Ref: 1100-07-CG

Date: 1 June 1999

To: All holders of *Guide to HACCP* Systems in the Meat Industry (*Hazard Analysis Critical Control Point)*

Subject: Amendment 5: *Guide to HACCP* Systems in the Meat Industry (*Hazard Analysis Critical Control Point)*

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1. Changes with Amendment 5

The pattern of changes to *Guide to HACCP* Systems in the Meat Industry (*Hazard Analysis Critical Control Point)* which started with Amendments 1-4 has continued with Amendment 5.

1.1 The amendment will be housed in the two folders as follows:

- Volume I will contain the addition to the Contents pages and to the Frequently Asked Questions;
- Volume II will contain the new generic HACCP plan (Appendix X.5).

1.2 Changes to the previous amendment are denoted by a # symbol in the margin indicating the line on which a change has been made.

2. Procedure

Attached are updated pages for your *Guide to HACCP* Systems in the Meat Industry (*Hazard Analysis Critical Control Point)*.

Please **sign off** the Amendment Record, and file this update letter in the back of your manual for quick reference.

Remove old pages	Insert new pages
Volume I P.8 11.8	 P.8 11.8-11.14
Volume II P.1	 P.1 New white divider marked "Processing of Edible Sheep and Lamb Casings" after Page X.4.31 X.5.1 – X.5.23

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HACCP plan for a particular product and process. Appropriate actions to be taken are specified in industry standards as regulatory requirements. Further, water usage is not an individual process step but an activity that is usually involved in many process steps. Therefore it is always easier to control water potability separately, before it impacts on the main process itself, e.g. by readjusting an existing prerequisite programme to improve its effectiveness or by having a separate HACCP plan for water potability.

Q25. Individual premises set their own microbiological targets. Why is this so and how will MAF ensure that acceptable microbiological targets are set by premises and that there is some standardisation in the industry?

A25. Individual premises need to set their own microbiological targets because these targets must be related to their own performance and be achievable by their premises. Standardisation will be assisted by the use of national microbiological targets, e.g. for bovines, allowing individual premises to assess where they lie against the current national performance and decide what actions they should take. Note that individual premises targets cannot be set above NMD targets. This evaluation process is further explained in Technical Directive 98/7. MAF's involvement in the evaluation process also is clearly outlined in this TD.

Q26. Who should be contacted for information regarding HACCP-related training?

A26. The industry training organisation (ITO) supporting your industry is your contact point for HACCP-related training queries. For example, export meat industry personnel should contact the Meat Processing Industry Training Organisation (MPITO) at 04 473 6465. MAF staff also can contact the above ITO. The HACCP help line at 0800 422 279 also will be able to answer queries from anyone regarding HACCP-related training.

Q27. Can a premises include Asure NZ inspection activities in their HACCP plans and have these as CCPs?

A27. Yes they can. However, Asure NZ must be involved with and agree to the developmental process. Some practical issues that must be considered when Asure NZ CCPs are included as part of an all-encompassing HACCP plan are:

- All components pertaining to any meat inspection/reinspection activities, including any Asure NZ CCP(s), must be seen to have been agreed to by the Asure NZ management staff for the personnel concerned. This includes the generation of appropriate records.

- Asure NZ CCPs may come under company activities with appropriate feedback loops that include Asure NZ management staff involvement in controls at a particular level (includes monitoring, corrective action and verification activities).

- The Asure NZ components of the HACCP plan would need to be validated by company in conjunction with Asure NZ management staff.

- The Asure NZ components would need to be endorsed in writing (signed off) by the appropriate Asure NZ management official.

- The implementation and maintenance of the HACCP plan would need to include the ongoing involvement and cooperation of Asure NZ staff as well as the company staff.

Such a HACCP plan must not compromise the integrity of the Asure NZ service (or the MAF Verification Agency who may be providing a verification role for Asure NZ) or provide conflict of interest.

Q28. A number of consultants are offering their services for the development of HACCP plans. How does the licensee know which consultant is best qualified to assist in the development of a HACCP plan that will meet the requirements of the HACCP Interim Standard?

A28. It is up to the licensee to check out the credentials of individual consultants. MAF Reg recommends that they consider the following attributes when selecting a consultant:

- a clear understanding of the HACCP Interim Standard, its requirements and implications for the company;

- knowledge of HACCP principles as defined by Codex;

- familiarity with the contents of *A Guide to HACCP Systems in the Meat Industry*;

- a good technical understanding of the different aspects of food safety, food microbiology and food processing, particularly in relation to the licensee's process;

- knowledge of and experience with the development and maintenance of QA systems;

- auditing skills.

If a licensee employs a consultant to be the HACCP coordinator for the premises' HACCP plans, then that coordinator will need the necessary NZQA qualification 12626 "*Coordinate the development and verification of a HACCP plan for a meat processing operation*".

Q 29. Can the frequency of HACCP plan compliance audits conducted by MAF VA personnel be part of performance-based verification (PBV) activities?

A29. The frequency of HACCP plan compliance audits conducted by MAF VA personnel shall be **at least monthly** until a period of twelve months implementation has elapsed. This will allow the HACCP system to settle in and initial problems to be sorted out. Thus HACCP compliance audits will become performance based on a premises-by-premises basis depending on when the premises HACCP plan was recognised as valid.

Q30. Does a US-listed premises killing bobby calves have to have its HACCP plan recognised as valid by 25 January 1999?

A30. If there is sufficient data to complete validation, the plan must be recognised as valid by MAF VA before they start processing bobby calves this season.

If there is insufficient data for validation, then TD 98/163 comes into effect, whereby the licensee carries out a provisional validation, and MAF VA does a provisional recognition of validation (i.e. desktop audit). The premises then has two working weeks to collect data to fully validate the plan, at which point MAF VA conducts a complete recognition of validation. The key point is that the licensee validates the plan and obtains MAF VA recognition early in the season.

Q31. A non-US listed meat export premises is required to have HACCP in place by 1 November 1999, but has already validated a HACCP plan and had it recognised by December 1998. Over the off season there have been substantial changes to the process involving new equipment. Some trials have taken place. The premises is currently revising its plan and has asked at what stage does it have to have the plan recognised as valid.

A31. The premises would need to run the new line under full processing conditions to fully validate the new process and therefore it makes sense that TD 98/163 would apply (i.e. provisionally recognise revised documentation as valid, then over a two week working period collect validation data before having the plan fully recognised as valid). The old plan cannot apply as the process has changed. The premises cannot delay the recognition of the new plan until immediately prior to 1 November 1999 because it has already committed to HACCP.

Q32. Does a HACCP plan have to be completed for product that is not exported to the United States?

A32. The general requirement is that all processes at a US-listed premises have HACCP plans regardless of the destination of the product, i.e. a condition of listing. Where a production regime for an entire species does not involve the US in any way, then the premises can be exempted even though the process is taking place within a US-listed premises. These “entire” operations don’t usually have to comply with any other US requirement, therefore they couldn’t be expected to implement the US HACCP requirement.

This means that some pig-slaughtering premises are exempt from producing a HACCP plan, unless they have decided to send any pork product to markets covered by the US requirements in Manual 12 (e.g. American Samoa). Conversely, if some beef products are going to the US market, then all beef products from that premises must be covered by a HACCP plan, regardless of whether they are going to the US (markets).

Product produced under this exemption also cannot be further processed (e.g. at another premises) and exported to US markets.

Q33. Does a HACCP plan have to be completed for product that is produced at a New Zealand abattoir or an export licenced premises, but is not exported?

A33. Section 3.1 of Circular 98/8/1 *Interim Standard for a HACCP Plan, HACCP Competency Requirements and HACCP Implementation* requires that each premises which produces meat and meat product for any market other than the domestic market must determine whether any food safety hazard(s) that may be reasonably associated with each product and process exists. TD 98/163 requires that non-US listed meat export premises have their HACCP plans recognised as valid by 1 November 1999.

MISC has not given an implementation date for HACCP in abattoirs as yet. Therefore, where a production regime for an entire species does not involve export in any way, the process for that species is currently exempt from HACCP requirements. This includes where that process is taking place within an export premises.

This means that some premises may be exempt from producing a HACCP plan if they do not export any product from a particular species. Conversely, if some meat products are going to an export market, then all meat products of that species produced at that premises must be covered by a HACCP plan, regardless of whether all products are to be exported.

Product produced under this exemption also cannot be further processed (e.g. at another premises) and exported.

Q34. When are hazards considered to be addressed by GMP/prerequisite programmes?

A34. Hazards are generally considered to be addressed by GMP/prerequisite programmes when any of the following apply:

- the potential hazard is addressed by general requirements in existing regulations and standards, e.g. Meat Regulations, MAF manuals, Industry Standards, Circulars, TDs (except regulatory requirements covering processes designed to reduce or eliminate specific hazards — see A36);

- the potential hazard affects the whole process and cannot be addressed at one specific step (e.g. water potability, personal hygiene, cleanup procedures, hygienic processing);

- the potential hazard directly or indirectly impacts on raw material, other inputs, outputs and/or the process but is addressed outside the HACCP plan (e.g. Supplier Quality Assurance, food contact materials, water potability, waste management, vermin control).

Q35. Can certain components of GMP/prerequisite programmes be considered as CCPs?

A35. Certain components of GMP/prerequisite programmes may be considered as CCPs if the potential hazard can be controlled at specific steps of the process and one or more of the following circumstances apply:

- existing procedures are not effective and/or process failure has occurred;
- improvement in the process is required and/or can still be achieved;
- the step is considered to be critical to the process and making it a CCP would increase the focus on control of the hazard and/or increase personnel awareness, and therefore would assist in the achievement of the FSO.

Thus, it is expected that making a component of a GMP/prerequisite programme into a CCP should directly or indirectly result in an improvement in the process and/or food safety outcomes through increased focus on control at that process step.

For the reasons given above, certain steps (e.g. legging, chilling) have been considered as addressed by GMP in some premises whereas others have considered them as CCPs. The CCP status of these steps can be removed when there is sufficient evidence to indicate that existing procedures at the particular step (which are components of a GMP/prerequisite programme) are adequate to consistently control the hazard over a period of time and that no other improvements in the process and/or food safety outcomes can be achieved by keeping the step as a CCP.

It should be noted that not all prerequisite programmes can be considered as CCPs because the reasons given above do not apply (e.g. water potability, cleanup procedures, waste management, control of chemicals). If any of these programmes is ineffective then the specific system must still be corrected, e.g. as described in IS 8.

Q36. Are there CCPs that are unlikely to ever be considered as GMP/prerequisite programmes?

A36. Control measures which are components of GMP/prerequisite programmes generally prevent the transfer and/or redistribution of hazards (e.g. hygienic dressing techniques). However, there are other types of control measures applied at certain steps that are not preventive but rather are designed to reduce or eliminate specific hazards. Examples of these are metal detection, thermal processing, and decontamination methods. In most cases, these operations would always be considered as CCPs.

Q37. What corrective actions are required to be taken when monitoring indicates that a critical limit has been exceeded at a CCP?

A37. Corrective actions must take three components into consideration when a critical limit is exceeded. These are as follows:

- rapidly regain / restore control of the hazard(s) at the CCP;
- determine disposition of affected product where necessary;
- prevent recurrence of the problem where possible.

Restoration of control at the CCP should be the easiest component to implement. After all, the CCP has been set up with critical limits and it is just a matter of reinstating these limits.

Disposition of affected product is not always as clear cut, depending on the nature of the CCP. For example, corrective action at a "legging" CCP where critical limits may be based only on operator technique does not lend itself readily to product disposition as part of the corrective action process. This is because the CCP is often one of two or three CCPs that relate to an overall microbiological outcome for the carcass and individual site contributions to this microbiological outcome are not observable. However, disposition of affected product at a retain rail CCP involves retaining an affected carcass for further trimming because the critical limits include **visible** abnormalities.

Another example is a carcass that is detected as positive for visible faecal contamination, post inspection. This finding exceeds the critical limit of zero tolerance but when the moving window is not exceeded, it is reasonable to expect the individual affected carcass to be dealt with, i.e. removal of visible faecal contamination from that carcass and then feedback to the process controllers of the slaughter board. Further product disposition should only be considered when the moving window has been exceeded and it is deemed necessary to involve a further processing department, e.g. in carcass rechecks or incorporation of an escalating response to an ongoing problem.

Prevention of recurrence of a problem is easier where automation is involved, e.g. a piece of machinery may be easily adjusted or permanently fixed to basically prevent the critical limit being exceeded again. However, where operators are involved at the CCP and it is an operator activity that is being monitored, then a degree of recurrence of the problem is to be expected and must be dealt with by an escalating corrective response, e.g. retraining or removal of individuals from the CCP.

An escalating response should be undertaken where **any ongoing noncompliance** with the critical limit(s) occurs, i.e. preventive measures are obviously not working. Depending on the critical limit at the CCP, the processor also may wish to take corrective action early when monitoring indicates a trend towards loss of control at the CCP.

Corrective actions should be specific for each CCP, but there may be situations where a generic procedure is available (e.g. an escalating response) which outlines the principles, and individual actions are then documented according to each expected situation.

Q38. What validation information should be available at the premises for audit?

A38. At any MAF VA recognition of validation audit, all validation information should be readily available and documented. This includes (but is not limited to):

- skills and resources used in the development of the plan (particularly important for further processing plans);
- appropriate validation information for each FSO (i.e. proven to be achievable by use of the HACCP plan, statistically valid methods where appropriate);
- background information on hazards appropriate to the product (e.g. use of generic plans, historical information, scientific literature, etc.);

- documentation to support CCP determination (i.e. rationale for why hazards were or were not considered significant/unacceptable, effectiveness of control measures);
- scientifically valid critical limits for each hazard;
- critical limits relevant to the FSO(s);
- proof that critical limits are achievable (practical), given the process;
- proof that monitoring supplies enough information to ensure the CCPs are under control (consider how monitoring is conducted, what is monitored, frequency of monitoring, including relationship to prevalence of hazard).

This information should also be available for MAF Reg Compliance Group audits or MAF VA internal audits, should they require it. Historical monitoring, corrective action and verification records should also be available if required by an auditor, though some older records may be archived and therefore may take longer to access.

Q39. Some premises have added several trimmers in their processing line to deal with visible faecal and ingesta contamination. Is this acceptable considering the potential for trimming to be used to mask the results of unhygienic slaughter and dressing practices?

A39. It is up to the company to decide how many trimmers are necessary for their operation and where these trimmers will be positioned in the processing line before carcass re-inspection, as per TD 98/150. It should be stressed, however, that trimming of visibly contaminated areas should not be substituted for compliance with good hygienic practices, e.g. the requirements of IS 5. In fact, unhygienic trimming may add to the microbiological load on the carcass. Control measures during slaughter and dressing should focus on minimising microbiological contamination including visible faecal and ingesta contamination on carcasses. Procedures should be in place covering effective monitoring and verification of operator compliance to pre-requisite programmes/SSOPs and/or CCP critical limits.

Contents of Volume II

Appendix X.5: Generic HACCP Plan for the Processing of Edible Sheep and Lamb Casings

1. Prerequisite Requirements

The following are documented prerequisite programmes/sanitation standard operating procedures (SSOPs):

- sanitary design;
- potable water quality;
- sanitation and cleanup procedures for edible areas and food contact surfaces (preoperational and operational);
- personal hygiene (protective clothing requirements, personal equipment and use of amenities);
- training;
- hygienic processing (processing techniques and procedures, dropped product);
- food contact materials (specifications, handling and storage);
- repairs and maintenance of equipment;
- control of chemicals;
- vermin control;
- waste disposal;
- refrigeration management;
- handling and disposition of detained and nonconforming products.

2. Scope of HACCP Plan

HACCP application: Food safety

Species: Ovine

Product: Edible casings from sheep and lamb intestines

Process: Processing, packaging, and storage of sheep and lamb casings; from receipt of gut sets from the slaughter floor to dispatch of packed cured casings.

3. Product Description and Intended Use

Form 1: Product description and intended use

1.	**Product name(s)**	Edible sheep and lamb casings
2.	**Important product characteristics**	Obtained from animals that have passed ante mortem and post mortem inspection and meet regulatory requirements for edible products. Product meeting company and regulatory specifications for physical and microbiological quality, and packaging.
3.	**How is it to be used:** **a. By a further processor or retailer** **b. By the consumer**	a. Manufacture of sausage products b. Consumed as cooked, smoked or dried sausage products
4.	**Intended consumer**	General public ("high-risk" groups not specified for this plan)
5.	**Packaging**	Company/regulatory specification
6.	**Shelf life and storage requirements**	Company/regulatory specification
7.	**Where it will be sold** **a. Export market** **b. Local market**	List countries, if applicable
8.	**Labelling instructions**	Company/regulatory specification
9.	**Special distribution controls required**	Company/regulatory specification

4. Initial Food Safety Objectives

(To be confirmed after hazard analysis and CCP determination. See Section 8 for confirmed objectives.)

To minimise microbiological hazards in the product to levels not exceeding specified targets.

5. Process Flow Diagram

Form 2: Raw materials / other inputs

Product names: Edible sheep and lamb casings	
Raw material/other inputs	**Description/specification**
Sheep and lamb gut sets	Obtained from animals that have passed ante mortem and post mortem inspection and meet regulatory requirements for edible products.
Salt (sodium chloride)[1]	As per company specifications and the New Zealand Food Regulations 1984.
Food contact packaging materials[1]	Suitable for use as food contact materials.

1. These inputs and possible hazards must be addressed by a prerequisite programme/SSOP, or be specifically considered during hazard identification in this HACCP plan.

Form 3: Process flow diagram

Process: Processing of sheep and lamb casings

Inputs	Process steps	Edible outputs
Sheep and lamb gut sets ▸	1. Receiving gut sets from slaughter floor ▾ 2. Pulling of intestines ▾ 3. Removal of intestinal contents[1] ▾ 4. Cutting ▾ 5. Conditioning 6. Loosening of threads (i.e. outer membrane) ▾ 7. Cleaning / mucosa stripping ▾ 8. Soaking ▾ 9. Sorting / classing ▾	
Salt ▸	10. Salting & curing[2] ▾ ▾ 11. Selection ▾ ▾ 12. Desalting ▾ ▾ 13. Tubing/grading	
Salt ▸	▾ ▾ 14. Re-salting	
Packaging materials ▸	▾ ▾ 15. Packing ◂ ▾ 16. Storage ▾ 17. Dispatch	▸ Packed cured casings

1. Some companies are only involved in the production of green runners. After the removal of intestinal contents, the green runners are packed in casks with chilled water, with or without metabisulphite, and then transported to other premises for further processing into cured casings. A HACCP plan for this type of operation should evaluate the process for any potential hazards associated with the use of metabisulphite and other processing steps.

2. In some premises, selected casings go to a tubing department for added-value processing (Steps 11-14).

6. Job Descriptions

Form 4 should be completed and confirmed for each step in the particular process.

Form 4: Template for job description

Job description
Process step no:
Summary list of food safety responsibilities of operator: *(confirm after HACCP plan completed)* **Reference:**

7. Hazard Analysis and CCP Determination

7.1 Raw material hazard identification

Form 5a: Hazard identification for sheep and lamb intestines[1]

Raw material	Biological hazard	Chemical hazard	Physical hazard[3]
Sheep and lamb gut set	B2 — Microbiological hazards not grossly detectable, e.g. *Toxoplasma gondii* [2] B4 — Microbiological hazards associated with contamination from the gastrointestinal tract (GIT), e.g. *Salmonella* spp., *Clostridium* spp.	Not applicable	None

1. The codes given below have been used in the *Generic HACCP Plan for Slaughter and Inverted Dressing of Sheep and Lambs.* Premises have the option of assigning their own codes in their HACCP plans.

   B — Biological
   - B1 — Microbiological hazards associated with grossly-detectable abnormalities, i.e. abscesses (not applicable for this plan)
   - B2 — Microbiological hazards not grossly detectable, e.g. *Toxoplasma gondii*
   - B3 — Visible parasites (not applicable for this plan)
   - B4 — Microbiological hazards associated with faeces and ingesta from the gastrointestinal tract
   - B5 — Microbiological hazards associated with the hide (not applicable for this plan)
   - B6 — Microbiological hazards associated with other inputs

   C — Chemical
   - C1 — Chemical hazards associated with identified chemical residues
   - C2 — Chemical hazards associated with unidentified chemical residues

   P — Physical

2. *Toxoplasma gondii* is likely to be present in the small intestines of sheep and lambs. However, there are no published reports on the prevalence and levels of *T. gondii* in sheep intestines, or on the effects of processing on the parasite. There are also no reported cases of human infection associated with the consumption of natural casings products. In the absence of such information, it can only be assumed that certain steps in the process (e.g. stripping and salting) contribute to the removal or destruction of the organism to a level such that the parasite is likely to present mimimal health risks to consumers in the final product. Hence, B2 hazards will not be considered any further in this plan.

3. Foreign objects such as sand, pebbles and small sticks are occasionally found in green runners from certain classes of stock (i.e. cull sheep and those that have been exposed to drought conditions). Premises should consider the relevance of these potential physical hazards to their product/process and address them in the HACCP plan, as appropriate.

7.2 Hazard analysis and CCP determination (raw material, other inputs and process steps)

Hazard analysis may result in changes to the initial food safety objectives set in Section 4. See Section 8 for confirmed objectives.

Form 5b: Hazard analysis and CCP determination (raw material, other inputs and process steps)

Process step	Inputs				(i) Process step hazards (ii) Potential impact of process step on existing hazards	Q1. Could the hazard be present in or on the product[1] at unacceptable levels[2] at this step? If yes, answer Q2 and Q3.		Q2. Is there a control measure at this step that would prevent unacceptable levels of the hazard? If yes, this step is a CCP. If no, not a CCP.	Q3. Is there a control measure available at a previous step that would prevent unacceptable levels of the hazard? If yes, retrospectively assign the previous step as a CCP.	CCP No.
	Raw material		Other inputs							
	Component	Hazards	Component	Hazards		Yes/No	Justification			
1. Receiving gut sets from slaughter floor	Gut set	B4. Enteric pathogens				Yes	Unacceptable levels of microorganisms in the GIT in relation to the FSO. Refer to Annex, Section 1.	No	No	
2. Pulling	Gut set	B4. Enteric pathogens				Yes	Unacceptable levels of microorganisms in the GIT in relation to the FSO. Refer to Annex, Section 1.	No	No	
3. Removal of intestinal contents	Intestines	B4. Enteric pathogens				Yes	Unacceptable levels of microorganisms in the GIT in relation to the FSO. Refer to Annex, Section 1.	No	No	

Process step	Inputs				(i) Process step hazards (ii) Potential impact of process step on existing hazards	Q1. Could the hazard be present in or on the product[1] at unacceptable levels[2] at this step? If yes, answer Q2 and Q3.		Q2. Is there a control measure at this step that would prevent unacceptable levels of the hazard? If yes, this step is a CCP. If no, not a CCP.	Q3. Is there a control measure available at a previous step that would prevent unacceptable levels of the hazard? If yes, retrospectively assign the previous step as a CCP.	CCP No.
	Raw material		Other inputs							
	Component	Hazards	Component	Hazards		Yes/No	Justification			
4. Cutting	Runners	B4. Enteric pathogens			(ii) Cross-contamination	Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	
5. Conditioning	Runners	B4. Enteric pathogens			(ii) Cross-contamination; growth of microorganisms	Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	
6. Loosening of threads	Runners	B4. Enteric pathogens				Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	
7. Cleaning	Runners	B4. Enteric pathogens			(ii) Cross-contamination; reduction of microbiological load	Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	

Process step	Inputs				(i) Process step hazards (ii) Potential impact of process step on existing hazards	Q1. Could the hazard be present in or on the product[1] at unacceptable levels[2] at this step? If yes, answer Q2 and Q3.		Q2. Is there a control measure at this step that would prevent unacceptable levels of the hazard? If yes, this step is a CCP. If no, not a CCP.	Q3. Is there a control measure available at a previous step that would prevent unacceptable levels of the hazard? If yes, retrospectively assign the previous step as a CCP.	CCP No.
	Raw material		Other inputs							
	Component	Hazards	Component	Hazards		Yes/No	Justification			
8. Soaking	Casings	B4. Enteric pathogens				Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	
9. Sorting/ classing	Casings	B4. Enteric pathogens				Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Sections 1 and 4.1.	No	No	
10. Salting & curing (certain classes of casings go straight to step 15 after salting & curing)	Casings	B4. Enteric pathogens			(ii) Destruction of vegetative forms of pathogens	Yes	Unacceptable levels of microbiological contamination from the GIT is likely. Refer to Annex, Section 1 and 4.1.	Yes - proper salting & curing will destroy vegetative forms of pathogens. Refer to Annex, Section 4.2	No	1
	Salt	None								
11. Selection	Casings	B4. Enteric pathogens				No				

Process step	Inputs				(i) Process step hazards (ii) Potential impact of process step on existing hazards	Q1. Could the hazard be present in or on the product[1] at unacceptable levels[2] at this step? If yes, answer Q2 and Q3.		Q2. Is there a control measure at this step that would prevent unacceptable levels of the hazard? If yes, this step is a CCP. If no, not a CCP.	Q3. Is there a control measure available at a previous step that would prevent unacceptable levels of the hazard? If yes, retrospectively assign the previous step as a CCP.	CCP No.
	Raw material		Other inputs							
	Component	Hazards	Component	Hazards		Yes/No	Justification			
12. Desalting	Casings	B4. Enteric pathogens				No				
13. Tubing	Casings	B4. Enteric pathogens				No				
14. Re-salting	Tubed casings	B4. Enteric pathogens				No				
	Salt	None								
15. Packing	Cured casings	B4. Enteric pathogens				No				
			Packaging materials	None						
	Salt	None								
16. Storage	Packed cured casings	B4. Enteric pathogens				No				
17. Dispatch	Packed cured casings	B4. Enteric pathogens				No				

1. Product is defined as the edible component of final product.

2. Unacceptable — as demonstrated by data (scientific literature, applied research or on-site experience) associated with achieving the FSOs established for the process. In the determination of unacceptability, hazards should be considered in terms of:

   - level;
   - frequency;
   - transfer and redistribution;
   - severity of effect on consumer.

8. Confirmed Food Safety Objectives (FSOs)

FSO: To minimise microbiological hazards in the product to levels not exceeding specified targets.

9. Completion of the HACCP Plan

Full documentation is required for the remaining elements of the HACCP plan:

- critical limit setting;
- monitoring procedures;
- corrective action procedures;
- verification procedures including validation;
- documentation and recordkeeping procedures.

Refer to Sections 9-13 of the *Template for Further Processing of Meat and Meat Products* for detailed requirements.

Form 6 provides a summary of the plan. References to documented procedures located elsewhere should be shown in this form.

10. Verification of the HACCP Plan

10.1 Validation of the HACCP plan

Validation of the HACCP plan involves the initial confirmation that the HACCP plan is complete and will achieve identified food safety objectives (FSO). CCPs should be evaluated to ensure that the control measure applied at that particular process step will achieve or contribute to the achievement of the relevant FSO. Some FSOs may be partially or wholly dependent on prerequisite programmes rather than the HACCP plan itself.

An example of how this generic HACCP plan may be validated is given below:

FSO: To minimise microbiological hazards in the product to levels not exceeding specified targets.

This FSO is expected to be achieved by providing adequate control measures during salting and curing (CCP1) together with effective prerequisite programmes (e.g. cleaning and sanitation, hygienic processing, refrigeration management).

Microbiological observations

The use of microbiological observations is appropriate for evaluating the adequacy of the process to achieve the FSO. This information may be obtained from relevant published scientific literature, in-house historical data, and/or by gathering new data.

Scientific evidence from published literature may be used to justify the effectiveness of a control measure applied at a specific step or steps. The use of this type of scientific information will be a sufficient basis for validation only if it can clearly be shown that the conditions or variables considered in the scientific study are applicable to those existing in the process being validated. Therefore, there may be instances when it may not be necessary for premises to gather new data for validation. However, microbiological testing of products as an on-going verification activity may still be required.

Premises that have previously collected microbiological data may use this historical information for evaluating CCP1 in relation to the achievement of the FSO. Historical data may be used provided there has been no change in the product and process from the time the data were collected, sampling and the analytical tests are based on standardised methods, and the amount of data available is adequate for validation.

When published scientific information or historical data is not available or is inadequate, microbiological validation will involve the collection of new data from the time that the HACCP plan is implemented. The following is an example of an appropriate design for microbiological validation in the absence of benchmark or historical data:

Sample size:	Number determined by statistical techniques.
Sample time frame:	Random selection of samples taken over a specified processing period.
Methodology:	Samples to be taken after the specified curing period. Visible salt adhering to the casings should be removed, without using water, prior to analysis. A suggested procedure for salt removal is to carefully shake the casings and/or scrape the visible salt away with a sterile spatula (Houben, pers. comm.). Samples to be tested for *Enterobacteriaceae* and *E. coli* counts (standard petri film *E. coli* test gives results for both). **Note**: The European Natural Sausage Casings Association (ENSCA) recommendations include criteria for aerobic plate count (APC), *Staphylococcus aureus* and clostridia spores (refer to Annex, Section 4.3). There is insufficient information, at present, to clearly justify the need to establish FSOs which include targets for these microorganisms. This will be reviewed after the completion of the MIRINZ study.

Water activity measurements

The relationship between water activity and the growth and survival of microorganisms is well established (Refer to Annex, Section 4.2). It is, therefore, acceptable to use water activity measurements **instead of or in addition to microbiological testing** for evaluating the adequacy of the process to achieve the FSO. The water activity target should be set at a level that is appropriate for the type of microorganism that is intended to be controlled. The effectiveness of the salting and curing process can be validated by measuring the water activity of casing samples using standardised testing methods. A similar sampling regime to that suggested for microbiological observations could be used for validation. Water activity measurements can also be used for ongoing verification of the process.

Measuring water activity could be a more practical and cost-effective means of verifying the process than microbiological testing if a premises has easy access to a water activity meter.

Prerequisite programmes

Prerequisite programmes are to be validated in accordance with requirements in IS 8.

10.2 Ongoing verification

Ongoing verification activities confirm whether the HACCP plan is operating effectively and according to documented procedures. Examples of these activities are internal and extrinsic audits, HACCP review and product testing programmes.

10.3 Revalidation

A revalidation of the HACCP plan is required whenever changes are made (e.g. changes to premises, product, process, intended use of the product) or when process failure that may compromise product safety occurs.

Form 6: HACCP plan summary spreadsheet for processing of edible sheep and lamb casings

Process step	Hazard ID	CCP no.	Critical limits	Monitoring procedures/tools (consider Who, What, When and How)	Corrective actions[1]	Verification procedures[2]	HACCP records[3]
10. Salting & curing	B4. Enteric pathogens	1	Visible salt crystals on casings after validated curing period. Properly cured appearance and texture throughout casings (i.e. bleached, shrunken; not smooth, wet and shiny).	Visual inspection of a specified number of cured casings per lot.	(a) Re-inspect casings from the same lot. (b) Repeat salting and curing. (c) Determine cause of noncompliance and correct procedure.	FSO validation Random visual inspection of products at predetermined frequency Product testing (e.g. microbiological, water activity) Internal audit Extrinsic audit (e.g. regulator, client) Customer complaints HACCP review	Validation records Daily monitoring records Corrective action reports Analytical test reports Internal audit reports Extrinsic audit reports Customer complaints file HACCP review records

1. Corrective actions should reflect an escalating response when ongoing noncompliance occurs.

2. Verification procedures apply to all aspects of the HACCP plan.

3. HACCP records apply to all aspects of the HACCP plan. Refer to IS 8, Section 4 regarding requirements for documentation and record keeping.

Ensure that detailed documentation (and evidence where relevant) exists for the following:

- ***rationale for critical limits;***
- ***monitoring procedures, including who's responsible, what monitoring will take place, when or at what frequency it will take place, how itwill be done;***
- ***corrective action procedures, including who's responsible, how control will be restored, what happens to affected product, how prevention of re-occurrence might be achieved;***
- ***verification procedures, including who's responsible, what verification consists of, how verification will be done, when and at what frequency ongoing verification activities will occur, when revalidation is necessary;***
- ***documentation and record keeping.***

Annex to Appendix X.5: Background Information to the Generic HACCP Plan for the Processing of Edible Sheep and Lamb Casings

Natural sheep casings are made from the small intestines of sheep and lambs. The small intestines comprise five distinct layers. From the inner to the outside layer, these are: mucosa, submucosa, circular muscle layer, longitudinal muscle layer and serosa. The submucosa forms the main base for natural casings. It consists mainly of collagenous and elastic fibres.

There are three types of companies involved in the processing of casings in New Zealand:

- Some companies are involved in the whole process, from the receipt of the gut set from the slaughterfloor to further processing of cleaned and salted casings and subsequent dispatch of packed cured casings. The process flow given in this generic plan reflects this type of operation.

- Other companies are only involved in the production of green runners. After the removal of intestinal contents, the green runners are packed in casks with chilled water, with or without metabisulphite, and then transported to other premises for further processing into cured casings.

- The scope of the operation of the third type of company is limited to the further processing of casings from green runners received from slaughterhouses.

1. Biological Hazards

1.1 Pathogenic bacteria

Bacterial contamination of intestinal material is expected to be very high, with enteric pathogens frequently present in substantial numbers (Gill, 1988; Fischer and Krol, 1997). Enteric pathogens that are associated with contamination from the gastrointestinal tract include *Salmonella*, *Clostridium* spp., *E. coli* O157:H7 and *Campylobacter* spp. The submucosa layer of the intestines is expected to be sterile before and immediately after hygienic removal from carcasses of healthy animals (Gill, 1988). During stripping and cleaning of the runners, the submucosa layer is exposed to microbiological contamination from intestinal contents. Studies show that microorganisms isolated and identified in natural casings are those that are found in the gastrointestinal tract of animals (Riha and Solberg, 1970).

1.2 Parasites

Toxoplasma gondii is a protozoan parasite that can cause human infection through the ingestion of *Toxoplasma* cysts in undercooked meat (Wilks and Humble, 1997). The parasite encysts in the skeletal muscles, cardiac muscles and other organs of mammalian hosts (Speer, 1997).

Estimated prevalence rates of *T. gondii* in sheep in New Zealand are in the region of 60-70% (Wilks and Humble, 1997). Toxoplasmosis is a common cause of placentitis, abortion and perinatal mortality in sheep.

Considering the high prevalence of *T. gondii* in sheep, it is reasonable to assume that the parasite may be present in the tissues of the small intestines of sheep and lambs (Pomeroy, pers. comm.). However, there are no published reports on the prevalence and levels of *T. gondii* in sheep intestines, or on the effects of processing on the parasite. There are also no reported cases of human infection associated with the consumption of natural casing products. In the absence of such information, it can only be assumed that certain steps in the process (e.g. stripping and salting) contribute to the removal or destruction of the organism to a level such that the parasite is likely to present mimimal health risks to consumers in the final product.

2. Chemical Hazards

There is no information available on possible levels of chemical residues in the small intestines of slaughter animals. Considering its end use as sausage casings, it is likely that if residues are present, the levels in the final product would pose minimal health risk to consumers. It should be noted that it is a requirement for carcasses and products from animals from chemical suspect lines to be sampled and detained according to MAF Reg (M&S) specifications. If found to contain a chemical residue above the maximum residue limit, then all products from these animals, including intestines, are condemned.

3. Physical Hazards

Anecdotal evidence from casings premises suggest that foreign objects such as sand, pebbles and small sticks are occasionally found in green runners from certain classes of stock (i.e. cull sheep and those that have been exposed to drought conditions). Premises should consider the relevance of these potential physical hazards to their product/process and address them in the HACCP plan, as appropriate.

4. Key Process Steps: Effects on Microbiological Hazards

4.1 Pre-salting steps

The first step in the processing of casings is to separate the intestines from other intestinal tissue. Next they are passed through a set of rollers for partial cleaning and removal of the intestinal contents. As the intestines from a sheep differ in diameter from one end to the other and a uniform product is needed, the intestines are cut into three approximately equal lengths. The runners are then held for around 24 hours in tanks with running water for washing and conditioning to soften the casings and for easier removal of the mucosa. The casings are then

passed through a cleaning machine which crushes them through rollers, stripping the outer membrane and all the mucosal layer. During these pre-salting steps, contamination of the casings with microorganisms from the intestinal contents is inevitable.

There is potential for microbial growth during the conditioning period, particularly during the summer months, as the water used for conditioning is not controlled at low temperatures (i.e. water generally comes straight from the tap). Results of preliminary trials obtained by MIRINZ Food Technology and Research (MIRINZ) from three New Zealand premises show that overnight conditioning results in a one log increase in microbiological levels in sheep casings, as determined by average aerobic plate count, *E. coli*, *Enterobacteriaciae* and anaerobic counts. Therefore, the temperature for fresh unsalted runners/casings should be kept as low as possible to minimise the growth of microorganisms.

Proper removal of the mucosa or slime during stripping can reduce microbial contamination of the casings (Fischer and Krol, 1997). When removal of slime has not been as good as possible, the salting preservation will take more time. A very high bacterial count at the beginning of salting can limit the efficiency of the step to eliminate or reduce the microorganisms present within the specified curing period (Fischer and Krol, 1997).

4.2 Salting and curing

The microbiological load of natural casings is reduced in two ways during the whole process. The first is the physical removal of bacteria through washing and cleaning, and the second is the destruction of bacteria by a high concentration of salt (Gabis and Silliker, 1974). The salting and curing step is the most important preservation step in the process, and if correctly performed eliminates microbial hazards to health almost completely (Fischer and Krol, 1997). No subsequent step will reduce or eliminate any hazards that may remain (Fischer and Krol, 1997).

The majority of sheep casings in New Zealand are dry salt packed. These casings are adaptable to long distance shipment and long-term storage (Rust, 1988). Casings are salted with medium fine salt by hand or with a machine. During salting, extra attention should be given to the area of the casing where the string or knot is located (Ockerman and Hansen, 1988). Each bundle may go directly to the packing barrel or hang in trolleys overnight. After the specified curing period, visible salt crystals should be present on the casings to ensure saturation has been imposed (Fischer and Krol, 1997). Casings should also have the appearance and texture associated with properly cured casings (i.e. bleached, shrunken or wrinkled, with no area appearing “wet”, shiny and smooth).

Prolonged storage in saturated salt solutions results in the destruction of most pathogens (Gill, 1988). Preliminary data obtained by MIRINZ from three New Zealand premises show the following microbiological levels for casings prior to salting: 10^7-10^8 cfu/g aerobic plate count, 10^6-10^7 cfu/g *Enterobacteriaciae* and 10^5-10^6 cfu/g *E. coli*. Twenty-four hours after salting, average aerobic plate counts decreased by about one to two log counts (10^5-10^6 cfu/g), and *Enterobacteriaciae* and *E. coli* were reduced to a “not detectable” level (detection limit of log 1.69 cfu/g). Aerobic plate counts decreased further during storage with levels down to 10^3-10^4 cfu/g after seven days and after three months storage. These results are within the range reported

by Riha and Solberg (1970), who found that microflora surviving in salted natural casings stored at chiller temperatures for 1-4 weeks varied in aerobic plate counts from 10^4 to 10^7 organisms per gram, but the flora was invariably dominated by bacilli and clostridia, the spores of which can withstand the salting process.

Salting results in the reduction of water activity which influences microbiological activity in the product. In general, foodborne pathogenic bacteria are inhibited by a water activity of 0.92 or less (equivalent to a salt solution with a sodium chloride concentration of 13% w/v) (Davidson, 1997). The exception to this is *Staphylococcus aureus*, which has a minimum water activity for growth of 0.83-0.86, but has a higher minimum water activity for enterotoxin production of 0.95 (Jay, 1978). *Salmonella* die slowly at water activity levels below those allowing growth (Jay *et al*., 1997). Preliminary data obtained by MIRINZ from three New Zealand premises show that water activity of sheep casings is reduced to 0.75 twenty four hours after salting. Therefore, correct salting and storage in saturated salt should be sufficient to eliminate bacterial pathogens in casings.

High levels of salting, particularly when there is some fluid, such as that applied to natural casings, are usually lethal to *Salmonella* (Jay *et al*., 1997). A study of the effect of various salt treatments on *Salmonella* in naturally contaminated casings shows that *Salmonella* in sheep casings were eliminated after 7 days in salt packs (sampling was only done on days 0, 7, 14 and 21) (Gabis and Silliker, 1974). *Salmonella* in hog casings, which were more heavily contaminated, were eliminated after 21 days of storage at 6 °C. The natural level of contamination and efficiency of the washing procedure as well as the temperature of storage in salt influences the length of time required to rid the casings of *Salmonella*. Sanitation in handling of unsalted casings also has an effect on the numbers of salmonellae that contaminate the unsalted material (Gabis and Silliker, 1974).

Gabis and Silliker (1974) concluded that there would be essentially no *Salmonella* risk with natural casings moving in international trade because of the lengthy exposure of the casings to saturated brine solutions. There may be some risk entailed in using casings fresh from the cleaning and finishing process, as no salting or other kill treatment is employed. These authors suggest that for rapid treatment of casings, the use of acetic acid brine would render naturally contaminated casings virtually free of *Salmonella* within 24 hours.

4.3 Packing and storage

Cured casings are usually packed in polyethylene-lined casks. Covering salt is added over the top layer of casings before sealing the casks. Packed casings in New Zealand premises are generally stored in chillers while awaiting dispatch. Provided salted casings are stored in cool temperatures, all microbial growth is inhibited (Gill, 1988). However, preserved casings are often transported overseas at ambient conditions. At warm temperatures, spoilage may occur; this is indicated by red discoloration on the product and is caused by the growth of halophilic bacteria, which are not pathogenic organisms (Wilkinson, 1992).

The European Natural Sausage Casings Association (ENSCA) has made the following microbiological recommendations for salted natural casings as incoming product at meat manufacturing plants, i.e. sausage manufacturers (Fischer and Krol, 1997):

	Acceptable (m) cfu/g	Maximum (M) cfu/g
Aerobic plate count	$< 1.0 \times 10^5$	5.0×10^6
Enterobacteriaceae	$< 1.0 \times 10^2$	1.0×10^4
Staphylococcus aureus	$< 1.0 \times 10^2$	1.0×10^3
Sulphite-reducing Clostridia – spores	$< 1.0 \times 10^2$	1.0×10^3

It is worth noting that these levels are similar to those given by the NZ Ministry of Health as a microbiological reference criteria for raw meat (MOH, 1995). At present, there is very limited data from industry to confirm the relevance of these values to casings produced under New Zealand conditions and practices. However, results of preliminary trials from three premises appear to indicate that lower levels than the m values given above for aerobic plate count and *Enterobacteriaceae* are readily achievable for commercially processed sheep and lamb casings. More information should become available after the completion of the microbiological study on natural casings presently being undertaken by MIRINZ.

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