INTRODUCTION TO CODEX HACCP AND HAZARD ANALYSIS FOR RISK MANAGEMENT PROGRAMMES

Prerequisite reading prior to attending the Introduction to Codex HACCP and Hazard Analysis for RMP workshop

DISCLAIMER

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1.0 Definitions

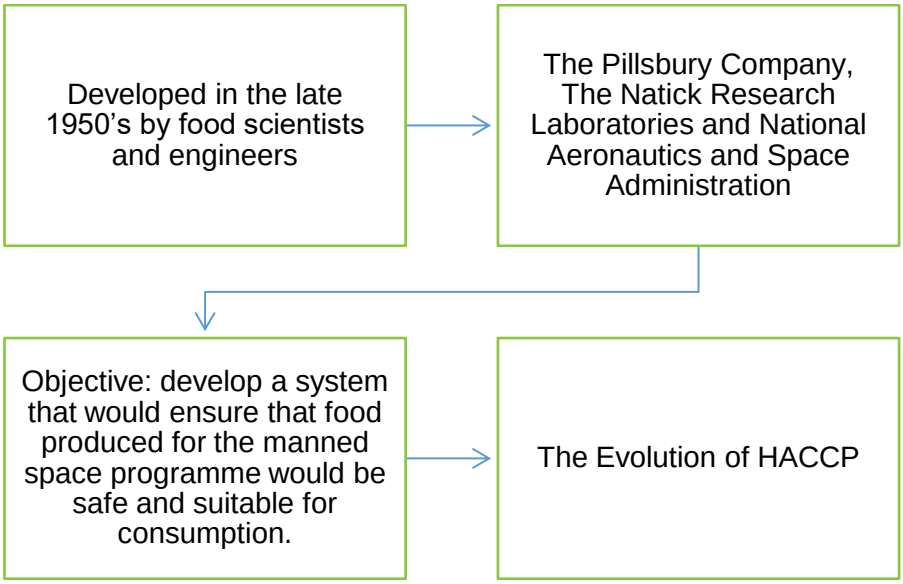
The following definitions and key words have been extracted from *Recommended International Code of Practice General Principles of Food Hygiene* and *HACCP System and Guidelines for its Application [CAC/RCP 1-1969, Rev 4 (2003)].*

Cleaning	The removal of soil, food residue, dirt, grease or other objectionable matter.
Contaminant	Any biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability.
Contamination	The introduction or occurrence of a contaminant in food or food environment.
Disinfection	The reduction, by means of chemical agents and/or physical methods, of the number of micro-organisms in the environment, to a level that does not compromise food safety or suitability.
Establishment	Any building or area in which food is handled and the surroundings under the control of the same management.
Food hygiene	All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.
Hazard	A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.
HACCP	A system which identifies, evaluates, and controls hazards which are significant for food safety.
Food handler	Any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements.
Food safety	Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.
Food suitability	Assurance that food is acceptable for human consumption according to its intended use.
Primary production	Those steps in the food chain up to and including, for example, harvesting, slaughter, milking, fishing.
Control (verb):	To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.

Control (noun):	The state wherein correct procedures are being followed and criteria are being met.
Control measure:	Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
Corrective action:	Any action to be taken when the results of monitoring at the CCP indicate a loss of control.
Critical Control Point (CCP):	A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
Critical limit:	A criterion which separates acceptability from unacceptability.
Deviation:	Failure to meet a critical limit.
Flow diagram:	A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item.
HACCP:	A system which identifies, evaluates, and controls hazards which are significant for food safety.
HACCP plan:	A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.
Hazard:	A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.
Hazard analysis:	The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.
Monitor:	The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.
Step:	A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.
Validation:	Obtaining evidence that the elements of the HACCP plan are effective.
Verification:	The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

2.0 History and evolution of the HACCP system

2.1 Where it all began



Hazard Analysis Critical Control Point system also known as HACCP, was originally developed in the late 1950s by a team of food scientists and engineers from The Pillsbury Company, the Natick Research Laboratories, and the National Aeronautics and Space Administration (NASA). The team's objective was to develop a system that would ensure that food produced for the manned space programme would be safe and suitable for consumption. This system was designed to identify and manage food safety hazards as a preventative measure to food safety. This preventative measure to food safety was an essential criterion to eliminate and significantly reduce the risk of astronauts suffering from food poisoning while in a zero-gravity environment.

Although this system of preventative measures could not guarantee zero presence of bacteria, it could however assure the production of safe food through the identification and management of hazards associated with each step in the process and the conditions under which the food was produced.

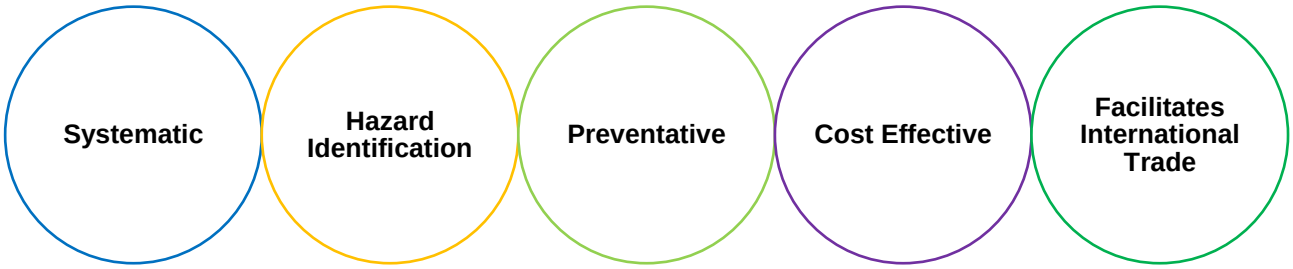
2.1.1 The Evolution of HACCP

The Pillsbury company introduced the concept of HACCP during a Food Protection Conference in 1971. This concept of preventative measures rather than relying on product testing to verify food safety, was positively received by food businesses and regulatory authorities. The Food and Drug Administration also known as FDA, took the initiative to incorporate the concepts of HACCP into its low acid and acidified food regulations in 1974. By the early 1980's and 90's, HACCP was becoming widely used by the major food companies on a global scale.

In 1989, followed by an amendment in 1997, The National Advisory Committee on Microbiological Criteria for Foods (NACMCF) published the first HACCP document. Both the Codex and NACMCF committees revised their standards, incorporating prerequisites within the guidelines as the essential foundations to a successfully applied HACCP system.

The version of the *Recommended International Code of Practice-General Principles of Food Hygiene including Annex on HACCP System and Guidelines for its Application* was adopted by the Codex Alimentarius Commission in 1997. HACCP Guidelines were revised in 2003. The current version of the Recommended International Code of Practice General Principles of Food Hygiene [CAC/RCP 1-1969, Rev 4 (2003)], incorporates the guidelines for the application of the HACCP system inclusive of the preliminary steps to the application of the seven principles.

2.2 Benefits of an integrated HACCP system



The preventive approach of HACCP based procedures not only improves food safety management but also complements other food safety management systems (FSMS). The HACCP principles can be applied across a variety of food sectors, from agricultural production to food service, from multinational manufacturers to small processors.

So, what are the advantages of integrating HACCP principles into a food business FSMS?

Firstly, HACCP system takes a systematic approach identifying all food safety hazards that are likely to occur within each step of the food business process. Typically, a food manufacture scope of operation would include; receipt of raw materials, storage, processing, handling and distribution.

By identifying the hazards that are likely to occur, food businesses can assess the risk these hazards pose to food safety. The identification of these hazards allows for a preventative approach to managing potential foods safety risks and company liability. This preventative approach to food safety reduces the reliance of end-product testing, product losses and rework that may have occurred under other FSMS's.

The identification of significant hazards allows for a more focused approach to managing and monitoring critical control points (CCPs) within a food business. Continuous monitoring of CCPs reduces the risks of recalls and product withdrawals which in turns reduces costs associated with insurance and business liability protection. In addition, the records and documentation generated from monitoring CCPs also offers due diligence defense in a court of law.

The use of HACCP principles focuses technical resources into critical parts of the food operation. Whilst complimenting other FSMS's, HACCP principles facilitate an approach to risk assessment, increasing the management and operatives focus and ownership of food safety disciplines.

The integration of HACCP principles within a FSMS not only facilitates international trade due to its recognition on a global scale but complies with relevant legislation and guidelines. This in turn increases customer and consumer confidence in the management of food safety hazards.

3.0 The Codex guidelines for the application of the HACCP systems

3.1 HACCP objectives

The HACCP system ultimate objective is to identify specific food safety hazard which have the potential to cause illness, injury or death. Food safety hazards are categorised as biological, chemical and physical hazards. The focus of control is either by preventing, eliminating or reducing the effects of these food safety hazards to an acceptable level for ensuing food is produced in a safe and suitable manner.

3.2 Food Safety Hazards

Codex definitions describe hazards as a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect. The Animal Products Act 1999 aligns with this definition and defines hazards as, “hazard means a biological, chemical, or physical agent that;

- is in or has the potential to be in animal material or product, or is or has the potential to be a condition of animal material or product; and
- leads or could lead to an adverse health effect on humans or animals.

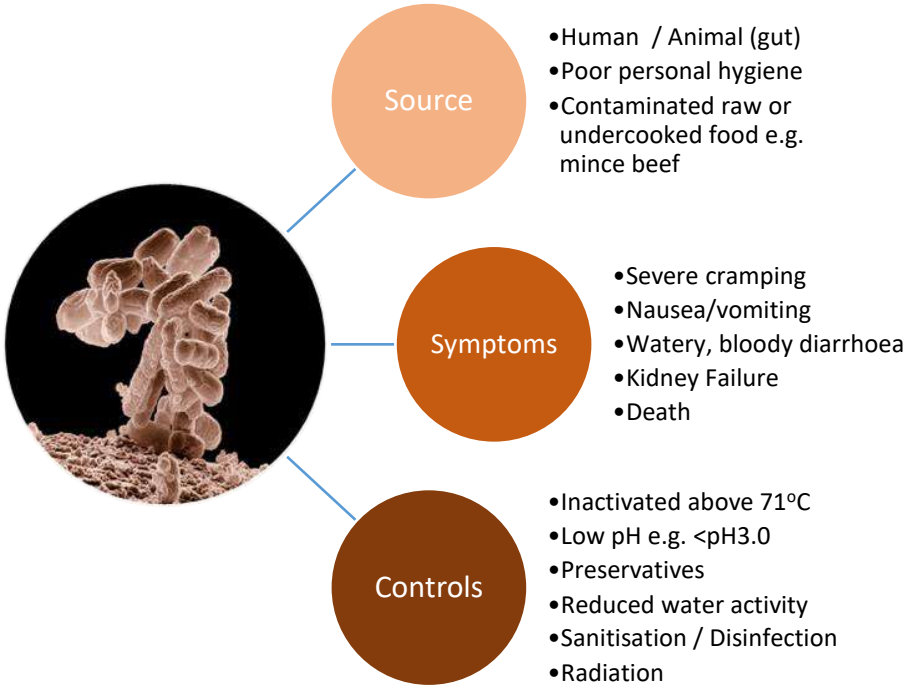
This diagram illustrates examples of hazards in each of the hazard categories

BIOLOGICAL	CHEMICAL	PHYSICAL
Bacteria	Cleaning chemicals	Glass
Viruses	Pesticides	Pests
Fungi	Solvents & lubricants	Manmade
Algae	Food additives	Vegetable & mineral matter
Parasites	Animal antibiotics	Plastic
	Heavy metals	Animal
	Naturally occuring chemicals	

3.2.1 Intrinsic Factors

There are several factors for consideration when identifying all potential hazards that are reasonably expected to occur (see Principle 1 Conduct a Hazard Analysis).

In addition to identifying specific hazards, it is important to understand the intrinsic properties of each hazard, the severity of the risk they pose, and know how they may react in certain environments or processing steps.



E coli 0157:H7 is one of the key pathogenic bacteria that causes death in vulnerable group (young children, elderly, immunocompromised, pregnant, allergen sufferers). This microorganism is found in human and animal guts. It has an optimum growth temperature of 37°C however can grow between 7-50°C and can grow in the presence or absence of oxygen. The presence of this strain of *E coli* is always associated with faecal contamination either from the raw materials (e.g. through animal contamination) or from inadequate cleaning, sanitization and personal hygiene during handling and processing.

In addition to knowing the characteristics of the hazard, it is also important to know how these hazards can be controlled and at what stage in the process should these controls be applied.

Consideration must be given to the following potential processing steps to ensure that the hazard is controlled in each stage of the process;

- The composition of ingredients and formulations;
- The preparation and handling;
- The processing equipment;
- The food safety treatments applied (cooking, pasteurization, sterilization, filtration, sieving);
- The intrinsic factors of the product (key characteristics compositional elements of the product e.g. pH, water activity (a_w), alcohol content);
- The shelf life and storage conditions of the product.

3.2.2 Sources of information

As stipulated by CODEX HACCP, there should be appropriate product specific knowledge and expertise within the business for the development of an effective HACCP plan. This may be accomplished by assembling a multidiscipline team or alternatively obtained from an external source such as a food consultant, regulatory authorities, legislation, HACCP literature and guidance material.

These following sources offer free information to assist the operator in ensuring they fully understand the characteristics of the hazards that may be associated with their food operation.

- MPI Hazard Database including key biological, chemical and physical hazards associated with specific food ingredients;
- Bad Bug Book published by the Centre for Food Safety and Applied Nutrition, of the Food and Drug Administration (FDA), U.S. Department of Health and Human Services;
- SafeFood 360 Whitepaper – Developing a HACCP plan (March 2014);
- You tube offer free courses in the application of HACCP principles;
- The web offers a vast amount of HACCP related information on a global scale.

3.3 Preliminary requirements and principles of the HACCP system

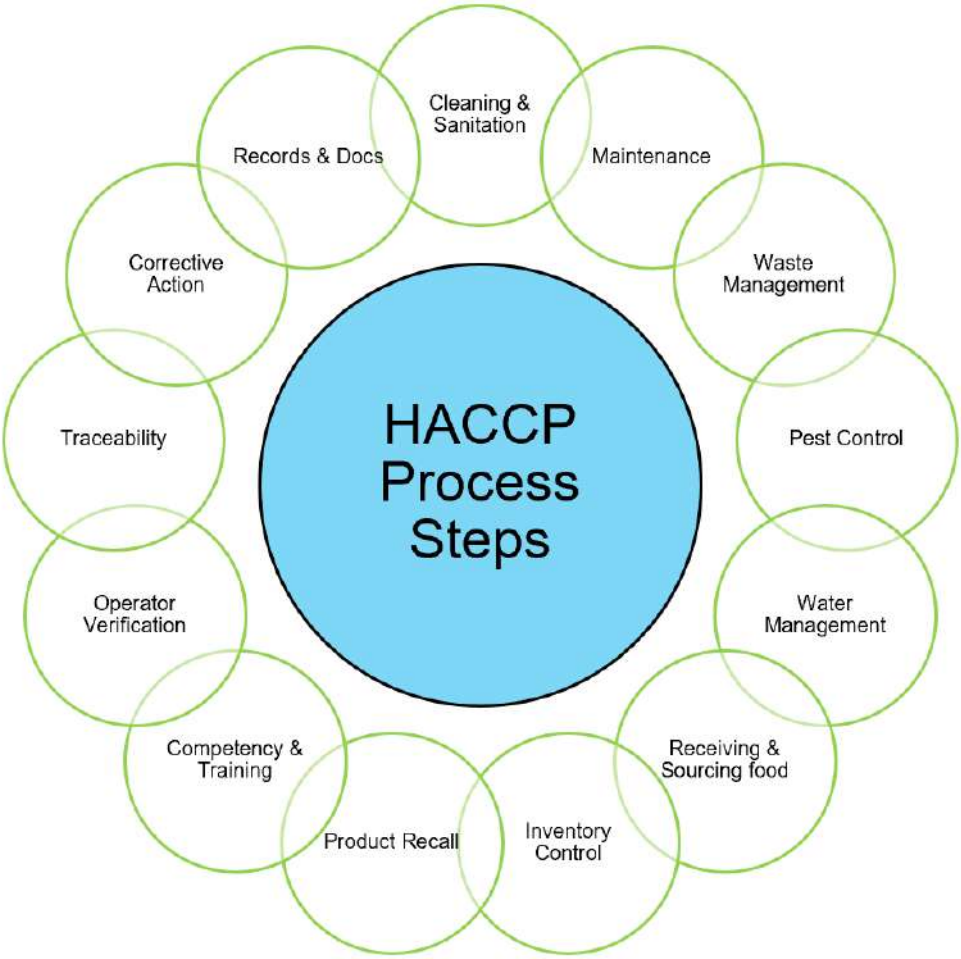
Prior to applying the seven principles of the HACCP system, CODEX have identified key steps to be considered to ensure the application of the principles are successful. Although not indicated in the *logical sequence for application of HACCP* as stated in the *HACCP System and Guidelines for its Application [CAC/RCP 1-1969, Rev 4 (2003)*], CODEX has reinforced the message that management commitment, the establishment of prerequisite programs and training of personnel are necessary to facilitate the successful application and implementation of the HACCP system.

3.3.1 Management Commitment

It is essential to the viability of the HACCP system that a food safety culture is effectively communicated through reporting channels from senior management positions to those responsible for the operation and implementation of the business objectives. As stipulated by CODEX HACCP, this commitment may be demonstrated through the provision of adequate resources, the implementation of effective communication, a system for management review and mechanisms for continual improvement in food safety awareness.

3.3.2 Prerequisite Programmes (PRPs)

CODEX HACCP defines documentation, implementation and ongoing maintenance of prerequisite programs (PRPs) as essential for the successful application of the HACCP system. PRPs also known as supporting programmes, provide the foundations for an effectively HACCP system. PRPs are mainly focused on facility-wide programs such as cleaning and sanitation, pest control, waste management, rather than product specific processes. It should be noted that food borne illness is often associated with a failure of a PRP rather than a CCP within a HACCP plan e.g. post-process recontamination and/ or unsanitary production environments.



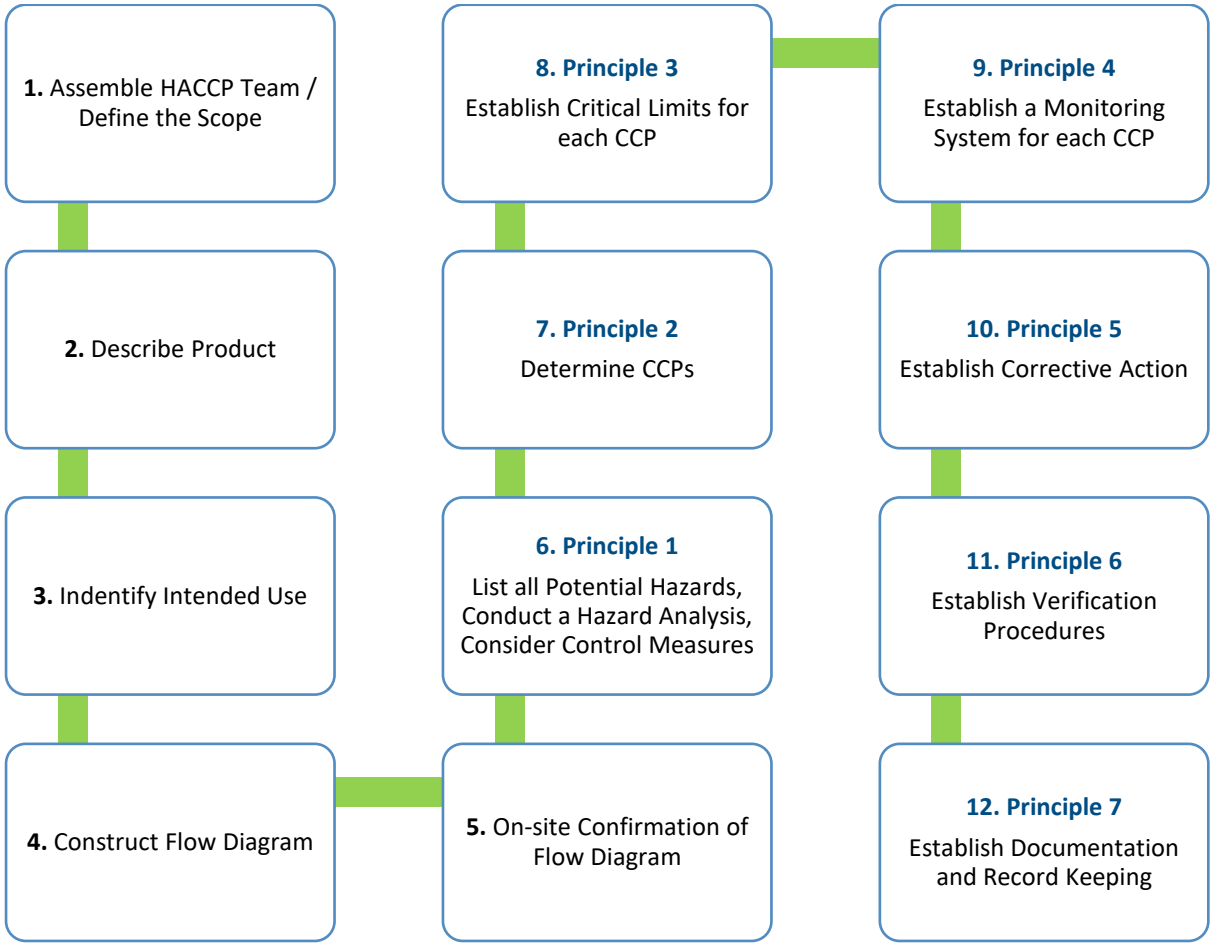
Recommended International Code of Practice General Principles of Food Hygiene [CAC/RCP 1-1969, Rev 4 (2003)], details the primary production and general hygiene principles which apply throughout the food chain to the point of sale. MP have incorporated the PRP requirements through guidance in codes of practice, notices, inclusive of legislation (see section 5.2. The Animal Products Act 1999 and Associated legislation).

3.3.3 Training

A documented HACCP system is ineffective if the requirements as stipulated by the plan has not been effectively implemented through initial and continuous ongoing training for all levels of employees and management. A HACCP system is designed to be flexible and constantly evolving. This flexibility is especially important when new product lines or equipment are introduced. Any changes in the plan must be appropriately communicated to all key staff members to ensure its success.

3.4 CODEX HACCP Steps

The diagram illustrates the key steps and HACCP principles as described by CODEX HACCP.



1. Assemble HACCP team / Define the Scope

Ideally a multidisciplinary team (experts in different areas of the business operation). Alternatively, opt for an expert where expertise is lacking. The HACCP team are required to define the scope of the HACCP plan defining the start and end point of the HACCP study including products, processes and food safety points of consideration.

2. Describe product

A full description of the product(s) including relevant safety information (pH, regulatory limits, heat treatments, freezing, brining, smoking etc), packaging, durability, storage conditions and methods of distribution. Product descriptions may be grouped aligning with similar product characteristics or processing steps.

3. Identify intended use

Expected use of the product by the end user or consumer e.g. ready-to-eat (RTE)/further preparation required, intended for vulnerable groups.

4. Construct flow diagram

Detailing all steps in the operation for a specific product(s). Process flows may be grouped, aligned with products manufactured or processed under similar processing steps. Steps preceding and following a specified operation should also be considered to determine control of all aspects of the process e.g. procurement, retail sales.

5. Onsite confirmation of flow diagram

HACCP team to confirm the processing operation against the flow diagram during all stages of production e.g. nightshift and dayshifts. The confirmation of a flow diagram should be performed by a person or persons with enough knowledge of the processing operation e.g. the production manager, key operating staff.

6. Principle 1

Conduct a hazard analysis;

1. List all potential hazards that are reasonably expected to occur at each step in the process e.g. procurement, receipt, storage, processing, manufacture, packing, distribution (retail, wholesale, catering) to point of consumption.

2. Conduct a hazard analysis;
   The HACCP team must determine which of the hazards identified are required to be reduced or eliminated to acceptable levels to ensure food is produced in a safe and suitable manner. This may be achieved by determining;
   - the likely occurrence of the hazard and severity of their impact on health effects (see risk matrix Appendix 1);
   - the qualitative and/or quantitative evaluation of the presence of hazards;
   - the survival or multiplication of microorganisms of concern;
   - the production or persistence in foods of toxins, chemicals or physical agents; and
   - the conditions leading to the above.

3. Consider control measures (if any) can be applied to each hazard. More than one control measure may be used to control a hazard e.g. time and temperature combinations. Also, more than one hazard may be controlled by a specific control measure e.g. chilled and frozen storage temperatures for raw, in-process and finished products.

7. Principle 2 — Determine the Critical Control Points (CCPs).

Determination of CCP's can be facilitated by the CODEX decision tree (see Appendix 2). In some cases, the questions asked may need to be modified to ensure effective CCP identification. If a CCP has been identified and no control measure exist at this step or any other step in the process, then the product or process steps must be modified to enable a control measure to be implemented.

8. Principle 3 — Establish critical limits for each CCP

Critical limits applied to a CCP must be validated and measurable and may consist of more than one critical limit e.g. time and temperature combination, moisture levels and A_w, pH, available chlorine, sensory parameters; visual appearance, texture. Critical limits validated by experts or governing bodies may be applied if conditions are of operation have been applied as per the expert's recommendations.

9. Principle 4 — Establish a monitoring system for each CCP

Monitoring is the scheduled measurement or observation of a CCP relative to its critical limit. The monitoring procedures must be able to detect loss of control at the CCP. The monitoring system should facilitate adjustment of the process prior to loss of control of a CCP. Monitoring should be rapid in its approach since most CCP's relate to in process activities. Physical and chemical measures are often used over microbiological testing as they are performed rapidly and can also be used as a microorganism indicator. All records and documents associated with monitoring CCPs must be signed by the person conducting the monitoring and verified by an independent official of the company e.g. Technical Manager.

10. Principle 5 — Establish the corrective actions

Established documented corrective actions must be stated for each CCP to ensure immediate action is take when monitoring indicates that a CCP is not under control. These actions must state how control can be reestablished, the disposition of affected product (rework, disposed) and the deviation of procedures to prevent reoccurrence of loss of control. Records of corrective action must be maintained.

11. Principle 6 — Establish verification procedures

Verification activities and frequency of their application are required to determine that the documented HACCP plan continues to be effective and working as intended. These activities should be carried out by someone other than the person who is responsible for monitoring and performing corrective action procedures e.g. Technical / Compliance Manager.

External experts or qualified third-party person should be considered if verification activities cannot be performed in house

Examples of verification activities include;

- Review of the HACCP system and plan and its records;
- Review of deviations and product dispositions;
- Confirmation that CCPs are kept under control.

Validation activities should include actions to confirm the efficacy of all elements of the HACCP system e.g. validation of CCPs, control measures, verification activities.

12. Principle 7 Establish documentation and record keeping

Documented procedures and accurate record keeping is essential to the application of the HACCP system. Consideration of the size and complexity of the operation will determine the detail required within records and procedures. Operatives may utilise expertly developed HACCP guidance material provided that the documentation used is reflective of the food operative's practices e.g. Processed Meats Code of Practice Part 4: HACCP Application.

Record examples may include;

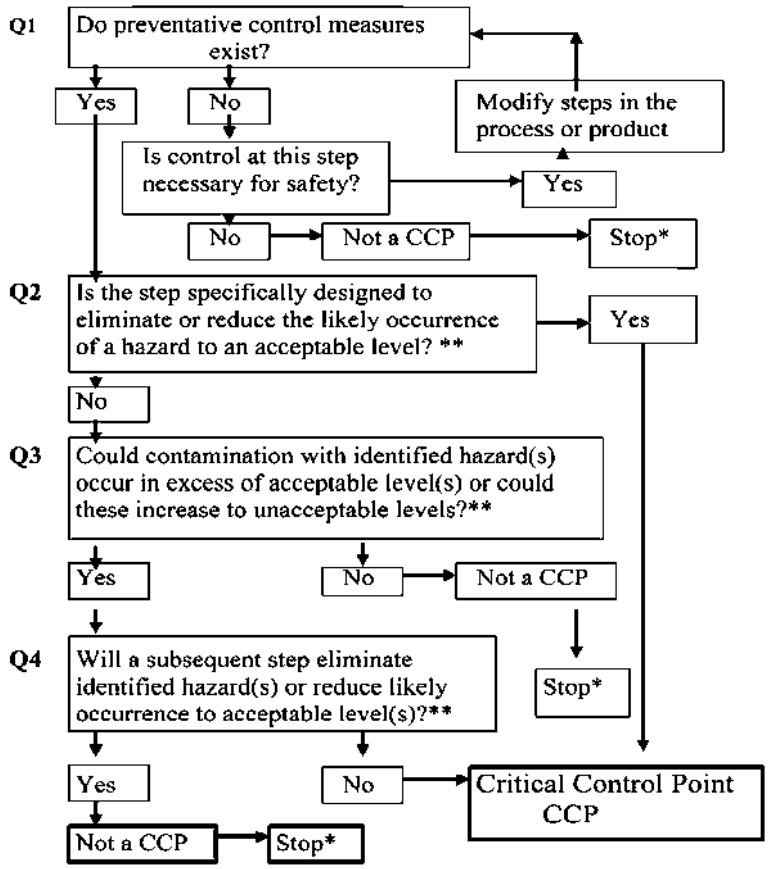
- CCP monitoring activities;
- Deviations and associated corrective actions (CAR);
- Verification procedures performed;
- Modifications to the HACCP Plan.

Appendix 1: Example of a Risk Matrix

Likelihood			Potential Consequences				
			L6	L5	L4	L3	L2
			Minor injuries or discomfort. No medical treatment or measureable physical effects.	Injuries or illness requiring medical treatment. Temporary impairment.	Injuries or illness requiring hospital admission.	Injury or illness resulting in permanent impairment.	Fatality
			Not Significant	Minor	Moderate	Major	Severe
	Expected to occur regularly under normal circumstances	Almost Certain	Medium	High	Very High	Very High	Very High
	Expected to occur at some time	Likely	Medium	High	High	Very High	Very High
	May occur at some time	Possible	Low	Medium	High	High	Very High
	Not likely to occur in normal circumstances	Unlikely	Low	Low	Medium	Medium	High
	Source: http://www.examspm.com			Low	Low	Low	Medium

Appendix 2: CODEX Example of Decision Tree to Identify CCPs

(answer questions in sequence)



***proceed to the next identified hazard in the described process**

****Acceptable and unacceptable levels need to be defined within the overall objectives in identifying the CCPs of HACCP plan.**

Appendix 3: Example of a CODEX HACCP Worksheet

1. Describe Product

2. Diagram Process Flow

3. List

Step	Hazard(s)	Control Measure(s)	CCPs	Critical Limit(s)	Monitoring Procedure(s)	Corrective Action(s)	Record(s)

4. Verification

4.0 A Customer and Regulatory Perspective

It is interesting to note that the integration of HACCP with FSMSs was initially driven by the industry rather than by regulations. Customers like McDonald's required all their suppliers to implement HACCP to ensure the safety of the food sold in their restaurants.

4.1 Global Food Safety Initiative Schemes

Today, HACCP is driven by regulatory and customer requirements such as Woolworths Quality Assurance scheme as well as Global Food Safety Initiative schemes (GFSI). The GFSI is an industry-driven initiative providing leadership and guidance on food safety management systems for ensuring food safety within the supply chain. This is achieved through the collaborative efforts of the world's leading food safety experts from retail, manufacturing, food service companies, as well as international organisations, governments and service providers to the global food industry.

The GFSI aim is to share knowledge and promote a harmonised approach to managing food safety across the industry whilst offering a benchmark model to determine equivalency between food safety schemes such as The British Retail Consortium, The International Food Standard (IFS), Safe Quality Food Initiative (SQF) and the International Standard for Organisation (ISO).

4.2 The Animal Products Act 1999 and Associated Legislation

Reprint as at 2 March 2018

Animal Products Act 1999

Public Act 1999 No 93
Date of assent 8 September 1999
Commencement see section 1

The following summary on the Animal Products Act 1999 (APA) has been extracted from MPI guidance document: An Overview of the Animal Products Act 1999, 18 Jan 2017.

APA is New Zealand's legal framework for processing animal material into food, such as meat and dairy products. It establishes a risk management system that requires all animal products traded and used to be 'fit for intended purpose' through meeting New Zealand animal product standards. The purpose of the Animal Products Act 1999 is to:

- regulate the production and processing of animal material and animal products in New Zealand;
- govern the slaughter, processing and sale of some food intended for human and animal consumption, including farmed meat and wild game, seafood, honey and bee products, eggs and dairy products;
- manage physical, biological and chemical hazards that might present a risk, irrespective of where in the production or processing chain they occur;
- ensure that products produced under the APA are wholesome and truthfully labelled;
- facilitate the entry of animal material and products into overseas markets by providing the controls and mechanisms needed to give and to safeguard official assurances for entry into those markets.

4.2.1 Regulations, Orders and Notices under the APA

The following lists the Regulations and Notices under the APA:

- Animal Products Regulations 2000
- Animal Products (Dairy) Regulations 2005
- Raw Milk for Sale to Consumers Regulations 2015
- Animal Products (Exemptions and Inclusions) Order 2000
- Animal Products (Fee, Charges and Levies) Regulations 2007
- Animal Products (Dairy Industry Fees and Charges) Regulations 2007
- Notices covering a range of legal requirements for businesses producing, processing, selling, storing, transporting, importing and exporting animal materials and products have been promulgated under the APA.

4.2.2 Risk Management Programme (RMP)

An RMP is a documented programme to identify and manage known biological, chemical and physical hazards, and other risk factors. The RMP is required to be based on the principles of HACCP. They are designed to identify, control, manage, eliminate or minimise hazards and other risk factors in relation to the production and processing of animal material and animal products to enable the resulting animal product to be fit for the intended purpose.

Risk factors may relate to the nature of the animal material or product concerned, or to the production, processing, preparation, distribution, trade, or intended use of the animal material or product.

RMPs usually relate to the individual business, but can be based on a code of practice, model or template. A single RMP can be applied to several comparable businesses, if approved by the Director-General (DG).

4.2.3 MPI Standardised HACCP Steps

In order to promote consistency within current and future HACCP guidance, MPI have developed HACCP guidance and generic HACCP plans to assist RMP operators:

- Standardisation of Hazard Analysis and Critical Control Point (HACCP), 8 August 2012, has information on how to apply HACCP principles;
- Risk Management Programme Manual for Animal Product Processing, Oct 2009;
- Processed Meats Codes of Practice (COP), February 2010;
- MPI Hazard Database has searchable information on food safety hazards that is reasonably likely to occur in New Zealand.

The standardised HACCP guide 8 August 2012 and other associated MPI animal and meat processing HACCP guidance considers the preliminary steps prior to applying HACCP principles to the production and processing of animal material and animal products. As per Codex HACCP, these include the requirement to establish verifiable supporting programmes. These systems may also be referred to as Standard Operating Procedures (SOPs), Sanitation Standard Operating Procedures (SSOPs), GMP procedures and pre-requisite programmes (PRPs).

The Animal Products (Specifications for Products Intended for Human Consumption) Notice or the Animal Products (Dairy Processing Specifications) and related approved criteria offer examples of supporting programmes that are likely to be include within an RMP. Examples of supporting programmes align with those set out by Codex HACCP.

There are, however, key differences in the application of principles documented in MPI guidance compared to the logical sequence for application of HACCP as stated in the HACCP System and Guidelines for its Application [CAC/RCP 1-1969, Rev 4 (2003)].

This following table illustrates the similarities and differences in content per HACCP step.

Codex HACCP Steps	Standardisation of HACCP / RMP Manual / Processed Meat COP
1. Assemble HACCP team / Define the Scope	All guides reference the requirement for competency in HACCP principles and other relevant guides, COP, legislation, regulatory and operator-defined limits inclusive of an understanding the products, processes and good operating practices (GOP) that are applicable to the food sector. In addition, MPI expects the scope of the HACCP application to be clearly defined, with justification as to which products, processes and practices (such as re-work) are included. There is no specific mention of assembling a multi-discipline team or obtaining expertise through other sources e.g. technical expert.
2. Describe product 3. Identify intended use	Although the Standardisation of HACCP guide does not state a requirement to describe products, other MPI COP and guidance includes the requirement to document the intended use, regulatory and operator-defined limits and other product details such as requirements for post-mortem examination, packaging, storage, shelf-life and/or labelling. RMP for Animal Processing Guide, Oct 2009, section 3.6.6; offers an example of how an animal material and animal product description can be documented.
4. Construct flow diagram	Although the Standardisation of HACCP guide does not include the requirement to document a process flow diagram, MPI COP and guidance states that the simplest way to describe a process is to use a process flow diagram showing all inputs, activities or steps, and outputs. These diagrams provide the foundation for hazard and other risk factor identification and hazard analysis.
5. Onsite confirmation of flow diagram	There is no stated requirement within MPI COP or guidance for the requirement to determine the accuracy of a process flow diagram.

6. **Principle 1** – Conduct a hazard analysis

Codex HACCP and MPI guidance align with the requirements for hazard identification to be specific to the type of hazard rather than a generic statement of biological, physical or chemical hazard e.g. *Salmonella spp*.

Hazard identification must be applied to the inputs and the direct process. Hazards from other sources such as personnel and pests are expected to already be covered by PRPs/ GOP prior to applying HACCP principles.

a. List all the hazards

MPI guidance offers a description on how to identify hazards that are reasonably expected to occur for instance hazards based on scientific reports, industry or company results, COPs, and information from MPI (MPI hazard database).

Codex HACCP, however, is not specific in terms of what is reasonably expected to occur, nor does it state that hazard identification must be determined for inputs other than stating listing all hazards expected to occur at each process step.

b. Conduct a hazard analysis

MPI guidance states that justification for the inclusion of a hazard must be documented (e.g. based on scientific literature, Codes of Practice, industry reports and experience, etc.) unless already justified in the MPI hazard database.

Codex HACCP are more detailed in the approach of determining which hazards are required to be reduced or eliminated to acceptable levels to ensure food is produced in a safe and suitable manner. This may be achieved by determining;

- the likely occurrence of the hazard and severity of their impact on health effects (see risk matrix Appendix 1);
- the qualitative and/or quantitative evaluation of the presence of hazards;
- the survival or multiplication of microorganisms of concern;
- the production or persistence in foods of toxins, chemicals or physical agents; and
- the conditions leading to the above.

Although MPI guidance state that hazard identification is required to be justified there is no step within this process of hazard analysis to determine which of the hazards identified are significant to food safety. The identification of significant hazards (using a risk-matrix) focuses attention on the key hazards to be controlled.

c. Consider control measures

Codex HACCP and MPI guidance align with the requirement to establish control measures to each identified hazard. More than one control measure may be used to control a hazard e.g. time and temperature combinations. Also, more than one hazard may be controlled by a specific control measure e.g. chilled and frozen storage temperatures for raw, in-process and finished products.

MPI guidance offers more information on how, why and when control measures are established e.g.;

- control the initial level of hazard (e.g. testing and rejection of unacceptable ingredients, good animal production practices);
- prevent an unacceptable increase of the hazard (e.g. chilling, reduction of water activity, use of preservatives, acidification); and
- reduce or eliminate the hazard (e.g. pasteurisation, commercial sterilisation, use of antimicrobial agents, trimming, washing).

7. **Principle 2** – Determine the Critical Control Points (CCPs)

The determination of a CCP in the HACCP system can be facilitated by the application of a decision tree that provides a series of questions to guide the user through the decision-making process.

The Codex decision tree (see Appendix 2) has been adapted by MPI for use by the animal products industry. Rather than four questions being asked in relation to the impact of the hazards within the process step, MPI require all process steps to be considered for CCP determination (See Appendix 4 for MPI version of a decision tree).

The operator is required to systematically work through each of the questions for every hazard that is likely to occur at each process step. Depending on the number of hazards identified, CCP determination can become a lengthy process. This is the reason why Codex HACCP only subject significant hazards to CCP determination decision tree.

When a CCP has been identified, the remaining HACCP principles must be applied. When there are no CCPs identified, verification, documentation and record-keeping still need to be applied.

MPI guidance also states that animal product industry may be required to identify other CCPs in the process to satisfy an overseas market access or customer requirement. No further justification for the identification of these CCPs is necessary, however, they must be clearly identified as market access CCPs,

to ensure their appropriate external verification. The Recognised Agency will verify the effectiveness of any market access CCP against the relevant Overseas Market Access Requirements (OMARs).

8. **Principle 3** – Establish critical Limits for each CCP

Codex HACCP and MPI guidance align with the requirements that critical limit(s) to be established and documented for each CCP.

This include the rationale for selection of the critical limits and the validation of these limits. The purpose of critical limits is to distinguish acceptability from unacceptability. When critical limits are exceeded, corrective action must be initiated.

Critical limits must be:

- measurable, appropriate and achievable by the business;
- parameters that can be monitored.

9. **Principle 4** – Establish a monitoring system for each CCP

Codex HACCP and MPI guidance align with the requirements for CCP monitoring procedures to be documented. This includes the monitoring method, frequency, persons responsible for carrying out monitoring and the requirement to keep records. Monitoring maybe continuous (e.g. using an automatic measuring and recording device) or based on an established frequency or statistical sampling plan.

The frequency must be adequate to ensure consistent control. Other factors to consider when establishing the frequency include:

- the nature of the product, the likelihood of failing the limits;
- the cost of monitoring, the consequence of failure (including risk to human health);
- expected corrective actions (especially with respect to product disposition).

10. **Principle 5** – Establish the corrective action

Codex HACCP and MPI guidance align with the requirements for establishing corrective action procedures in the event of a critical limit not being achieved.
Corrective action procedures should include:

- the identity of the person or position responsible for taking corrective action
- procedures for restoration of control
- procedures for control and disposition of non-complying product, including checking of product back to the last good result, where possible
- action to prevent a reoccurrence
- escalating response if preventative action fails; and
- requirement to keep records to be kept.

11. **Principle 6** – Establish verification procedures

Codex HACCP and MPI guidance align with the requirements for establishing documented verification procedures to ensure that the CCP is implemented effectively, monitoring is occurring as written and that appropriate corrective action is taken when critical limits are not met.

These procedures should include:

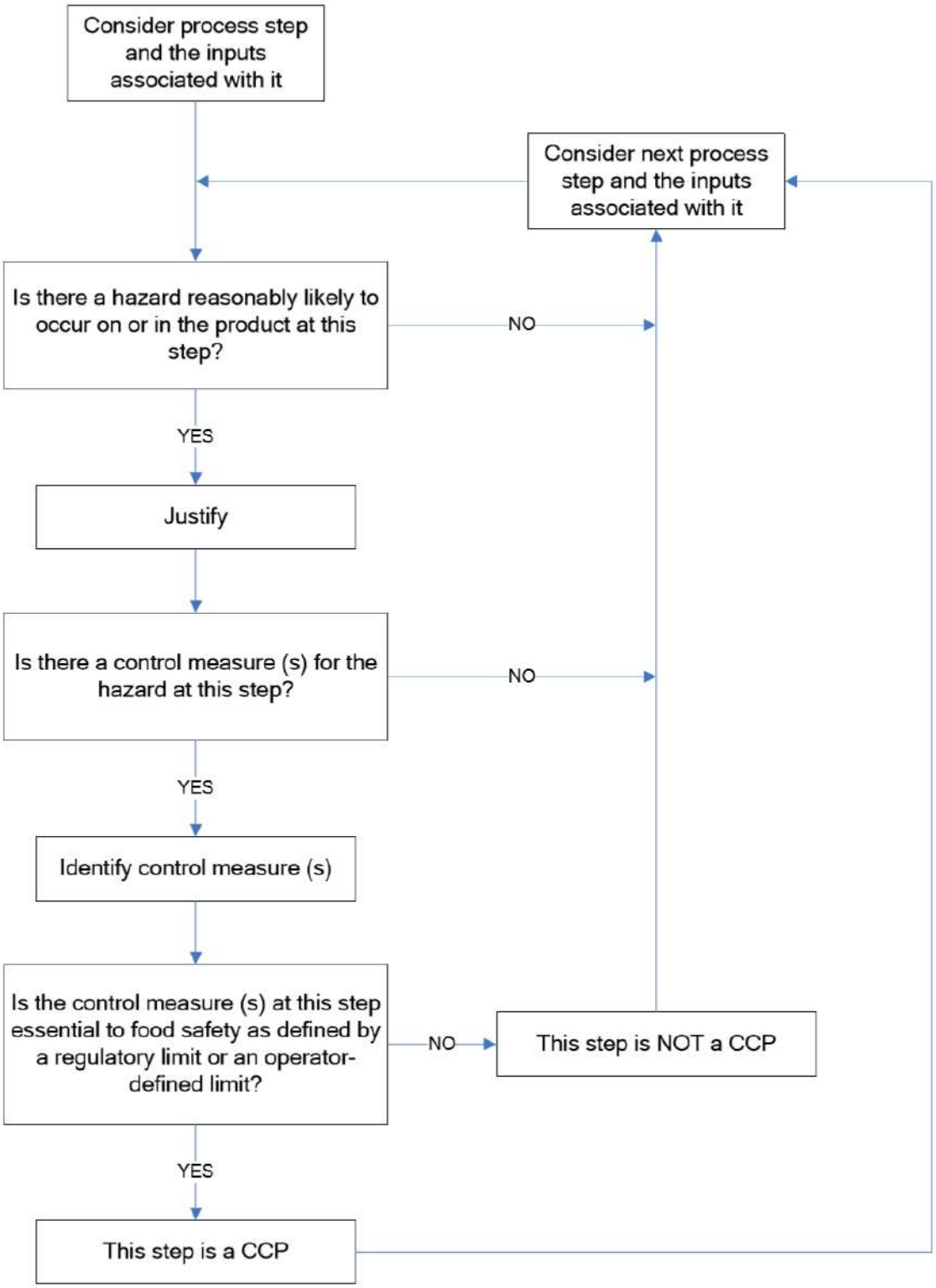
- the identity of the person or position responsible for ongoing operator verification;
- procedures for operator verification activities to be undertaken;
- frequency of operator verification activities;
- follow up action to be taken if non-compliance occurs; and
- requirement for records to be kept.

12. **Principle 7** – Establish documentation and record keeping

Codex HACCP and MPI guidance align with the requirements for establishing documentation and record keeping.

Suitable records must be maintained being able to demonstrate that the HACCP part of the RMP has been implemented effectively, e.g. CCP monitoring records, CCP corrective action records and HACCP verification records.

Appendix 4 – MPI version of a HACCP Decision Tree



Appendix 5 Example MPI Hazard Analysis and CCP Determination Template

Process step.	Inputs.	Hazard reasonably likely to occur on or in the product at this step.	Justification.	Q1. Is there a control measure(s) for the hazard at this step? If yes, identify the control measure and then answer Q2. If no, consider hazard at next step.	Q2. Is the control measure at this step essential to food safety as defined by a regulatory limit or operator-defined limit? If yes, this step is a CCP. If no, this step is not a CCP.	CCP No.

5.0 References

Animal Product Act 1999

Guidance Document: An Overview of the Animal Products Act 1999, 18 Jan 2017

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