



Australian Dairy Authorities'  
Standards Committee

# **Australian Manual For Control of *Salmonella* 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 dried milk products are hygienically manufactured and do not present a health risk to the consuming public.

## *Salmonella Manual*

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

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

This edition of the Manual replaces in full the January 1994 edition.

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

The **mandatory** clearance procedures and procedures for disposal of contaminated product detailed in the Manual (white pages) apply to dried milk products manufactured in all States and Territories in Australia. Where appropriate, the procedures outlined in this Manual may also be applied to the clearance of other dairy products. 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 *Salmonella* 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 *Salmonella* in the dairy processing environment.

### **3. Summary of Company Responsibilities**

The company **must**:

- (a) notify the State Dairy Authority (SDA) Representative of all *Salmonella* isolations in dried milk product samples immediately. This is to be followed by written confirmation within 7 days. It is also **strongly recommended** that the SDA Representative is advised of *Salmonella* isolations in environmental samples;
- (b) notify the Health Department, or other relevant authorities, according to state regulation;
- (c) after identification of a *Salmonella* contamination, in conjunction with the SDA Representative, prepare a time-table for plant shut-down, inspection, cleaning and sanitising, and plant clearance;
- (d) segregate contaminated product from other non-contaminated product;
- (e) ensure that contaminated product is labelled accordingly and is clearly identified; and
- (f) obtain approval from the SDA Representative for the disposal or reprocessing of contaminated product.

## **4. Background on *Salmonella***

### **4.1 Introduction**

*Salmonella* belong to a family of bacteria, the Enterobacteriaceae which live in the gut of animals. Some features of *Salmonella* species include:

- (a) Gram-negative rods;
- (b) motile bacteria;
- (c) non-spore formers;
- (d) do not survive pasteurisation, are not resistant to heat and other environmental influences; and
- (e) do not produce toxins.

There are about 2,000 different *Salmonella* serotypes.

*Salmonella* are found in a wide range of animals both warm and cold blooded. It has been noted that most species of animals and birds have been found to have had the organisms at one time or another. Even though *Salmonella* are found widely in the environment they cannot be classified as ubiquitous, because if they were then they would be found in the majority of production sites and animals.

The major source of *Salmonella* is domestic animals, the more humans and animals are together the more the organism is spread around. Mice, rats, reptiles and birds are potential sources of the organism as well as the environment.

*Salmonella* are a problem because they cause salmonellosis. The most common form of the illness is gastroenteritis which occurs usually 12-36 hours after ingestion of the infected food. This illness, which although very unpleasant at the time, is mostly short-lived and recovery occurs in 1-2 days, but more serious problems can occur such as enteric fever and meningitis which may be fatal. The host response is dictated by a number of factors, for example, virulence of the strain, size of dose, age, and immunological competence. Infants and elderly have a much higher incidence of salmonellosis and *Salmonella* has emerged as an important pathogen in patients with AIDS.

### **4.2 Background in the Dairy Industry**

In 1943 the first significant Victorian case of *Salmonella* in a milk product occurred. Raw milk contaminated by a typhoid-carrying farm worker was distributed for public consumption, resulting in over 400 cases of typhoid fever and 23 deaths.

In 1967 the Department of Agriculture issued a letter warning dairy companies of the danger of *Salmonella* infections in the manufacturing plant after the *S. new-brunswick* outbreak in the United States in milk powder. *Salmonella* was detected in casein from a western Victorian plant in 1977. By mid 1978 casein from four more plants were found to be contaminated, then in July that year the *S. bredeney* outbreak in infant powder occurred. Dryer insulation was implicated as the source of the contamination.

After this incidence the Department of Agriculture in Victoria carried out a series of dryer inspections. Many had damp insulation and in each case the *Salmonella* in the insulation and related contaminated product were the same serotype. Insulation was removed from dryers and in most cases has not been replaced.

Sporadic isolations of *Salmonella* in both the environment and in product continue to occur. For example, in 1997 the *National Enteric Pathogens Surveillance Scheme* reported 68 isolations of *Salmonella* in milk products, throughout Australia. During the same period, routine samples and swabs from the environment of dairy factories were taken. *Salmonella* was detected in a small proportion of these samples, emphasising the importance of monitoring the dairy factory environment.

### **4.3 Prevalence of *Salmonella* in the Dairy Industry**

*Salmonella* initially gained entry to plants from the environment a long time ago, and were able to proliferate due to favourable growth conditions. Powder, dust and water supply the nutrients and the warmth provides the ideal growth condition. Dust and powder residues from ledges, filterhoods, wall ceilings, floors and ancillary equipment are common sources of contamination.

Originally, contaminated insulation material was probably the main source of *Salmonella* detected in product. Dust, powder, water and contaminants entered the insulation around explosion doors and areas where there was incomplete sealing of the dryer cladding to the support structure. Stress cracks in the dryer wall allowed moisture from damp contaminated insulation to seep into the dryer and contaminate powder.

## 5. Salmonella Prevention Procedures

### 5.1 Introduction

*Salmonella* can be carried by animals, birds and may also be found in the environment, 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 *Salmonella* from the farm to the factory milk receival areas is therefore difficult to prevent. However there are steps that can be taken to minimise or prevent the organisms proceeding further into the factory.

Wherever *Salmonella* enters the processing line, product is contaminated and the entire plant from there on is contaminated by dispersal of the product. When contamination occurs the plant has to be completely dismantled, cleaned and sanitised to “clean-up” the problem.

### 5.2 Steps to Control *Salmonella* Entry to Plant Areas

Specific aspects which require special attention for the control of *Salmonella* 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;
- (h) ensure screw conveyor lines are not left uncovered or partially uncovered, and manhole covers and vents in storage silos of dried milk products are in place to minimise condensation forming in silos;
- (i) compressed air which comes in contact with milk products and process equipment surfaces should be of food grade standard. Air used in processing rooms should be filtered before entry to minimise the risk of airborne

contamination. Conveying air is also critical. Sealing of factory roads, planting of lawns in unused yards, keeping drains clean all help to reduce the potential sources of air contamination;

- (j) water used in plants should be of potable quality. With the increasing costs of water and disposal of waste waters the use of recycled water is increasing. The quality of recycled water must be closely monitored;
- (k) most plants, especially the older ones, have not been designed with the purpose of excluding pathogens. Effective footbaths or red-line areas should be in place at all points of entry into processing areas to prevent the organism gaining entry. Shoes worn outside should not be worn inside unless covered by waterproof overshoes, as soles and heels of boots can be sources of contamination. Ideally soles and heels of boots should be cleaned and sanitised daily and clothes worn inside the plant should not be worn outside; and
- (l) *Salmonella* and other pathogens require a supply of nutrients and water to grow, therefore floors need to be kept dry and any areas wet cleaned should be quickly dried even if forced drying is required. The state of cleanliness should be maintained with a dirty surface indicating potential pathogen contamination and requiring recleaning.

### **5.3 Steps to Control *Salmonella* in the Processing Area**

Potential areas of 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 cooling systems. A scheduled review program should be initiated to ensure they are properly protected and do not contain any pathogenic organisms.

#### (b) Cracks and Crevices

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 contamination does not occur. This is outlined in detail in Section 12 of this Manual. Utensils used for cleaning and unblocking powder lines and bins must be properly stored, cleaned and sanitised.

#### (d) Product Handling

Manufacturers should minimise the amount of product handling and product exposure to the plant environment. This can be accomplished by minimising handling and storage time prior to final packaging.

### (e) Absorbent Items

The use of absorbent items, such as cloths 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. It is important to incorporate a cleaning and sanitising regime for all conveyors.

### (g) Cross Contamination

Cross-connections between milk lines and other sections of the plant such as 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.

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.

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

When changing external air filters from within the building the dirty filters should be placed in a bag and immediately sealed prior to removal from the filter room. The operators should also change their outer garments and place them in a bag prior to leaving the filter bank room.

### (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 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.

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 *Salmonella* spp may contaminate exposed product and product contact surfaces.

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

### (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.

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.

## (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.

### (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 is prohibited in any production area.

Employees must not wear hairpins, rings (with the exception of plain wedding bands), 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 production 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 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 *Salmonella* 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.

Container 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.

### (n) Sampling and Testing

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

## **5.4 A Check List for Avoiding 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

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- (f) Filling and Packaging - CRITICAL ATTENTION
- (g) Cross-contamination - ELIMINATION/ACCURATE PLANS
- (h) Airborne Contamination - POSITIVE PRESSURE/FILTRATION
- (i) Conveyor Systems - DIFFICULT TO CLEAN
- (j) Milk, Water Pooling - SPLASHING/AEROSOL FORMATION
- (k) Floor Drains - SPECIAL CLEANING
- (l) Traffic Flow - CONTROL
- (m) Personnel - CLEAN CLOTHING/RESTRICT TRAFFIC BETWEEN AREAS
- (n) Product/Container Returns - STRICT CONTROL NEEDED

## 6. Management of *Salmonella* Contamination

### 6.1 Recommended Testing Programs

The following testing programs are designed for those manufacturing and/or blending dried milk products.

#### 6.1.1 High Risk Product Testing Program

It is **highly recommended** that manufacturers producing high risk dried milk products test as follows. These products are those destined for use by infants or the aged, as outlined by the International Commission of Microbial Specifications for Foods (ICMSF), or any dried milk product that will not be heat treated before use. Also see the flow chart in Appendix 3.

Testing Requirements:

- (a) test each code at 60 samples x 25 g. The code must be held pending results;
- (b) test at least 15 environmental samples weekly, with at least 5 samples being taken from each of the inner-near, inner-far and outside levels, as outlined in Section 10 of this Manual; and
- (c) if results on the product are negative, the individual codes of product from this plant are cleared for release on an ongoing basis.

#### 6.1.2 Block Testing Program

Many companies manufacturing and blending dried milk products, as well as manufacturers of stockfood, choose to test and clear each code of product on a block release basis. This may be done by completing a Block Testing Program. The following **minimum** testing program is required. Also see the flow chart in Appendix 4.

Testing Requirements:

- (a) the first 9 consecutive codes must be tested at 15 samples x 25 g per code;
- (b) the following 3 codes of product must be tested at 60 samples x 25 g per code (the clearance point);
- (c) at least 15 environmental samples must be taken on the 11<sup>th</sup> code of the program when testing at 60 samples x 25 g per code. At least 5 samples are to be taken from each of the inner-near, inner-far and outside levels as outlined in Section 10 of this Manual; and
- (d) if all results on the product are negative up to and including the clearance point, all codes of product from this plant back to the previous clearance point will then be cleared for release as a block.

#### 6.1.3 Selected Code Testing Program

Some manufacturers do not test and clear product on a daily basis, but instead conduct selected code testing. A selected code testing program may be done by adopting the following routine testing regime, however the SDA **must** be consulted to approve the adoption of such programs.

## Testing Requirements:

- (a) the selected code testing program involves testing of selected codes only. The level and frequency of testing will be determined by the manufacturer in consultation with the SDA Representative;
- (b) the adoption of this program should also include routine monitoring of the manufacturing environment, with at least five environmental samples being taken from each of the inner-near, inner-far and outside levels, as outlined in Section 10. The level and frequency of testing will be determined by the manufacturer in consultation with the SDA Representative; and
- (c) if results on the product and environmental samples are negative, the product is cleared for release and normal operations can continue.

## 6.2 Notification of a Positive Result

The SDA Representative **must** be verbally notified of all positive *Salmonella* isolations from product immediately. This is to be followed by written confirmation within 7 days. As soon as the SDA Representative is notified of a contamination with *Salmonella*, they will supervise investigations into the possible cause of the contamination, and supervise the procedures for dealing with the product, the plant and the environment at the establishment. It is also **strongly recommended** that the SDA is advised of *Salmonella* isolations in environmental samples.

The SDA Representative and factory management will discuss the procedures required to be completed by the company before a full clearance can be granted. Discussions will entail which plant and product is implicated by the contamination. Factory management will be requested to conduct both line and environmental surveys before any cleaning procedures are started, this may be helpful in identifying the source of the *Salmonella* contamination. Upon approval of the program by the SDA Representative, a time-table for plant shut-down (if required), inspection, cleaning and sanitising, and plant clearance is also fixed at this time.

The procedures outlined below **must** be followed if *Salmonella* is found in dried milk products. If a manufacturer is unsure which clearance program to complete, the SDA should be contacted.

## 6.3 Clearance Programs

When product is found to be contaminated with *Salmonella* a clearance program **must** be carried out by the dairy company according to the procedures in this Manual and under the supervision of the SDA Representative.

The clearance of individual codes which have been placed under order is based on testing of 60 samples x 25 g per code. Testing **must** be conducted in accordance with AS 1766.2.5 - 1991, *Salmonellae*, and AS 1766.3.3 - 1991, *Dehydrated Foods*, by a NATA laboratory accredited for *Salmonella* testing.

The clearance program implemented will be based on providing an assurance that the plant will be free of *Salmonella* after the program has been completed. The factors to be considered are:

- (a) the implementation of an increased testing program to determine if codes of product prior to and after the positive code are not contaminated; and
- (b) the need to cease production and conduct a full plant wash.

Upon notification of a positive result to the SDA, a decision will be made on whether production is allowed to continue or if production is to cease and a full plant wash-up conducted.

After the detection of a positive code the following criteria will be considered by the SDA in reaching a decision to allow the plant to continue production without a plant shut down and clean up:

- (a) a single code of product is found to be positive for *Salmonella*, and there has been no other positive code in the plant over an immediate and continuous three month period of production, and it is demonstrated to the satisfaction of the SDA that it is an isolated incident and does not indicate persistent or recurring contamination in the production environment; and
- (b) the plant has an established history of cleanliness, hygiene control procedures and good quality records.

Only if these factors are present will a plant be allowed to continue production and implement Clearance Program A, in Section 6.3.1.

If a decision to shut down is made in consultation with the SDA production shall be stopped as soon as possible. The production shut-down and cleaning program shall be conducted in accordance with the principles in Section 6.4, and the guidelines outlined in Section 12.

There are two types of clearance programs that can be implemented and these apply regardless of the testing programs used by factories.

### **6.3.1 Clearance Program A**

This program is used where production is allowed to continue after the detection of a single positive code and approval granted by the SDA under Section 6.3. Also see flow chart in Appendix 5.

Testing Requirements:

- (a) all available codes of product from any prior clearance point up to the current date will be placed under order;
- (b) all available consecutive codes immediately prior to the positive code, up to 12 codes, or back to a completed Block Testing Program must be tested at 60 samples x 25 g per code;
- (c) the 12 consecutive codes immediately following the positive code must be tested at 60 samples x 25 g per code;

- (d) on the 11<sup>th</sup> code, after the positive code, a minimum of 15 environmental samples must be taken from each of the inner-near, inner-far and outside levels, as per Section 10 of this Manual;
- (e) if all results of the product tested are negative the plant is considered cleared and normal operations, including testing, can continue; however
- (f) If *Salmonella* is detected in any of the codes tested:**
  - (i) Production must cease as soon as possible after consultation with the SDA Representative, and the Clearance Program B (refer Section 6.3.2) put in place;
  - (ii) Any codes which test positive for *Salmonella* are to be disposed of as outlined in Section 8 of this Manual; and
  - (iii) If any environmental samples are positive, the affected area must be cleaned and sanitised and further sampling and testing conducted in accordance with Section 10 of this Manual.

### **6.3.2 Clearance Program B**

This program is used where production stoppage and plant clean-up have been implemented in accordance with the principles in Section 6.4, and the guidelines outlined in Section 12, after a code is found to be positive for *Salmonella*.

All available codes of product from the affected plant back to the last clearance point will be placed under order pending clearance on the basis of 60 samples x 25 g per code. Upon resumption of production, in order to obtain a Plant Clearance the following **minimum** testing program is required. See the flow chart in Appendix 6.

Testing Requirements:

- (a) the first 2 consecutive codes must be tested at 60 samples x 25 g per code;
- (b) the following 7 consecutive codes must be tested at 15 samples x 25 g per code;
- (c) the following 3 consecutive codes must be tested at 60 samples x 25 g per code; and
- (d) on the 11<sup>th</sup> code a minimum of 15 environmental samples must be taken for testing. At least 5 samples to be taken from each of the inner-near, inner-far and outside levels as outlined in Section 10 of this Manual;
- (e) if all 12 codes are negative for *Salmonella*, the plant is clear and normal operations can continue; however
- (f) If any of the codes are positive for *Salmonella* then the process reverts to the beginning of this program:**
  - (i) Any individual codes which are negative for *Salmonella* at 60 samples x 25 g will be released from order. Any codes not tested at 60 samples x

25 g will be placed under order for clearance at 60 samples x 25 g per code;

- (ii) Any of the codes which test positive for *Salmonella* are to be disposed of as outlined in Section 8 of this Manual; and
- (iii) If any environmental samples are positive, the action detailed in Section 10 of this Manual is to be followed.

### **6.4 Production Shut-Down and Cleaning Program**

It is important that the SDA Representative is notified **before** shut-down procedures are implemented following notification of *Salmonella* contamination in product. In negotiation with the SDA Representative, dismantling and cleaning procedures should be initiated.

As soon as the plant production is stopped a series of line and environmental samples **must** be taken. This may help identify the contamination source(s) and should include samples of process water, insulation material, filter material, product residues on floor or equipment, sweepings from dry areas, dust, insects and samples from any footbath in the proximity of the plant. The SDA Representative is to be present throughout this process.

Following this, plant cleaning and sanitising shall be implemented under the supervision of the SDA Representative.

The clean up program should be planned prior to shut-down so that this can proceed immediately following the sampling program above. Important factors to consider are:

- (a) during the equipment dismantling stage, all components are to be scrutinised for possible faults or contamination spots; and
- (b) in accordance with the *Export Control (Processed Food) Orders*, which outline that construction or alterations can only be conducted in accordance with submitted plans or specifications, any resultant modifications to the plant deemed necessary must be approved by the SDA Representative.

A final inspection for cracks or flaws is conducted at this stage.

### **6.5 Recommencement of Production**

A final inspection by the SDA Representative, is to be conducted prior to commencement of production.

## **7. Export Requirements**

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

## *Salmonella Manual*

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Upon notifying the SDA or AQIS that *Salmonella* has been detected in dried milk product and the product has been placed under order by a State Dairy Authority, the following conditions apply:

- (a) the SDA or AQIS will resume responsibility for issuing export certification until satisfied that operations are being carried out in a suitable manner; and
- (b) dried milk product contaminated by *Salmonella* can only be rendered eligible for export by complying with the provisions in Section 8 of this Manual.

If any implicated product has already departed 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 dried milk product which has already left Australia.

## 8. Disposal of Contaminated Product

Contaminated product **must** be segregated while being held, and will be placed under orders until cleared by these procedures. Approval for the release of contaminated product under order for sale, reprocessing or disposal **must** be obtained from the SDA Representative in writing.

**NOTE:**

- Unless there has been negotiation and agreement between the company concerned and the State Dairy Authority, batches of product are not permitted to be split, retested and disposed of separately.

### 8.1 Sale of *Salmonella* Contaminated Product

#### 8.1.1 Product Not Known To Be Positive

This includes product which is within the same block program as a contaminated code, but may not necessarily be positive, and reprocessed product.

- (a) For Human Consumption

Must be cleared at 60 samples per code.

- (b) For Sale as Stockfood

Must be cleared at 15 samples per code and clearly labelled as stockfood.

- (c) Not for Edible Use

No testing required BUT must be clearly labelled as: *Industrial: Not for Edible Use*. This will only be relevant to casein powders.

#### 8.1.2 Product Known To Be Positive

- (a) Not for Edible Use

Only under controlled conditions will contaminated product be released for industrial use. That is, the product must be clearly labelled and marked *Industrial: Not for Edible Use*. This will only be relevant for casein powders. Approval of the SDA Representative will be required.

### 8.2 Product Reprocessing

#### 8.2.1 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 product 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 reconstitution 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 *Salmonella* is the only acceptable form of reprocessing, regardless of product type.

## 8.2.2 Conditions for Approval

Depending on the product type and the nature of the manufacturing process, specific requirements will apply when a manufacturer applies for product to be reprocessed. In each case, before the SDA Representative will consider an application for approval to reprocess, these requirements will need to be met. 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) dust 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.

## 8.2.3 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 approved procedure must be itself 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.

### **8.3 Destruction of *Salmonella* Contaminated Product**

Product contaminated with *Salmonella* that is being disposed of must be destroyed to eliminate the chance of consumption. Contaminated product may be dumped by burial or incineration under the supervision of the SDA Representative.

## 9. Sampling Product for *Salmonella* Testing

### 9.1 Sampling Method

Australian Standard procedures must be used when sampling dairy products for the detection of *Salmonella*. Refer to AS 1166 - 1992, *Milk and Milk Products - Methods of Sampling*.

**NOTE:**

- Aseptic techniques, and sterilised equipment and containers are to be used.

### 9.2 Sample Size

As per AS 1166 - 1992, sampling for microbiological examination requires that a sample of not less than 100 g be taken.

15 x 25 g or 60 x 25 g or mL samples (depending on the product category) 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.

A continuous 'autosampler' system may also be used. Samples collected in this manner should be mixed well and then submitted for testing as an equivalent of a 15 x 25 g composite sample. By submitting whole product units to the laboratory for analysis the risk of contamination at the point of sampling is removed. Where possible sample product in sequence, as this may provide useful information if positives are isolated.

### 9.3 Compositing

Compositing samples of dried milk product at the sampling point is permitted as long as the conditions detailed as follows are adhered to:

- (a) sampling procedure must be to the satisfaction of the SDA Representative;
- (b) sampling implement must be sterilised before use;
- (c) the sampling implement must be cleaned and sterilised between composites;
- (d) the composite container must be a sterile tin, or plastic bag or container of sufficient volume to allow proper mixing of the composite;
- (e) each composite must be made up from equal amounts from 15 units of a code. The amount taken from each unit must be sufficient to enable two separate *Salmonella* tests to be performed on the composite (at least 2 x 375 g) as well as for Standard Plate Count and Coliform tests. Therefore, at least 800 g is required (for sampling at 60 per code, 4 composites of 15 units will be needed); and
- (f) the composite sampling procedure must be conducted in an area where the risk of contamination of the samples is minimised. It is recommended that the

product units be removed to a suitable place, outside the plant area, for compositing.

### **9.4 Stage of Manufacture for Sampling**

- (a) When 60 samples are taken, samples must be taken from bag (or other unit) number 1, 5, 10, 15 and 20 at the start of the code and from 5 bags on the last pallet of the code. The remaining are to be taken at random from the rest of the code. If the units are bins, then sample the first 5 bins and the last 5 bins. If the number of bins is less than the number of samples required, take multiple samples from the bins until the desired number is reached;
- (b) when 15 samples are taken, sample bag numbers 1, 5, 10, 15 and 20 at the start and 5 from the last pallet. The remainder are taken at random throughout the code.
- (c) the sample size required above is 100 g unless samples are to be composited at the point of sampling;
- (d) samples may be composited in the factory laboratory as 15 x 25 g composites; and
- (e) if a code consists of a small number of bags, (eg. less than 60), more than one sample may be taken from the one bag.

#### **NOTE:**

- All sampling must be conducted to the satisfaction of the SDA Representative, and in accordance to AS 1166 - 1992, *Milk and milk products - Methods of Sampling*, and must be tested by a NATA laboratory accredited for *Salmonella* testing.

Sampling should be performed after the final stage of manufacture which will usually be packing. However sampling may be performed at a stage just prior to packing if additional environmental samples are taken of the filling area. This serves as a check to reduce the risk of contamination occurring at a stage past the sampling point.

## 10. Environmental Testing

### 10.1 Introduction

Regular monitoring of the environment in and around the plant can be an effective early warning system for identifying potential sources of *Salmonella* contamination of product.

A regular program should include all the critical points, both inside and outside 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, rubbish bins, pallets, vehicles, cooling towers, waste plant
2 Inner-Far	Floors, walls, ceilings, ledges in manufacturing areas where plant is covered, cleaning implements, other equipment
3 Inner-Near	Filters, air ducts, line samples (before heating), process water, hoods over open equipment, product tailings

### 10.3 Action Required for Positive Environmental Samples

(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 control.

(b) Positive Level 2 - Inner-Far

Sample and test at least 5 samples from Level 3. If negative, no further action is required except to tighten hygiene control.

(c) Positive Level 3 - Inner-Near

Sample and test product at 60 samples per code from the day before, the day of and the day after the positive Level 3 sample. If any codes are positive, then the relevant Category of clearance must be implemented.

Guidelines outlining how swab samples should be taken can be found in Appendix 7.

## 11. Test Methods

### 11.1 Introduction

Methods for the detection of *Salmonella* in foods have been intensely researched for many decades, and this has led to the development of many analytical procedures for their isolation and identification. The development of standardised reference methods for the detection of *Salmonella* in food became necessary with the adoption of microbiological specifications for this microorganism in state, national and international food laws.

### 11.2 Reference Test Method

The required reference method is AS 1766.2.5 - 1991, *Examination for specific organisms - Salmonellae*. This standard provides a reference method suitable for determining that dairy product complies with microbiological requirements. The method incorporates the use of liquid resuscitation, liquid selective enrichment and solid selective media for the isolation of presumptive salmonellae and their subsequent biochemical and serological confirmation.

### 11.3 Alternative Test Methods - Rapid Kits

There are many rapid test kits available in the dairy industry, for the detection of *Salmonella*. Any alternative test method or rapid test kit used for the detection of *Salmonella* **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 *Salmonella* test result is to be confirmed using the reference test method.

The local State Dairy Authority should 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, must 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.

AS 1162 - 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 both 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 as appropriate, when 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 can 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. The Orders also outline the potable water standard, 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 product or product surfaces.

## 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

## *Salmonella Manual*

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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

AIFST (NSW Branch) Food Microbiology Group, *Foodborne Microorganisms of Public Health Significance*, Fifth Edition, 1997

Australia New Zealand Food Authority, *Food Industry Recall Protocol*, 1997

Australia New Zealand Food Authority, *Food Standards Code*, latest edition

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

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

Jill Gebler, *Salmonella In Spray Drying Plants*, Dairy Industry Quality Centre Seminar, Contaminants: Reducing the Risk, 1997

National Enteric Pathogen Surveillance Scheme, *Non-Human Annual Report 1997*, October 1998

Proceedings and Programme, *Food Associated Pathogens*, Uppsala, Sweden, 1996

Proceedings of the *Good Manufacturing Practice for Dried Milk Products* Seminar, Melbourne, July 1978

Standards Australia, AS 1166 - 1992, *Milk and milk products - Methods of sampling*

Standards Australia, AS 1162 - 1991, *Cleaning and Sanitising Dairy Factory Equipment*

Standards Australia, AS 1766.2.5 - 1991, *Examination for specific organisms - Salmonellae*

Standards Australia, AS 1766.3.3 - 1991, *Examination of specific products - Dehydrated foods*

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

##### **Dairy Food Safety Victoria**

PO Box 548  
RICHMOND VIC 3121

Phone: (03) 9426 5999  
Facsimile: (03) 9427 1895

##### **SafeFood - New South Wales**

PO Box A2613  
SYDNEY SOUTH NSW 2000

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

##### **Tasmanian Dairy Industry Authority**

PO Box 68  
HADSPEN TAS 7290

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

##### **Queensland Dairy Authority**

Private Bag 5  
Roma Street  
BRISBANE QLD 4003

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

##### **Dairy Industry Authority of Western Australia**

PO Box 75  
CLAREMONT WA 6010

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

##### **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** - *Salmonella* not detected under the procedures required in this Manual

**Code / Batch** - up to 24 hours production from any specified packaging line of a particular product, 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 biochemical and serological confirmation

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

**Dried Milk Product** - a dried product of which milk or a constituent of milk is a major component

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

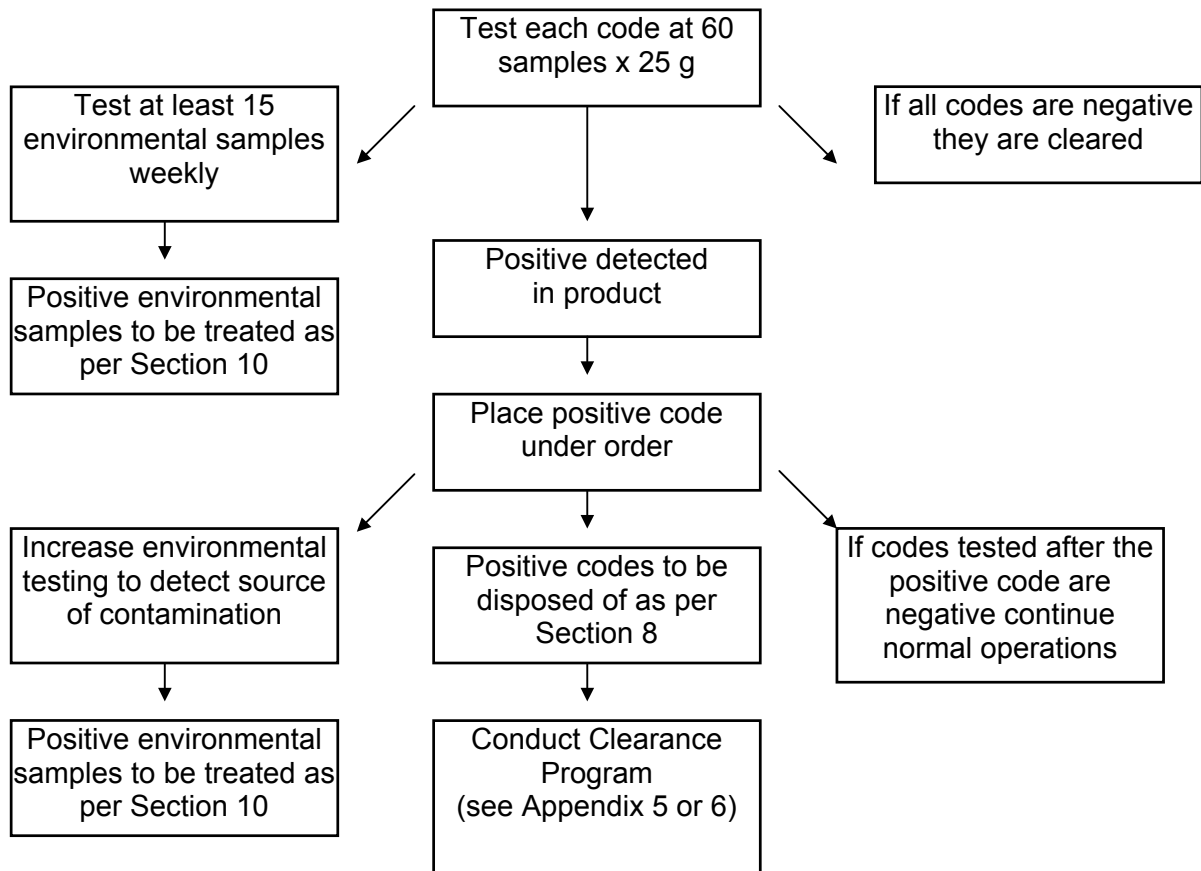
**State Dairy Authority (SDA) Representative** - any person appointed by the ADASC member to supervise the implementation of these procedures

**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

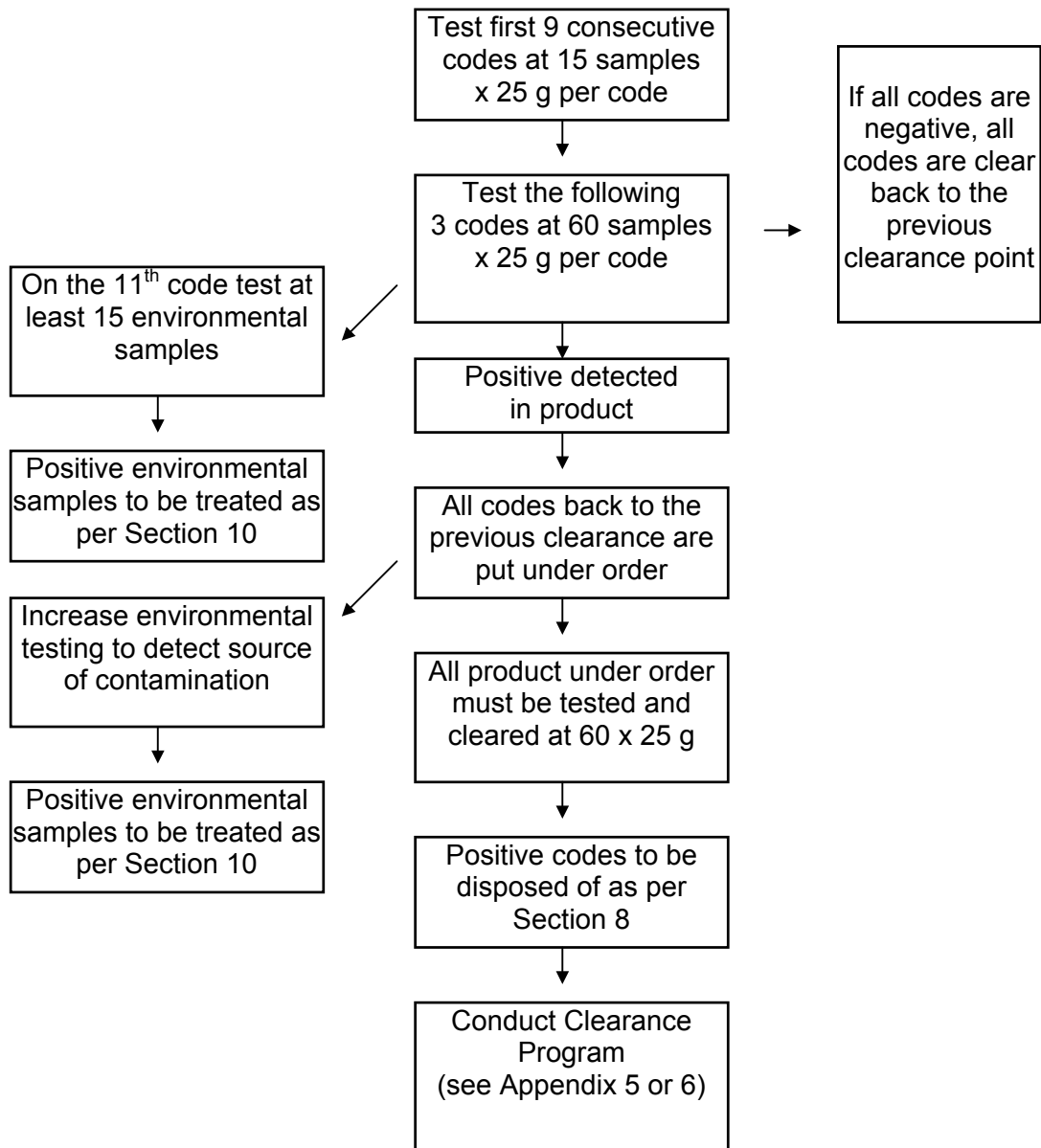
# Appendix 3

## High Risk Product Testing Program



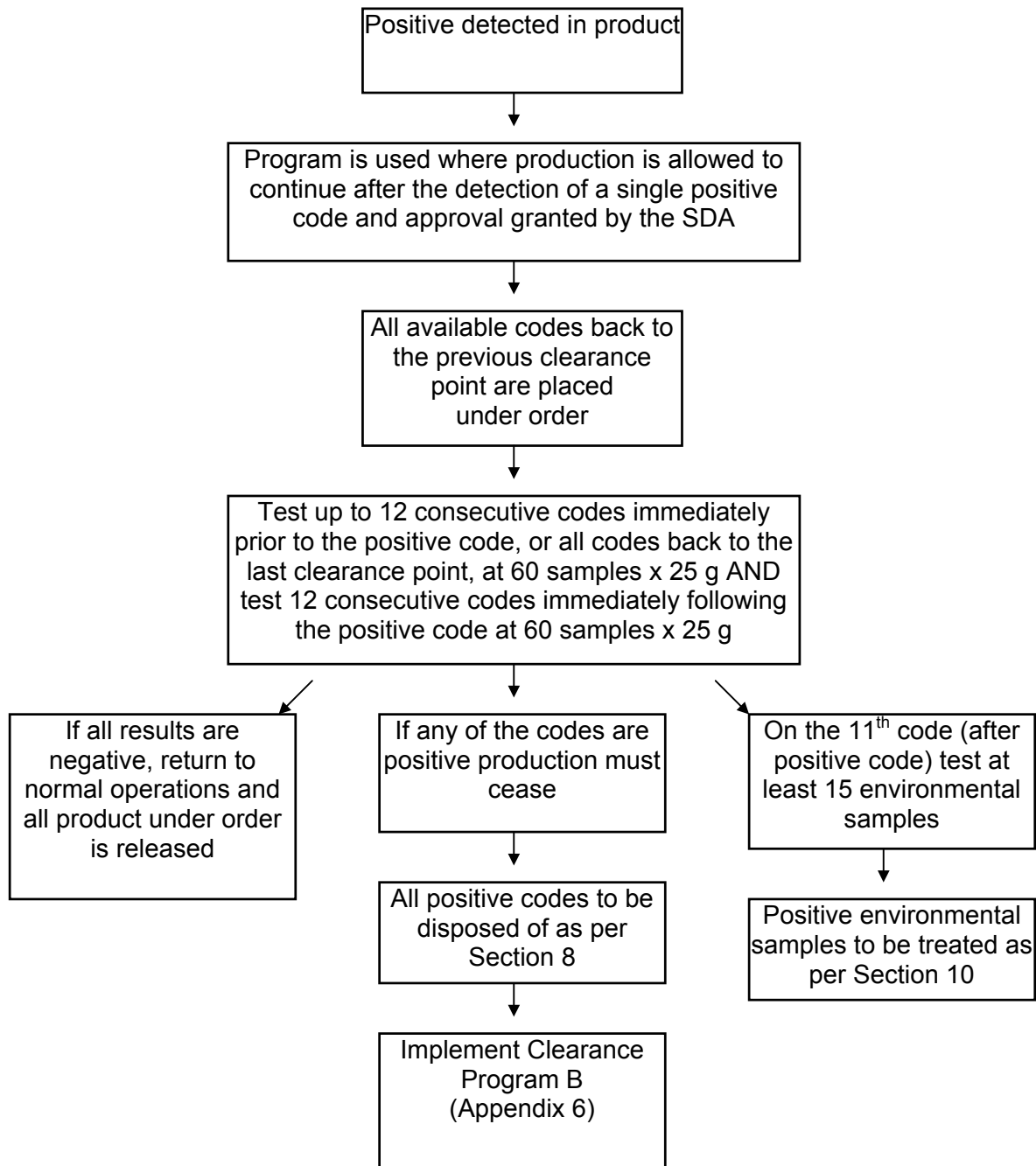
# Appendix 4

## Block Testing Program



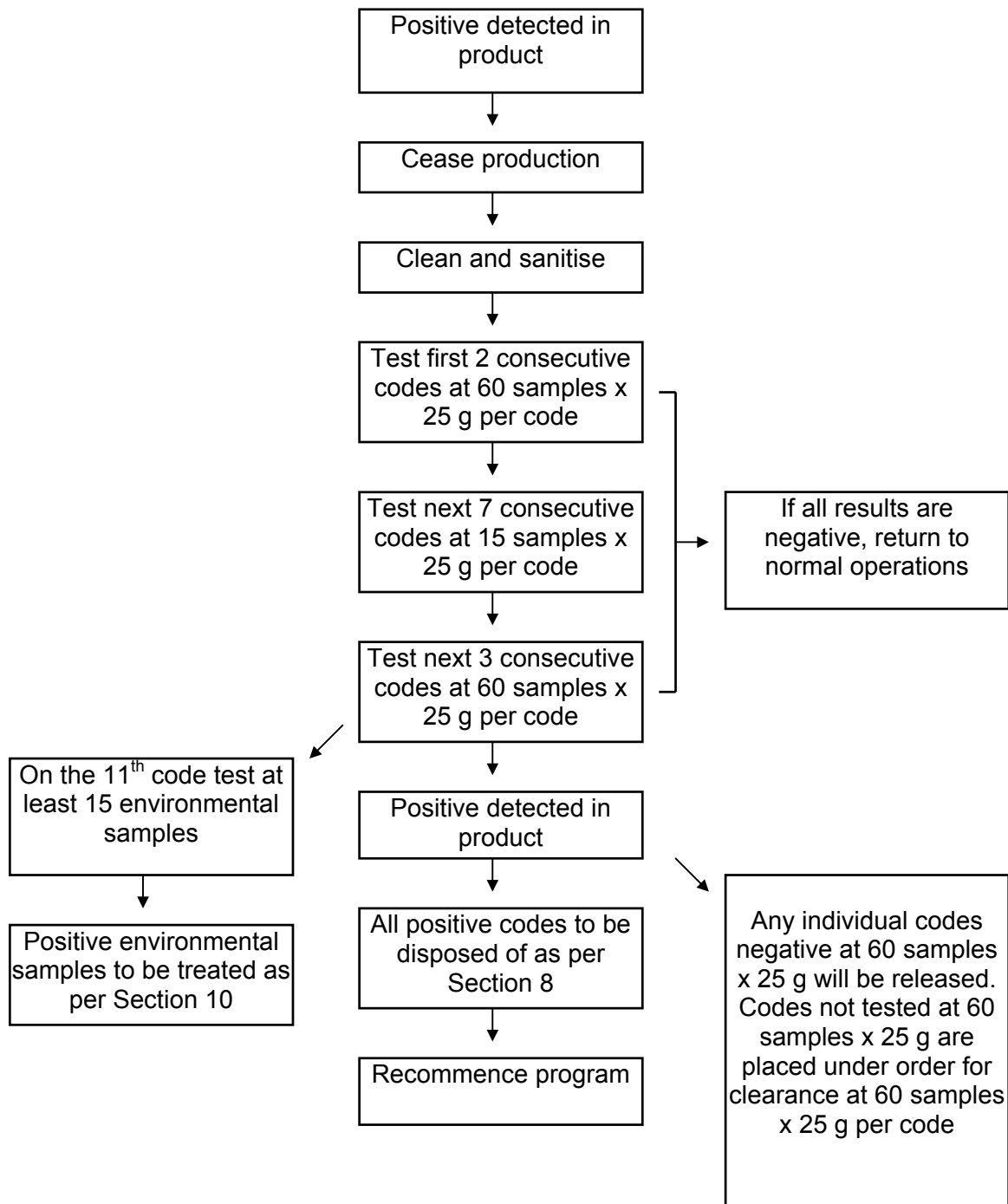
# Appendix 5

## Clearance Program A



# Appendix 6

## Clearance Program B



## Appendix 7

### Procedure for *Salmonella* 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, 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 *Salmonella*. However if there is a chance that this may be the case swabs should be dipped in neutraliser before sampling. 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), 'Inner-Far' (within the manufacturing area) or 'Outside' locations in the factory.

An initial survey of 'Inner-Far' locations should be undertaken of the processing area to determine potential hot spots where *Salmonella* 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 *Salmonella*.

On a routine basis **all** 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 *Salmonella* present. If samples must be taken during non-production, several hours should have elapsed since cleaning or sanitising, unless neutraliser has been used on the swab.
- (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 cm<sup>2</sup> 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. If swabs are not to be tested within 24 hours of sampling, they should be placed in transport media, also see part 5 of this section.
- (e) All swabs should be held at 4°C during transportation.

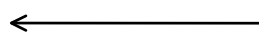
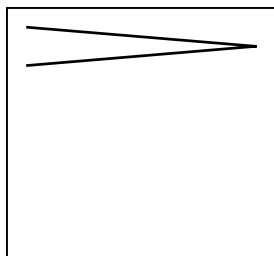
## 3. Environmental Samples Following *Salmonella* Detection

If *Salmonella* species has been detected in product, then swabs should be taken from a variety of locations, from all levels of classification.

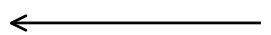
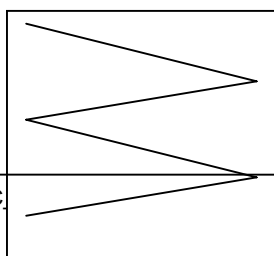
If an initial survey has been conducted to identify problem areas at 'inner-near' or 'inner-far' locations this information can be utilised to determine if control measures have been effective or if new potential sources of contamination have developed.

## 4. 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 cm<sup>2</sup>)



Incorrect swabbing method

## **5. Transport of Samples**

Transport media varies depending on the microorganism being examined. *Salmonella* swabs should be transported in empty sterile test tubes, however if testing will not be carried out within 24 hours of sampling, swabs should be placed in transport media.

## **Appendix 8**

### **Explanatory Notes**

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

#### **Section 2 Purpose and Scope**

- Includes references to various Sections as regulatory or advisory. This Section 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 Salmonella 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. Meeting the requirements in this Manual will not only provide assurance of product quality but will assist in compliance with the Food Standards Code requirements.

#### **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 their direct responsibilities in the event of a contamination with *Salmonella*.

#### **Section 4 Background on *Salmonella***

- In the previous edition of the Salmonella Manual there was no background information given. For the purpose of this edition, a background Section on *Salmonella* has been included. This information aims to give a brief introduction on the characteristics of *Salmonella*, as well as significance and prevalence in the dairy industry.

#### **Section 5 *Salmonella* Prevention Procedures**

- This is a new Section in the Salmonella Manual. With the aim to provide advisory information, this Section outlines areas to assist in reducing the risk and incidence of *Salmonella* contamination within the plant and processing environments. This Section also gives a checklist of important areas which should be identified in order to help prevent contamination.

#### **Section 6 Management of *Salmonella* Contamination**

- In this Section of the Manual, a number of areas have been amended to better reflect current requirements and practices relating to clearance of dried milk products.
- When putting together these clearance procedures a number of factors have been considered:

- ⇒ Sampling plans for situations involving direct hazard from pathogens, as described by the International Commission on Microbiological Specification for Foods (ICMSF), *Sampling for microbiological analysis: Principles and specific application* (1978), have been considered in this review. The document describes testing samples based on the relative hazard that exists when a food may contain *Salmonella*. This information has been used to assist in developing the existing sampling plans, based on testing 60 and/or 15 samples per code of product.
- ⇒ Extensive past experience in the Australian dairy industry has proven that these clearance procedures are effective in controlling and managing contamination by *Salmonella*.
- ⇒ Considerations have been made for the type of product being manufactured, and the intended use of the product. Therefore an option of testing programs have been suggested:
  - (a) high risk product testing - including products whereby the consumers of these products may be in a susceptible proportion of the population;
  - (b) block testing - including all other dried milk products (this category would also encompass blend products and stockfood); and
  - (c) selected code testing - for situations where manufacturers do not test and clear on a daily basis.
- The previously specified clearance category for stockfood, where testing was conducted at 5 samples x 25 g has now been omitted. This is because by taking only 5 samples within a single code of product, there is a high chance of never detecting the presence of *Salmonella* (ICMSF, 1978). For this reason it is proposed that the frequency of testing for these types of products be increased.

## Section 7 Export Requirements

- *Export Requirements* has 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

- Previously divided into two separate parts - *Methods of Disposal* and *Reprocessing* - this Section aims to consolidate details which relate to the *Disposal of 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 to reprocess, the option to destroy or dispose of implicated product in another manner.

## Section 9 Sampling Product for *Salmonella* Testing

- Previously only compositing of samples was described, therefore this Section of the Manual has been further expanded to include sampling methodology. 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 9.4, *Stage of Manufacture for Sampling* has been included.

## **Section 11 Test Methods**

- *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 within the testing laboratory they may be used for screening purposes, however any positive results should be confirmed using the reference method.

## **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 been 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 to confirm that residual material is removed and, cleaning and sanitising procedures are effective.