods* has been included in the Manual as there is often confusion regarding what methods are able to be used. This Section describes that provided rapid kits are validated they may be used for screening purposes, however any positive results should be confirmed using the reference method or by gene probe - provided this has also been fully validated in the testing laboratory.

Section 12 Cleaning and Sanitising

- This Section of the Manual is advisory only. For this reason prescriptive information which was documented in the previous revision has been omitted from this Manual. Also included is information on water quality - even though a certain level of water quality is required, as per the *Export Control (Processed Food) Orders*, this information has still be included. Information regarding water hardness and re-used or re-circulated water is also included for reference.
- Also included in this revision of the Manual is verification - cleaning and sanitising procedures need to be verified as a means of confirm that residual material is removed and, cleaning and sanitising procedures are effective.