

## Guidance on food safety management systems for small food retailers (SFR-FSMS): the application of hazard identification, ranking and control in butcher, grocery, bakery, fish and ice cream shops

This guidance was extracted from the Opinion of the Panel on Biological Hazards of the European Food Safety Authority (EFSA) on "*Hazard analysis approaches for certain small retail establishments in view of the application of their food safety management systems*". The full Opinion is available at <http://www.efsa.europa.eu/en/efsajournal/pub/4697> and provides additional background information relevant for this guidance. For quotation purposes, no reference should be made to this guidance but to the original Opinion.

Butcher, grocery, bakery, fish and ice cream shops may apply the 'simplified approach' to food safety management as described in this guidance and in the Opinion. While this general approach may be used it is important that individual retail establishments tailor their food safety management system in a clear and user-friendly way based on the specific processes (stages) and products relevant to their business.

Before providing guidance on each of these retail establishments, an overview of so called prerequisite programs (PRPs) is provided.

PRPs are preventive practices and conditions needed prior to and during the implementation of HACCP and which are essential for food safety. The PRPs needed depend on the segment of the food chain in which the sector operates and the type of sector. Examples of equivalent terms are Good Agriculture practice (GAP), Good Veterinarian Practice (GVP), Good Manufacturing Practice (GMP), Good Hygiene Practice (GHP), Good Production Practice (GPP), Good Distribution Practice (GDP) and Good Trading Practice (GTP). Sometimes, procedures to ensure traceability of food and recall in case of non-compliance are considered part of the PRPs. In Codex Alimentarius standards PRPs are referred to as 'Codes of Good Practice.

### Overview of PRPs

**Table 1:** A summary of prerequisite programme (PRP) activities including the 12 defined PRPs from EC Commission Notice C278/2016 and an additional PRP 13 'product information and consumer awareness'

PRP	Control infrastructure/ activities	Monitoring	Record keeping required (yes/no)	Corrective action
PRP 1: Infrastructure (building and equipment)	Hygienic infrastructure and fit for purpose building and equipment.	Monthly visual check based on checklist of infrastructure (hygiene and condition).	Yes, but only when there is remedial work required.	Proper maintenance of premises and equipment.
PRP 2: Cleaning and disinfection	Cleaning & disinfection schedule and/or 'clean as you go' policy.	Spot visual checks. Daily visual checks. Monthly microbiological testing.	Yes, when there is a non-compliance.	Cleaning and disinfection of area/equipment affected.  Review and if necessary retrain staff and/or revise

<b>PRP</b>	<b>Control infrastructure/ activities</b>	<b>Monitoring</b>	<b>Record keeping required (yes/no)</b>	<b>Corrective action</b>
				frequency and method of disinfection.
PRP 3: Pest control: focus on prevention	Pest control activities.	Weekly check	No	Revise and/or renew pest control activities.
PRP 4: technical maintenance and calibration	Maintain all equipment. Calibrate measuring devices (e.g. thermometer, balance, etc.).	On-going monitoring of equipment. Periodic (daily/weekly) calibration status with records.	No Yes, status of calibration	Repair or replace equipment as necessary. Review maintenance and calibration programme.
PRP 5: Physical and chemical contamination from production environment	Ensure all materials are stored correctly. Ensure all surfaces are properly rinsed after disinfection.	Visual check during processing. Monthly check based on checklist of infrastructure (hygiene and condition).	Yes, but only when there is remedial work required.	Review storage, cleaning and disinfection procedures, etc.
PRP 6: Allergens	Ensure the absence of allergens in raw materials Keep an up-to-date inventory of potential allergens including sources (e.g. raw material, cross-contamination, etc.) Potential sources of cross-contamination identified and controlled.	Raw material specifications from to suppliers. Activities to prevent cross-contamination are implemented on a continuous basis	No	Stop using potentially 'contaminated' raw materials. Review suppliers/supplier requirements. Revise acceptance criteria. Review and correct activities designed to prevent cross-contamination.
PRP 7: Waste management	Complete separation of waste from raw materials or foods. Specific requirements of legislation are in place in case of waste of foods of animal origin (animal by-products).	Routine visual check to ensure the food business's policy on waste management is being fully complied with.	No	Remove waste directly Review and revise current waste management activities. Retrain staff as required.

<b>PRP</b>	<b>Control infrastructure/ activities</b>	<b>Monitoring</b>	<b>Record keeping required (yes/no)</b>	<b>Corrective action</b>
PRP 8: Water and air control	Use of Potable water, also for ice making.  Good condition of water distribution infrastructure with absence of toxic contact materials.	If not a municipal supply, ongoing monitoring of water treatment.  Periodic microbiological testing.	Yes, results of microbiological testing	Revise water treatment.
PRP 9: Personnel (hygiene, health status)	Presence of hygiene rules and agreements with personnel adapted to the nature of the activities.  Health status of personnel.	Daily visual check during processing.  Medical check and/or awareness training for all personnel	No  Medical check and training record keeping	Address any personnel issues immediately.  Revise and inform personnel.
PRP 10: Raw materials (supplier selection, specifications)	Raw materials are fulfilling legal requirements.  Retailers have acceptance criteria based on specifications.	Presence of specifications from suppliers or presence of labels of packaged materials.  Acceptance criteria are checked upon each delivery.	Yes, but only when there is a non-compliance, e.g. the raw materials were not delivered at the correct temperature.	Do not use affected raw materials.  Review suppliers/supplier requirements.  Revise acceptance criteria.
PRP 11: Temperature control of storage environment	Temperature of storage environment (cooling or deep freezing) is adequate to reach product temperature requirements.	Automatic monitoring with alarm and automated record keeping.  Manual monitoring / daily check or more checks of the temperature of storage facilities and product.	Yes, where the control activity is based on quantifiable parameters such as temperature (e.g. chilling and cooking)	Replace/repair/reset chilling/freezing equipment.  Based on the extent of the non-compliance consider disposal of the affected product.  For bakery products, high temperatures will promote acrylamide formation. Such 'over-cooked' product should be disposed of.
PRP 12: Working methodology	Personnel following work descriptions, standard operating procedures (SOP).	Daily visual check.	No	Retrain personnel.
PRP 13: Product information and consumer	All products at retail level should be accompanied by	Routine checks to ensure this information is	No	Review and revise the information as

<b>PRP</b>	<b>Control infrastructure/ activities</b>	<b>Monitoring</b>	<b>Record keeping required (yes/no)</b>	<b>Corrective action</b>
awareness	<p>sufficient information to promote proper handling, storage and preparation by consumers.</p> <p>Allergen and shelf-life information should also be included if appropriate.</p>	provided.		necessary.

## *Flow diagrams*

Flow diagrams for the butcher, grocery, bakery, fish and ice cream shops are provided in Figures 1, 2, 3, 4 and 5, respectively. These flow diagrams are then used to identify the 'stages' that inform the first column of the SFR-FSMS tables. Information on the 'hazards', 'activity contributing to increased/decreased occurrence of the hazard' and 'control activity (PRP)' are also included to complete the SFR-FSMS tables for the butcher shop (Table 2), grocery shop (Table 3), bakery shop (Table 4), fish shop (Table 5) and ice cream shop (Table 6).

Legend for flow charts:



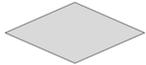
process step



start-end of production process

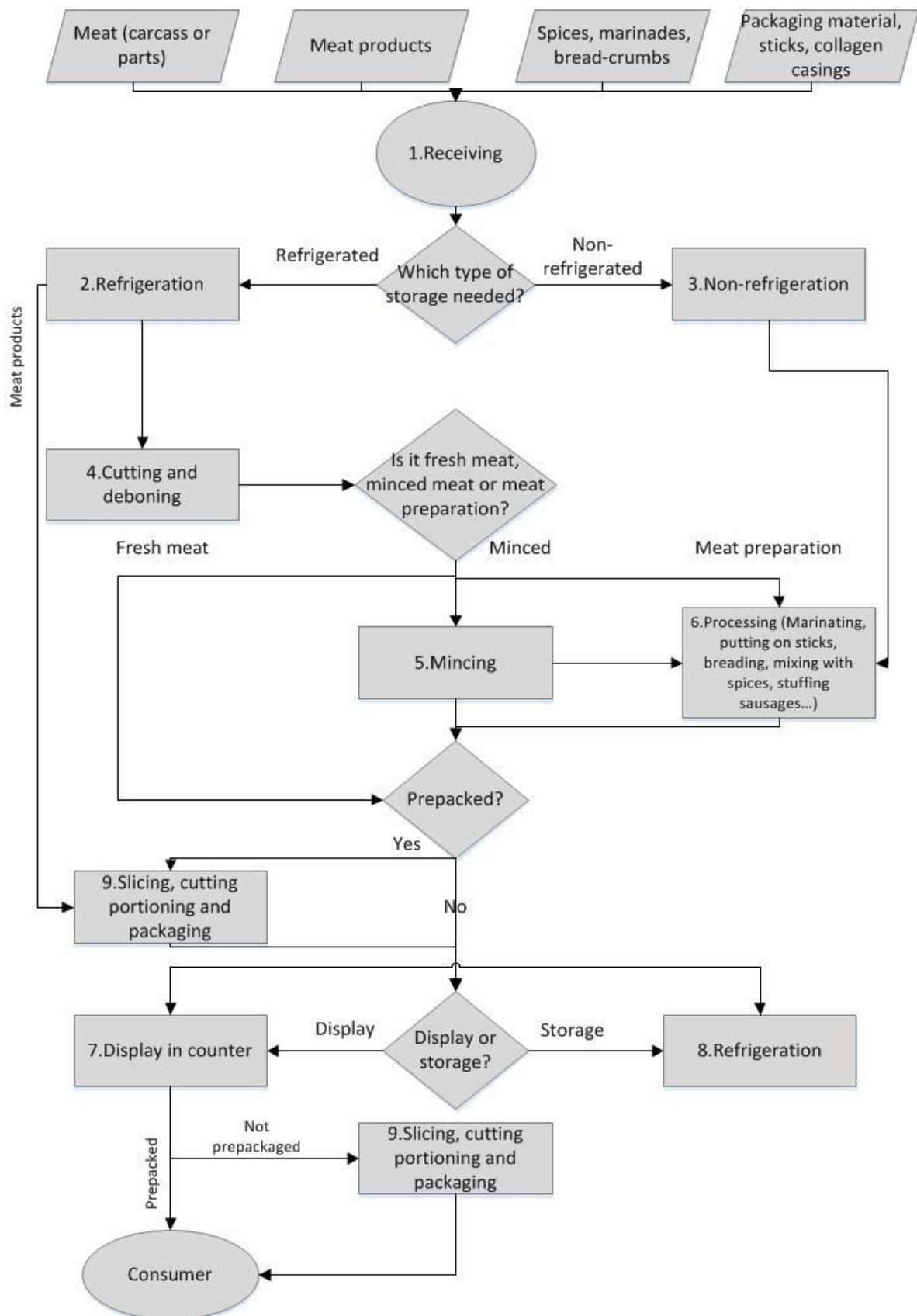


raw materials, intermediate product or final product



decision between different possible production steps

## Butcher shop



**Figure 1:** Flow diagram butcher shop

**Table 2:**

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
Receiving	Y	Y	Y	Y	<p>Failure to ensure the microbiological quality of incoming raw materials</p> <p>Presence of chemical or physical hazards or allergens in incoming raw materials</p>	<p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 6: Allergens</p> <p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 12: Working methodology</p>
Refrigerated storage	Y	Y	Y	Y	<p>Microbial growth due to failure to chill properly</p> <p>Cross-contamination due to a failure to separate raw from cooked/RTE products</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Non-refrigerated (ambient) storage	Y	Y	Y	Y	<p>Microbial growth due to failure to store in dry conditions</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Cutting and portioning	Y	Y	Y	N	Contamination with biological, chemical or physical hazards due	<p>PRP 2: Cleaning and disinfection</p> <p>PRP 4: Technical maintenance and calibration</p>

					to a failure to clean and disinfect equipment properly, lack of personal hygiene, knives and equipment	PRP 5: Physical and chemical contamination from production environment PRP 9: Personnel (hygiene, health status)
Mincing	Y	Y	N	Y	Cross-contamination with biological hazards due to a failure to clean and disinfect equipment properly or lack of personal hygiene  Contamination with chemical hazards  Contamination with allergens	PRP 2: Cleaning and disinfection PRP 9: Personnel (hygiene, health status)  PRP 2: Cleaning and disinfection  PRP 6 : Allergens
Processing	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards due to a failure to clean and disinfect equipment properly, lack of personal hygiene, environment, higher concentration of additives than allowed  Contamination with allergens	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 9: Personnel (hygiene, health status) PRP 12 : Working methodology  PRP 6 : Allergens
Display in counter	Y	Y	N	Y	Microbial growth due to failure to chill properly  Cross-contamination with biological hazards due to a failure to separate raw from cooked/RTE products  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 12 : Working methodology  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment

					Contamination with allergens	PRP 6 : Allergens
Refrigerated storage	Y	Y	Y	Y	Microbial growth due to failure to chill properly  Cross-contamination due to a failure to separate raw from cooked/RTE products  Contamination with chemical or physical hazards from the environment, personnel, etc.  Contamination with allergens	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 12: Working methodology  PRP 2: Cleaning and disinfection PRP 3: Pest control: focus on prevention PRP 5: Physical and chemical contamination from production environment  PRP 6: Allergens
Slicing, serving and packing	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens due to failure in working methodology and lack of personal hygiene.  Failure to inform the consumer of potential allergens and storage mode, time etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology  PRP 6 : Allergens PRP 13: Product information and consumer awareness

(a): =biological, C=chemical, P=physical, A=allergen

Grocery shop

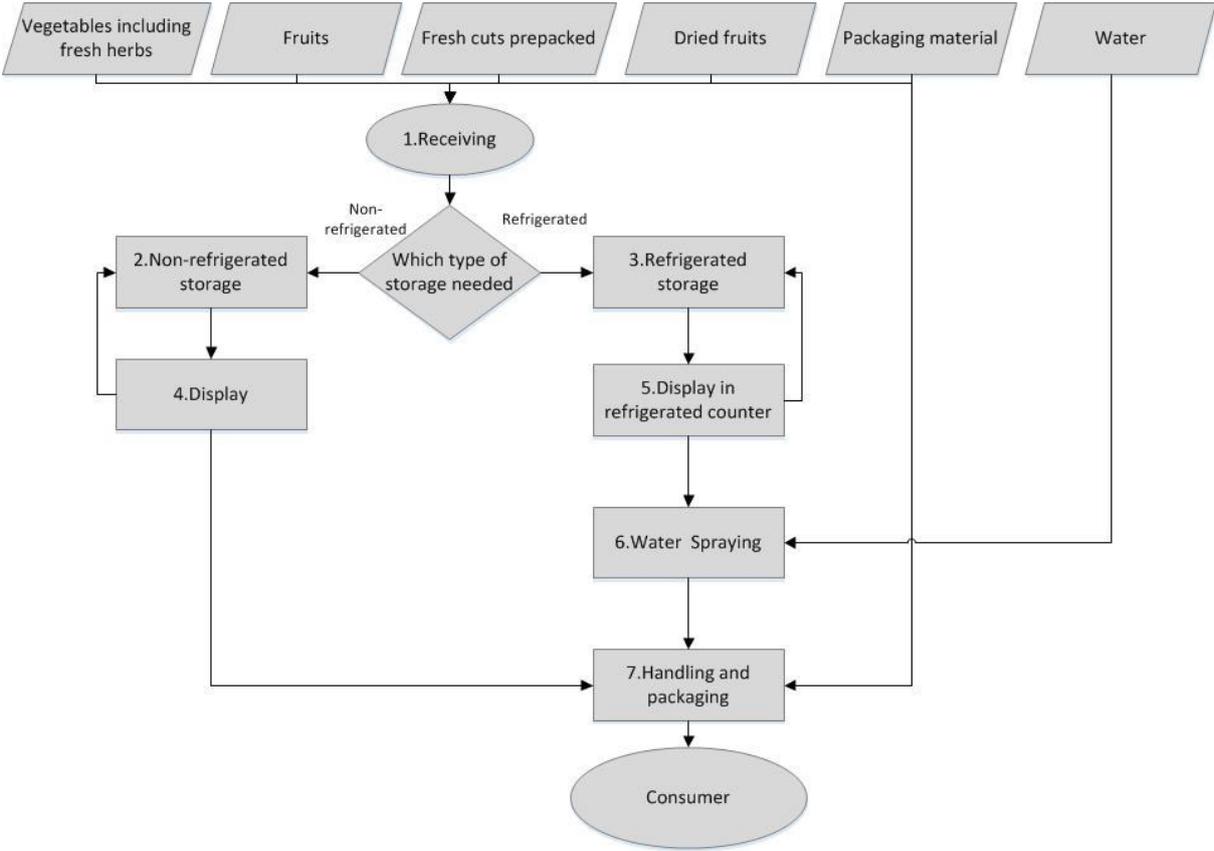


Figure 2: Flow diagram grocery shop

**Table 3:** SFR-FSMS for the grocery shop

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
Receiving	Y	Y	Y	Y	<p>Failure to ensure the microbiological quality of incoming raw materials</p> <p>Presence of chemical or physical hazards or allergens in incoming raw materials</p>	<p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 6: Allergens</p> <p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 12: Working methodology</p>
Non-refrigerated (ambient) storage	Y	Y	Y	Y	<p>Contamination with biological, chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Refrigerated storage	Y	Y	Y	Y	<p>Microbial growth due to failure to chill properly</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Washing	Y	Y	Y	N	<p>Contamination with biological, chemical and physical hazards from water, the environment, personnel, etc.</p>	<p>PRP 2: Cleaning and disinfection</p> <p>PRP 4: Technical maintenance and calibration</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 8: Water and air control</p> <p>PRP 9: Personnel (hygiene, health status)</p>
Display	Y	Y	Y	Y	<p>Contamination with biological, chemical or physical hazards or</p>	<p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 2: Cleaning and disinfection</p>

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					allergens from the environment, personnel, etc.	PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 7: Waste management
Display in refrigerated counter	Y	Y	Y	Y	Microbial growth due to failure to chill properly  Contamination with biological, chemical or physical hazards or allergens from the environment, personnel, etc.	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 1: Infrastructure (building and equipment) PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 7: Waste management
Spraying	Y	Y	Y	N	Contamination with biological, chemical and physical hazards from water, the environment, personnel, etc.	PRP 2: Cleaning and disinfection PRP 4: Technical maintenance and calibration PRP 5: Physical and chemical contamination from production environment PRP 8: Water and air control PRP 9: Personnel (hygiene, health status)
Serving and packing	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens from the environment, personnel, etc.  Failure to inform the consumer of potential allergens and storage mode, time etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology  PRP 6: Allergens PRP 13: Product information and consumer awareness

(a): B=biological, C=chemical, P=physical, A=allergen

Bakery shop

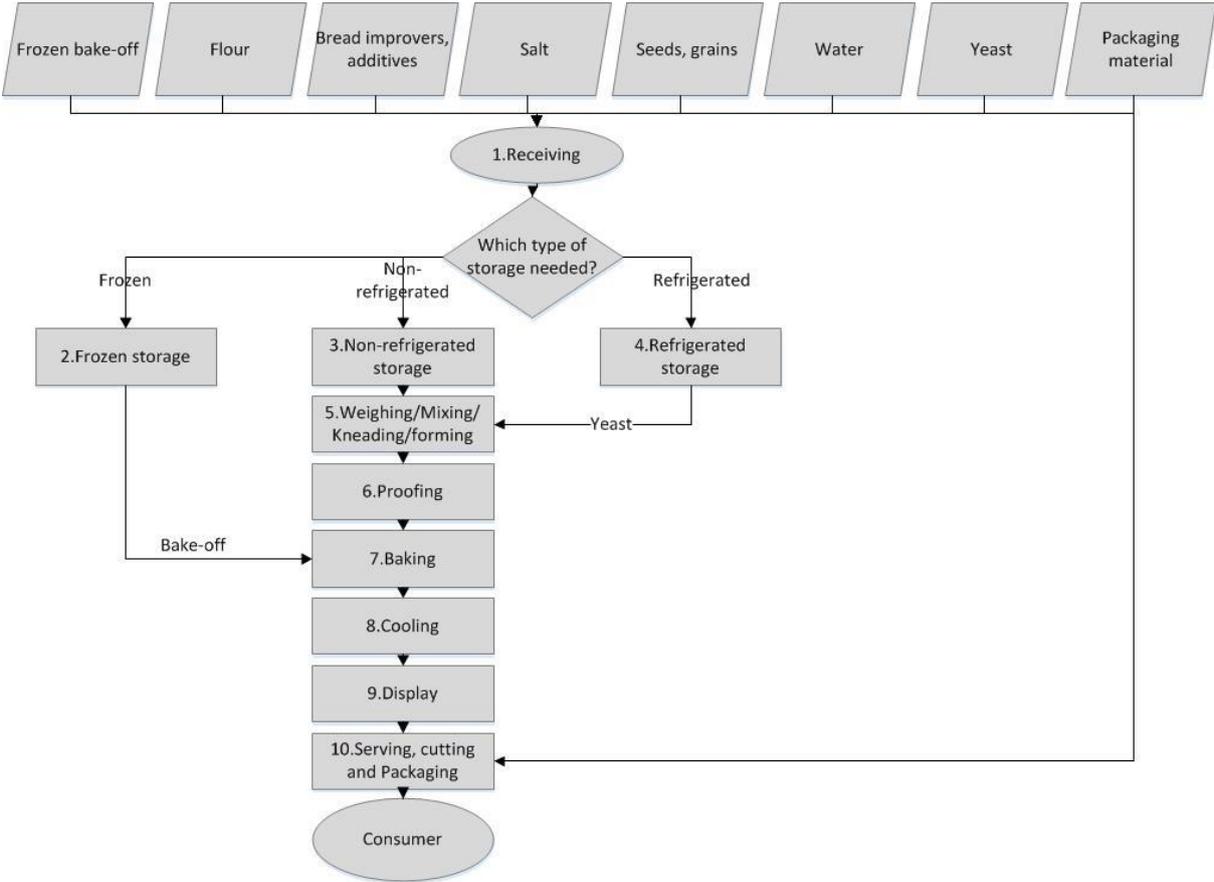


Figure 3: Flow diagram bakery shop

**Table 4:** SFR-FSMS for the bakery shop

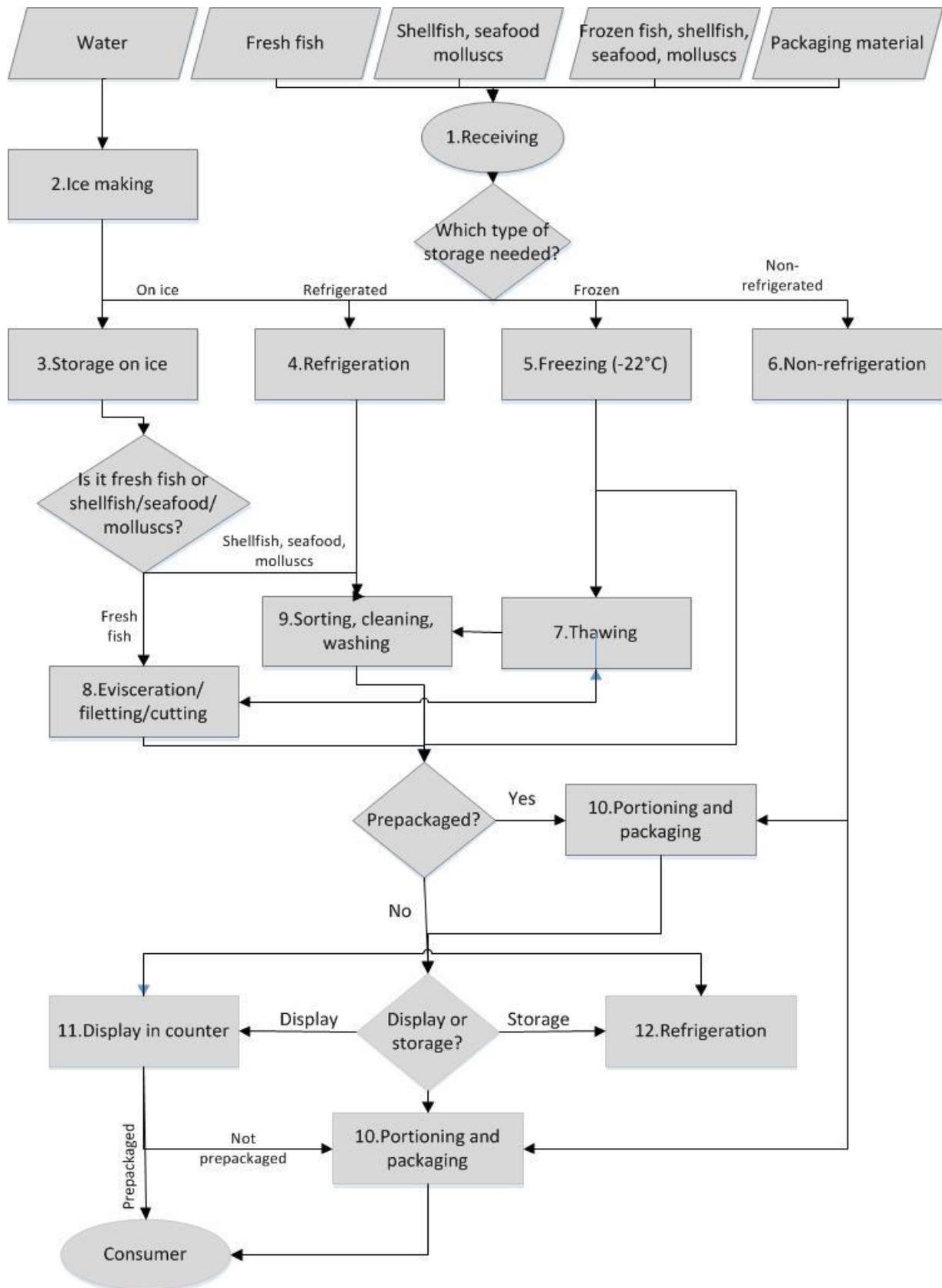
Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
Receiving	Y	Y	Y	Y	<p>Failure to ensure the microbiological quality of incoming raw materials</p> <p>Presence of chemical or physical hazards or allergens in incoming raw materials</p>	<p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 6: Allergens</p> <p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 12: Working methodology</p>
Non-refrigerated (ambient) storage	Y	Y	Y	Y	<p>Microbial growth due to failure to store in dry conditions</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Refrigerated storage	Y	Y	Y	Y	<p>Microbial growth due to failure to chill properly</p> <p>Cross-contamination due to a failure to separate raw from cooked/RTE products</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Weighing,	N	Y	Y	Y	Contamination with chemical or	PRP 4: Technical maintenance and calibration

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
mixing and kneading					physical hazards and allergens from the environment, personnel, higher levels of additives than allowed, etc.	PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 12: Working methodology
Proofing	N	Y	Y	Y	Contamination with chemical or physical hazards from the environment, personnel, etc.  Contamination with allergens	PRP 5: Physical and chemical contamination from the production environment PRP 12: Working methodology  PRP 6: Allergens
Baking	Y	Y	N	N	Failure to achieve sufficiently high temperatures to ensure that microbial hazards are killed  Over-cooking resulting in the formation of acrylamide.	PRP 4: Technical maintenance and calibration PRP 12: Working methodology  PRP 12: Working methodology
Cooling	Y	Y	N	N	Failure to chill quickly  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 12: Working methodology  PRP 5: Physical and chemical contamination from the production environment
Display	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens from the environment, personnel, etc.	PRP 1: Infrastructure (building and equipment) PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 7: Waste management
Serving, cutting and packing	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens due to a failure to clean and disinfect equipment properly.  Failure to inform the consumer of	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology  PRP 6: Allergens

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					potential allergens and storage mode, time etc.	PRP 13: Product information and consumer awareness

(a): B=biological, C=chemical, P=physical, A=allergen

*Fish shop*



**Figure 4:** Flow diagram fish shop

**Table 5:** SFR-FSMS for the fish shop

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
Receiving	Y	Y	Y	Y	<p>Failure to ensure the microbiological quality of incoming raw materials</p> <p>Presence of chemical or physical hazards or allergens in incoming raw materials</p>	<p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 6: Allergens</p> <p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 12: Working methodology</p>
Ice making	Y	Y	Y	N	<p>Failure to ensure the quality of the water used</p> <p>Failure to maintain, clean and disinfect equipment</p>	<p>PRP 5: Physical and chemical contamination from the production environment</p> <p>PRP 8: Water and air control</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 4: Technical maintenance and calibration</p>
Storage on ice	Y	Y	N	N	<p>Microbial growth due to failure to chill properly</p> <p>Failure to prevent microbial growth and the production of histidine (time restriction)</p> <p>Contamination with chemical hazards</p>	<p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 12: Working methodology</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 5: Physical and chemical contamination from the production environment</p> <p>PRP 8: Water and air control</p>
Refrigerated storage	Y	Y	Y	Y	<p>Microbial growth due to failure to chill properly</p> <p>Contamination with biological, chemical or physical hazards from the environment, personnel, etc.</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 12: Working methodology</p>

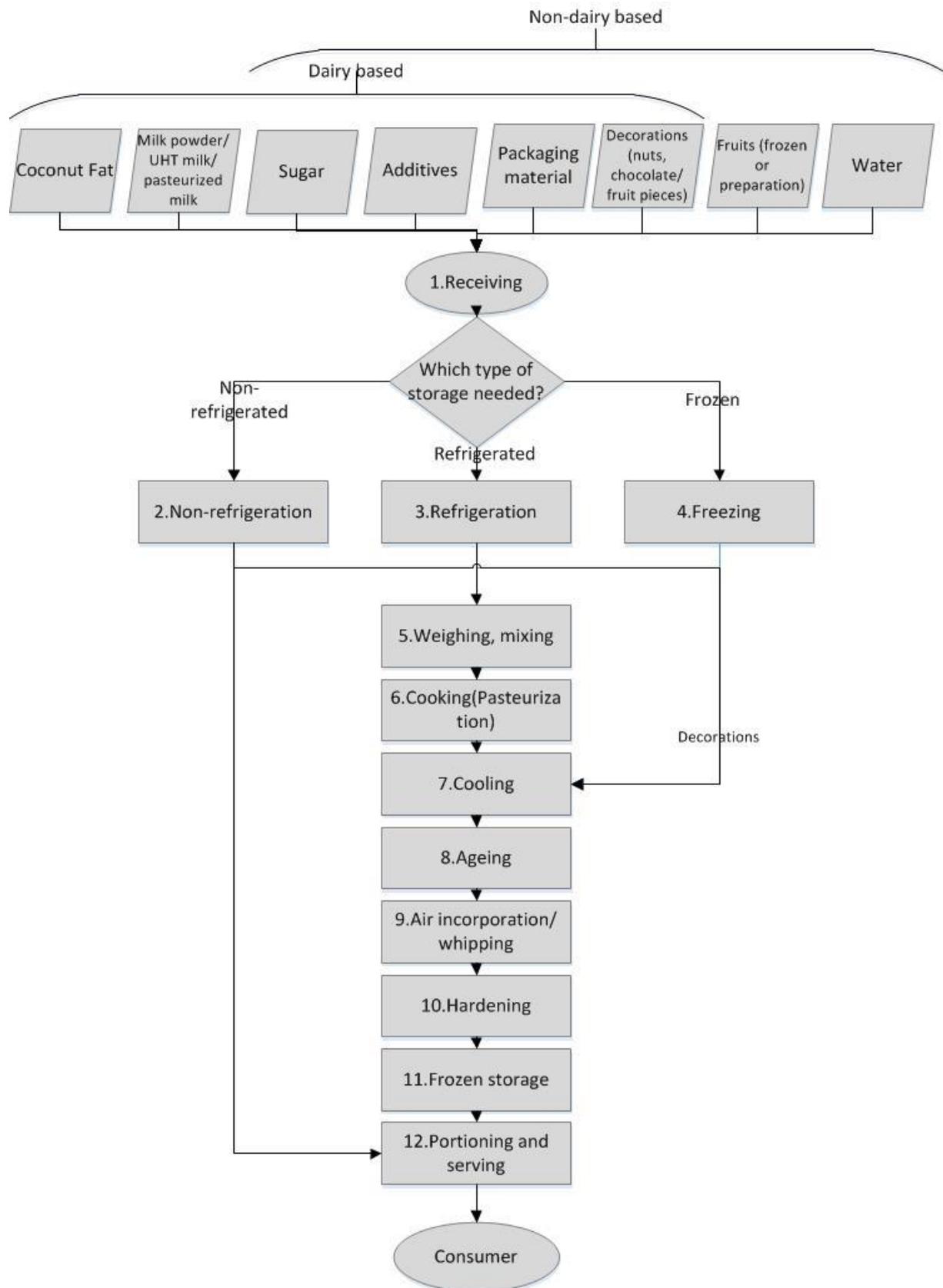
Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					Contamination with allergens Failure to prevent microbial growth and the production of histidine (time restriction)	PRP 6: Allergens PRP 12 : Working methodology
Frozen storage	Y	Y	Y	N	Microbial growth due to failure in freezing temperature  Contamination with chemical or physical hazards from the environment, etc.	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 5: Physical and chemical contamination from production environment
Non-refrigeration (ambient) storage	Y	Y	Y	Y	Microbial growth due to failure to store in dry conditions  Contamination with chemical or physical hazards from the environment, personnel, etc.  Contamination with allergens	PRP 1: Infrastructure (building and equipment) PRP 2: Cleaning and disinfection  PRP 1: Infrastructure (building and equipment) PRP 3: Pest control: focus on prevention PRP 5: Physical and chemical contamination from production environment  PRP 6: Allergens
Thawing	Y	Y	N	N	Microbial growth due to failure to maintain low temperatures  Failure to prevent microbial growth and the production of histidine  Contamination with chemical hazards	PRP 11: Temperature control of storage environment  PRP 12 : Working methodology  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from production environment
Evisceration	Y	Y	Y	N	Cross-contamination with biological hazards from the gut to the meat  Contamination with biological,	PRP 7: Waste management PRP 12 : Working methodology  PRP 2: Cleaning and disinfection

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					chemical and physical hazards from the environment, personnel, etc.	PRP 5: Physical and chemical contamination from production environment PRP 9: Personnel (hygiene, health status)
Sorting, cleaning and washing	Y	Y	Y	N	Contamination with biological, chemical and physical hazards from water, the environment, personnel, working method etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from production environment PRP 8: Water and air control PRP 9: Personnel (hygiene, health status) PRP 12 : Working methodology
Cutting	Y	Y	Y	N	Contamination with biological, chemical or physical hazards due to a failure to clean and disinfect equipment properly, the environment, personnel, work method.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from production environment PRP 9: Personnel (hygiene, health status) PRP 12 : Working methodology
Refrigerated storage	Y	Y	Y	Y	Microbial growth due to failure to chill properly  Contamination with biological, chemical or physical hazards from the environment, personnel, etc.  Contamination with allergens Failure to prevent microbial growth and the production of histidine (time restriction)	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 2: Cleaning and disinfection PRP 3: Pest control: focus on prevention PRP 5: Physical and chemical contamination from production environment PRP 12: Working methodology  PRP 6: Allergens PRP 11: Temperature control of storage environment PRP 12: Working methodology
Display in refrigerated counter	Y	Y	Y	Y	Microbial growth due to failure to chill properly  Contamination with biological, chemical or physical hazards or allergens from the environment, personnel, etc.	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 1: Infrastructure (building and equipment) PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					Contamination with allergens Failure to prevent microbial growth and the production of histidine (time restriction)	PRP 7: Waste management  PRP 6: Allergens PRP 11: Temperature control of storage environment PRP 12: Working methodology
Serving and packing	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens from the environment, personnel, etc.  Failure to inform the consumer of potential allergens and storage mode, time etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology  PRP 6: Allergens PRP 13: Product information and consumer awareness

(a): B=biological, C=chemical, P=physical, A=allergen

*Ice cream shop*



**Figure 5:** Flow diagram ice cream shop

**Table 6:** SFR-FSMS for the ice cream shop

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
Receiving	Y	Y	Y	Y	<p>Failure to ensure the microbiological quality of incoming raw materials</p> <p>Presence of chemical or physical hazards or allergens in incoming raw materials</p>	<p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 6: Allergens</p> <p>PRP 10: Raw materials (supplier selection, specifications)</p> <p>PRP 12: Working methodology</p>
Ambient Storage	Y	Y	Y	Y	<p>Microbial growth due to failure to store in dry conditions</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 1: Infrastructure (building and equipment)</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Refrigerated storage	Y	Y	Y	Y	<p>Microbial growth due to failure to chill properly</p> <p>Cross-contamination due to a failure to separate raw from cooked/RTE products</p> <p>Contamination with chemical or physical hazards from the environment, personnel, etc.</p> <p>Contamination with allergens</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p> <p>PRP 12: Working methodology</p> <p>PRP 2: Cleaning and disinfection</p> <p>PRP 3: Pest control: focus on prevention</p> <p>PRP 5: Physical and chemical contamination from production environment</p> <p>PRP 6: Allergens</p>
Frozen storage	Y	Y	Y	N	<p>Microbial growth due to failure in freezing temperature</p>	<p>PRP 4: Technical maintenance and calibration</p> <p>PRP 11: Temperature control of storage environment</p>

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
					Contamination with chemical or physical hazards from the environment, etc.	PRP 5: Physical and chemical contamination from production environment
Weighing and mixing	Y	Y	Y	Y	Microbial growth due to long period of weighing and mixing  Contamination with chemical or physical hazards and allergens from the environment, personnel, etc.	PRP 12: Working methodology  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6 : Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology
Cooking	Y	Y	N	N	Failure to achieve sufficiently high temperatures  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 12: Working methodology  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment
Cooling	Y	Y	N	N	Failure to chill quickly  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 12: Working methodology  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment
Ageing	Y	N	N	N	Microbial growth due to failure to chill properly	PRP 4: technical maintenance and calibration PRP 11: Temperature control of storage environment
Air incorporation /whipping	Y	Y	Y	N	Microbial growth due to failure to chill properly  Contamination with chemical or physical hazards from the environment, personnel, etc.	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 8: Air and water control

Stage	Hazard identification <sup>(a)</sup>				Activities contributing to increased/decreased occurrence of the hazard	Control activities
	B	C	P	A		
						PRP 12: Working methodology
Packaging	Y	Y	Y	N	Contamination with microbial, chemical or physical hazards from the packaging materials, environment, personnel, etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 9 : Personnel (hygiene, health status) PRP 12: Working methodology
Hardening	Y	Y	N	N	Microbial growth due to failure in freezing temperature  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 5: Physical and chemical contamination from the production environment
Frozen storage	Y	Y	N	N	Microbial growth due to failure in freezing temperature  Contamination with chemical hazards	PRP 4: Technical maintenance and calibration PRP 11: Temperature control of storage environment  PRP 5: Physical and chemical contamination from the production environment
Portioning and serving	Y	Y	Y	Y	Contamination with biological, chemical or physical hazards or allergens due to a failure to clean and disinfect equipment properly.  Failure to inform the consumer of potential allergens and storage mode, time etc.	PRP 2: Cleaning and disinfection PRP 5: Physical and chemical contamination from the production environment PRP 6: Allergens PRP 9: Personnel (hygiene, health status) PRP 12: Working methodology  PRP 6: Allergens PRP 13: Product information and consumer awareness

(a): B=biological, C=chemical, P=physical, A=allergen