IMK 407

Hazard Analysis Critical and Control Point (HACCP)

Norlia Mahror 21122020

CONTENT

- ❑ Preliminary tasks
  - ✓ Build a team
  - ✓ Describe the food and its distribution
  - ✓ Intended use and the consumer
  - ✓ Flow diagram
  - ✓ Verify the flow diagram
- ❑ HACCP principles
  - ✓ Hazard analysis
  - ✓ Determine the CCP
  - ✓ Establish critical limits
  - ✓ Establish Monitoring procedure
  - ✓ Establish corrective action
  - ✓ Establish verification procedures
  - ✓ Establish record keeping and documentation procedure

https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/haccp-principles-application-guidelines#app-e

What is HACCP?

- HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.
- Pre-requisite program such as GMP is the foundation of HACCP
  - Facilities, supplier control, specification, production equipment, cleaning & sanitation, personal hygiene, training, chemical control, receiving, storage & shipping, traceability & recall, pest control, etc..
- HACCP is applied in food processing plant, retail food store, and food service operations
- OBJECTIVE: to produce safe food products for the consumers

PRELIMINARY TASK IN THE DEVELOPMENT OF THE HACCP PLAN

PRELIMINARY TASKS

5 Tasks: Need to be accomplished

1

Build a team

2

Describe the food and its distribution

3

Intended use and consumer of the food

4

Flow diagram

5

Verify the flow diagram

Process specialist

Plant engineer

Food scientist/ technologist

Microbiologis

Process engineer

Regulatory specialist

Plant personnel

DESCRIBE THE FOOD & ITS DISTRIBUTION

Info needed:

- Raw materials (ingredients, packaging materials, cleaning chemicals)
- Plant manufacturing (processing steps, packaging steps)

Finished products:
Frozen/chilled/RTE/Raw

Distribution conditions:
Refrigerated/Frozen/Ambient

INTENDED USE AND CONSUMER OF THE FOOD

Intended use

- Direct consumption
- Reheating step is necessary
- Cooking step is necessary
- Etc..

Consumer

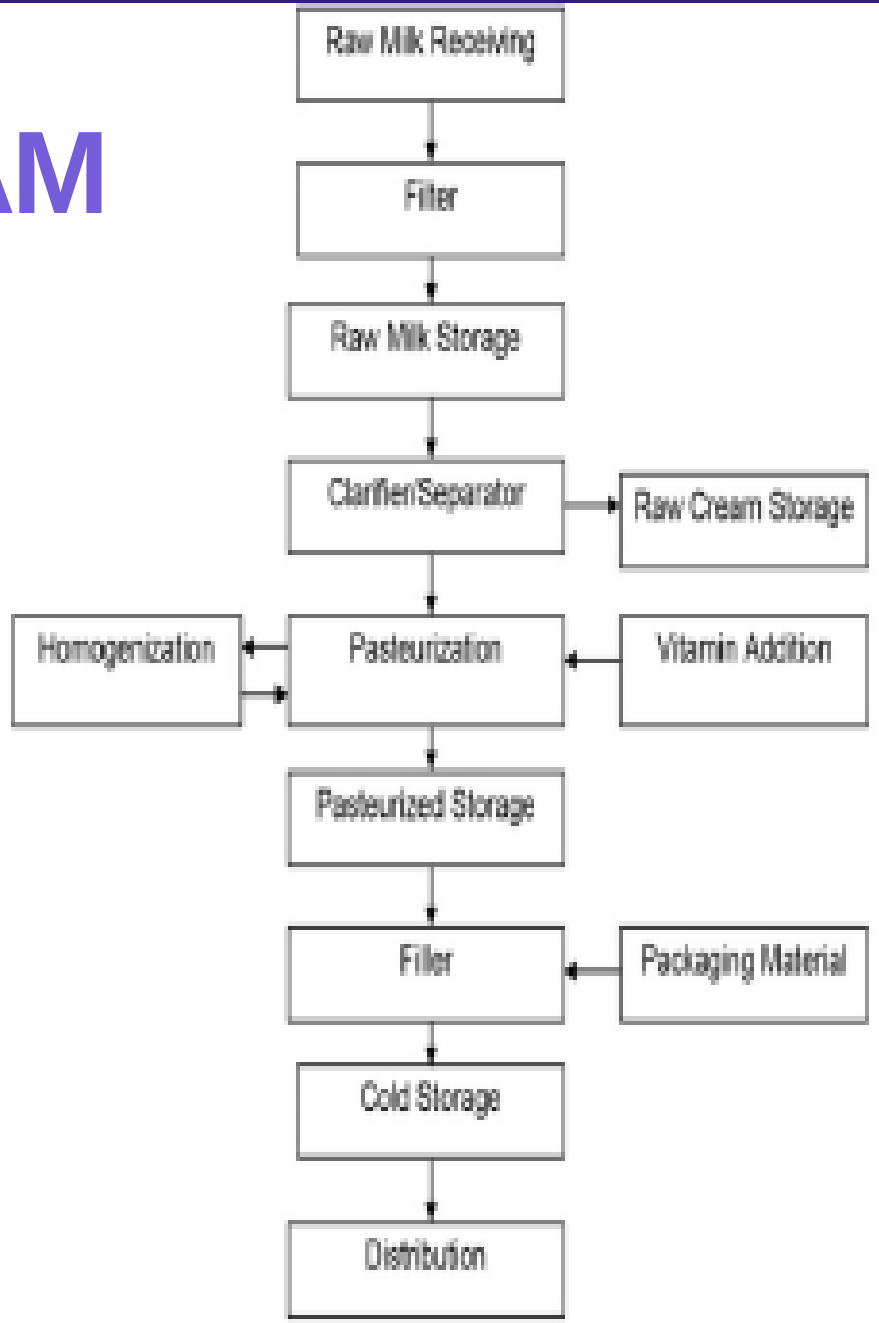
- Elderly
- Children
- General population

FLOW DIAGRAM

To provide a clear, simple outline of the steps involved in the process which are directly under the control of the establishment

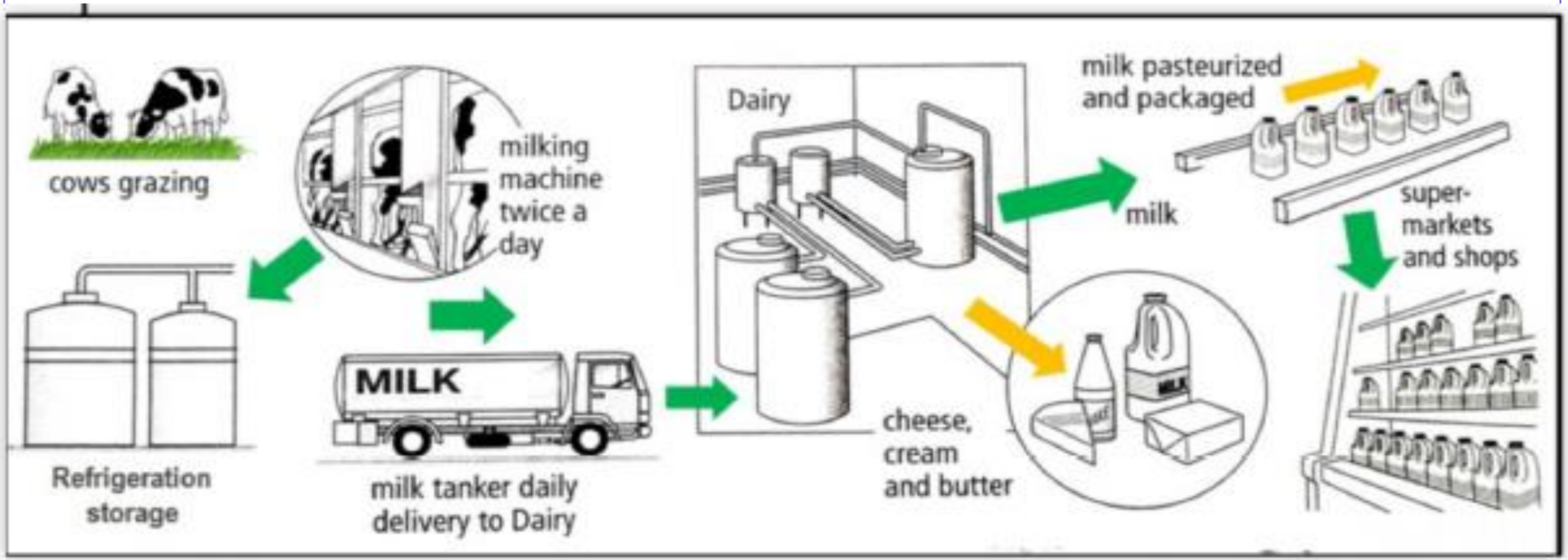
To address:

- How are the raw materials/packaging received?
- How is the product processed/packaged?
- How the product distributed?



VERIFY THE FLOW DIAGRAM

Perform an on-site review of the operation to verify the accuracy and completeness of the flow diagram



HACCP PRINCIPLES

1) Conduct a hazard analysis

2) Determine the critical control point (CCP)

3) Establish critical limit

4) Establish monitoring procedure

5) Establish corrective actions

6) Establish verification procedures

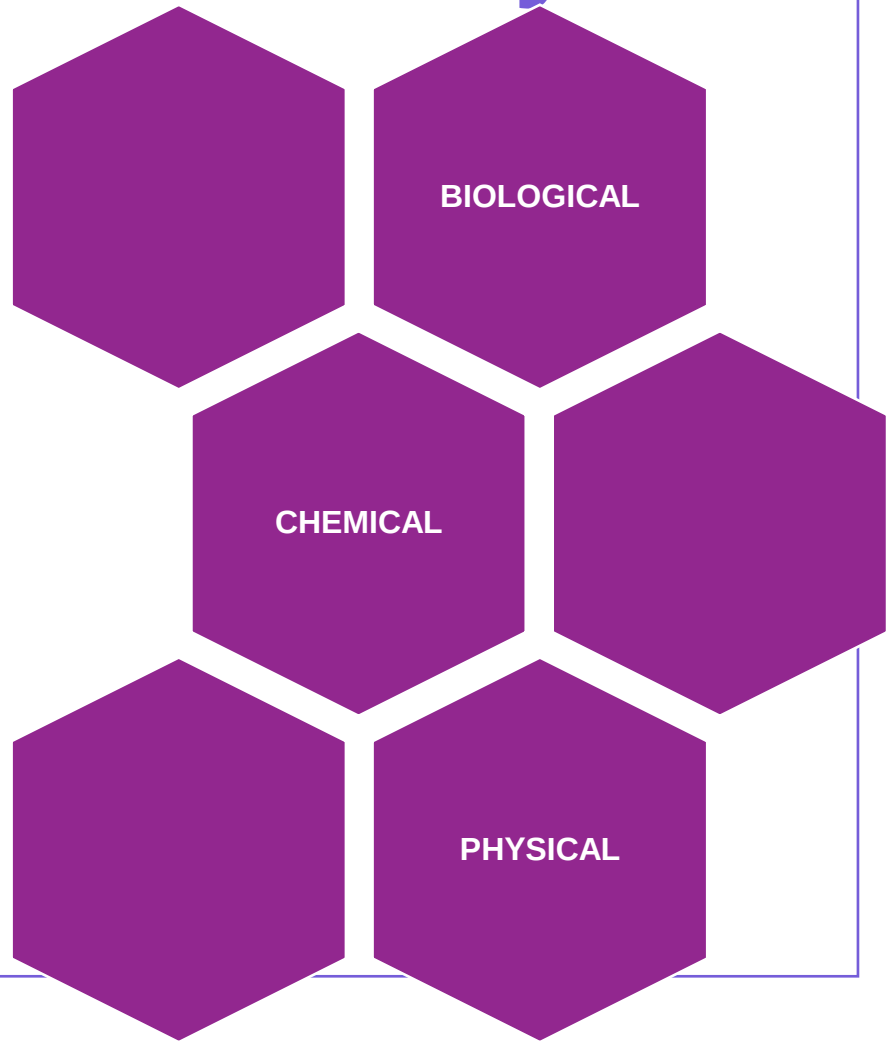
7) Establish record keeping and documentation procedures

Principle 1: Conduct a hazard analysis

Purpose:

To develop a list of hazards which are of such significance that they are reasonably likely to cause injury or illness if not effectively controlled

It provide basis to determine CCPs in Principle 2



Hazard can occur at any stage of processing

Stage

- Pre/post harvest
- Supplier stage (processing of the raw materials/packaging)
- Processing
- Storage
- Distribution to and from your manufacturing plant
- Retail
- Consumer level

Source

- Personnel: improper handling at the growing stage
- Processing equipment, environment
- Improper storage before or after processing (e.g. mix of RTE with raw materials, allergen vs non-allergen products)
- Personnel: hygiene, health

Two stages of hazard analysis

HAZARD IDENTIFICATION

Raw material / Ingredient of the product

Activities at each step of the process

The equipment used

Final product – storage and distribution

The intended use

Consumer of the product

HAZARD EVALUATION

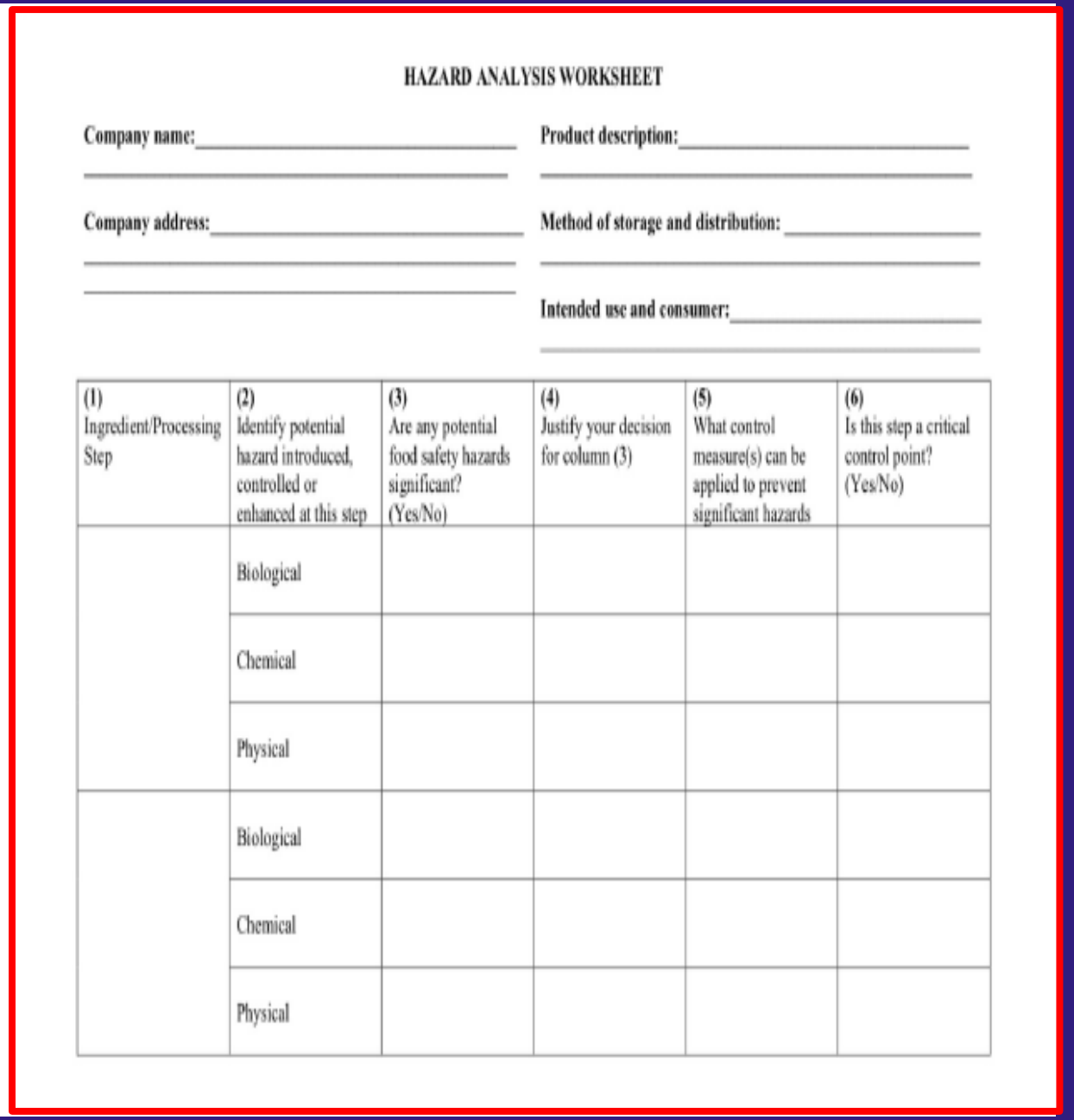
Potential hazard is evaluated based on severity and its likelihood

This will determine whether the potential hazard should be considered in the HACCP plan

Hazard analysis worksheet

- Identify potential hazard
- Any significant potential food safety hazard?
- Justify your decision
- What is the control measure can be applied to prevent significant hazards
- Is this step critical control point?

Control measure is any action or activity that can be used to prevent, eliminate, or reduce a significant hazard to an acceptable level



HAZARD ANALYSIS WORKSHEET

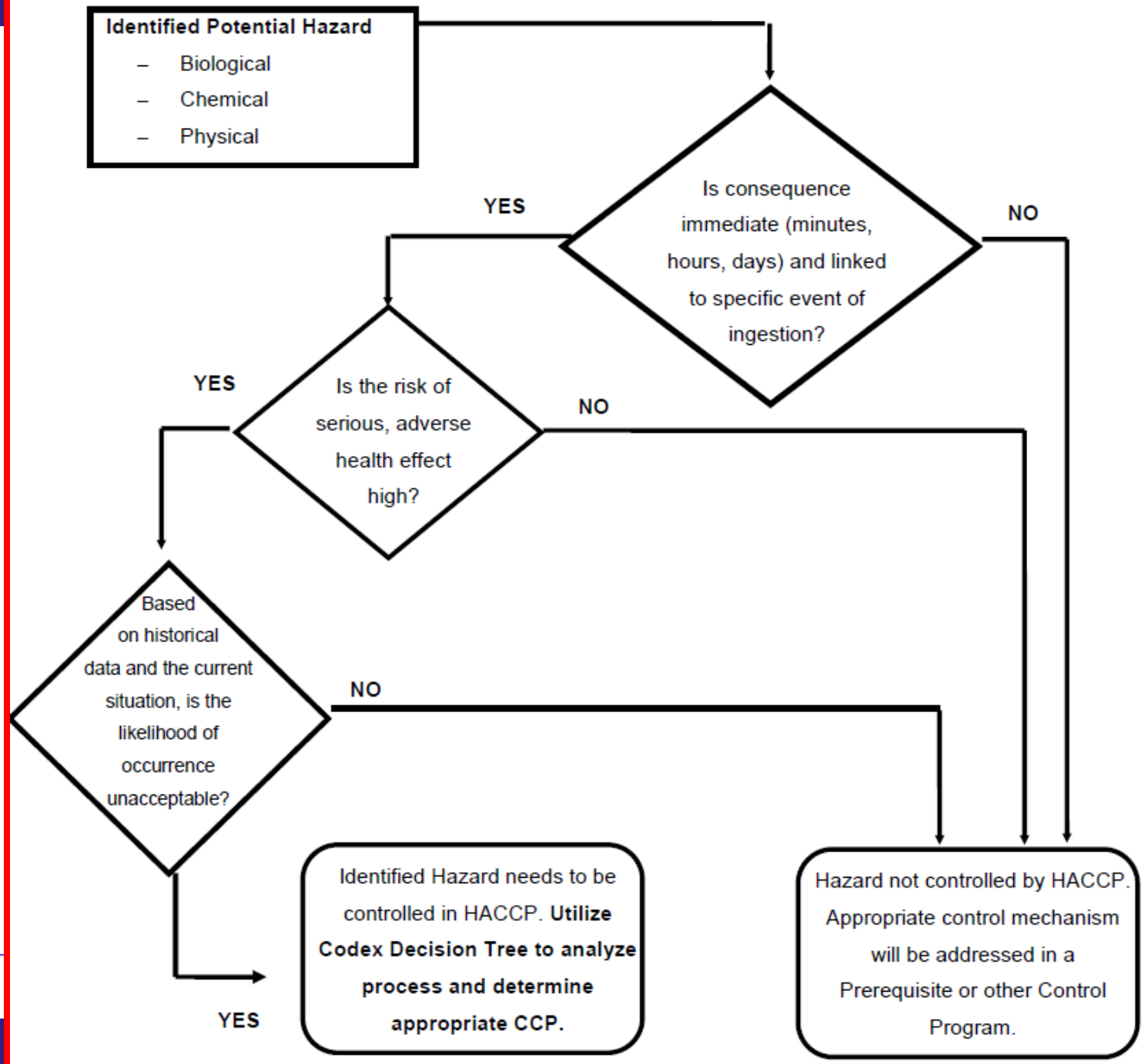
Company name:_____ Product description:_____

Company address:_____ Method of storage and distribution:_____

Intended use and consumer:_____

(1) Ingredient/Processing Step	(2) Identify potential hazard introduced, controlled or enhanced at this step	(3) Are any potential food safety hazards significant? (Yes/No)	(4) Justify your decision for column (3)	(5) What control measure(s) can be applied to prevent significant hazards	(6) Is this step a critical control point? (Yes/No)
	Biological				
	Chemical				
	Physical				
	Biological				
	Chemical				
	Physical				

Hazard evaluation flow chart



Hazard analysis in frozen cooked beef patty

Stage 1: Hazard Identification

- Enteric pathogens (i.e., *E. coli* O157:H7 and *Salmonella*)

Stage 2: Hazard evaluation

1. Severity of health consequences if these hazards are not properly controlled
2. Likelihood of occurrence
3. Determine if this potential hazard is to be addressed in the HACCP plan.

1. Undercooked beef patties have been linked to foodborne disease – severe health effect including death
2. The occurrence of *E. coli* O157:H7 & *Salmonella* in meat is of low probability but the effect is severe
3. The HACCP team decides that enteric pathogens are the significant hazards for this product - **Hazards must be addressed in the plan.**

Hazard analysis in frozen curry puff

Stage 1: Hazard Identification

- *Staphylococcus aureus* in finished product

Stage 2: Hazard evaluation

1. Severity of health consequences if these hazards are not properly controlled
2. Likelihood of occurrence
3. Determine if this potential hazard is to be addressed in the HACCP plan.

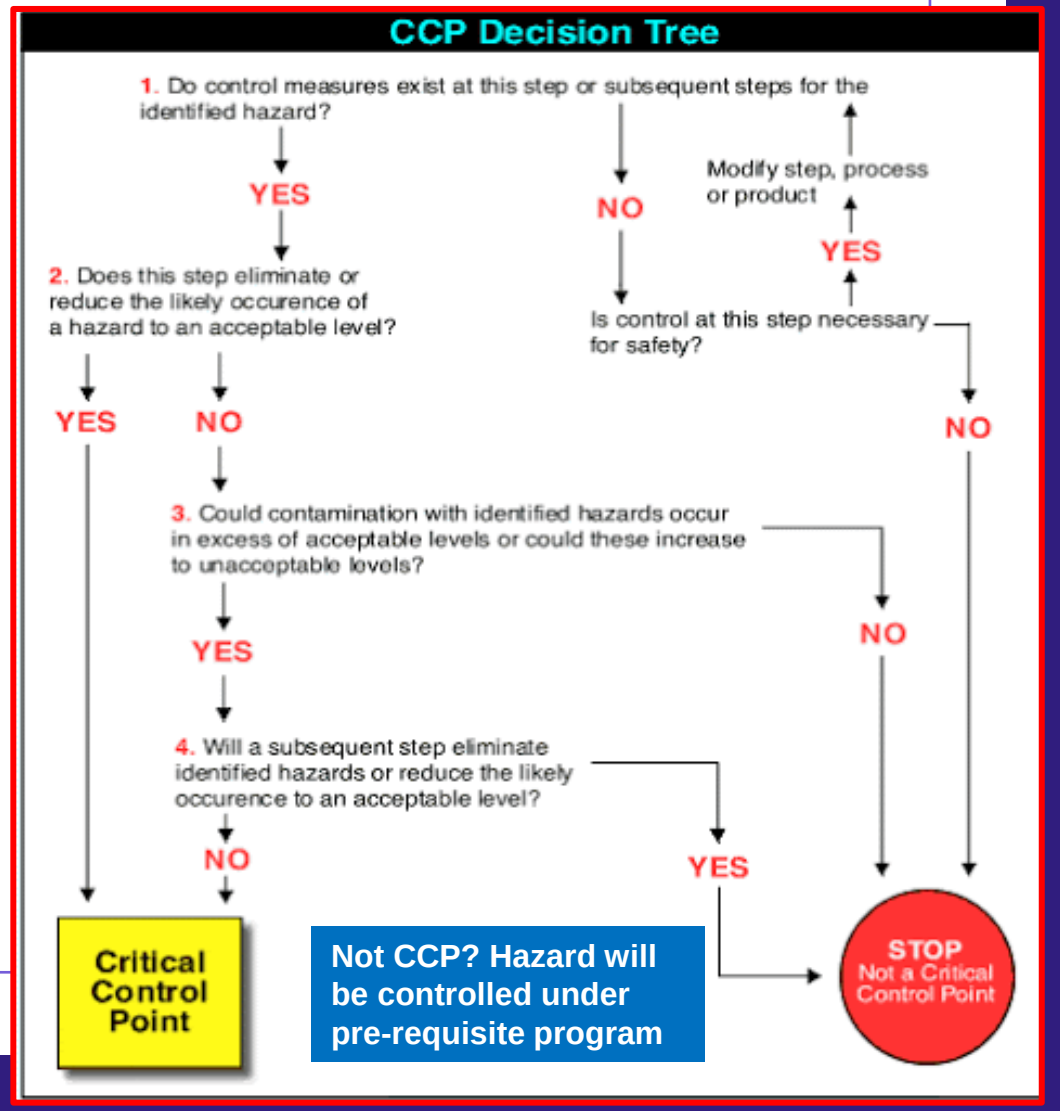
1. *S. aureus* produce an enterotoxin which can cause a moderate foodborne illness
2. Contamination may occur due to human handling during the preparation of curry puff. Enterotoxin is produced when *S. aureus* reach level of 10^6 cfu/g. Freezing prevent the growth of *S. aureus*, thus the potential for enterotoxin is vey low
3. The HACCP team decides that the personal hygiene, rapid freezing and handling instructions are adequate to control this hazard – **Hazard does not need to be addressed in the plan**

Principle 2: Determine 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

- Prevent (CoA from supplier, verify the CoA, trusted supplier)
- Eliminate (heat treatment)
- Control (refrigerated, chilling, freezing)



Critical control points are located at any step where hazards can be either prevented, eliminated, or reduced to acceptable levels.

Points may be identified as CCPs when hazards can be **PREVENTED:**

- Pathogen growth can be controlled by refrigerated storage or chilling
- Using nitrated and nitrates to prevent C. botulinum growth in vacuum packed product

Points may be identified as CCPs when hazards can be **ELIMINATED:**

- Metal fragment can be detected by a metal detector and eliminated by removing the contaminated product
- Sterilization can kill vegetative and spore former bacterial cells

Points may be identified as CCPs when hazards can be **REDUCED TO ACCEPTABLE LEVEL:**

- Some chemical hazards such as patulin can be reduced by processes such as culling, brushing, and washing
- Pasteurization can reduce spoilage organism to an acceptable level

Potato chips

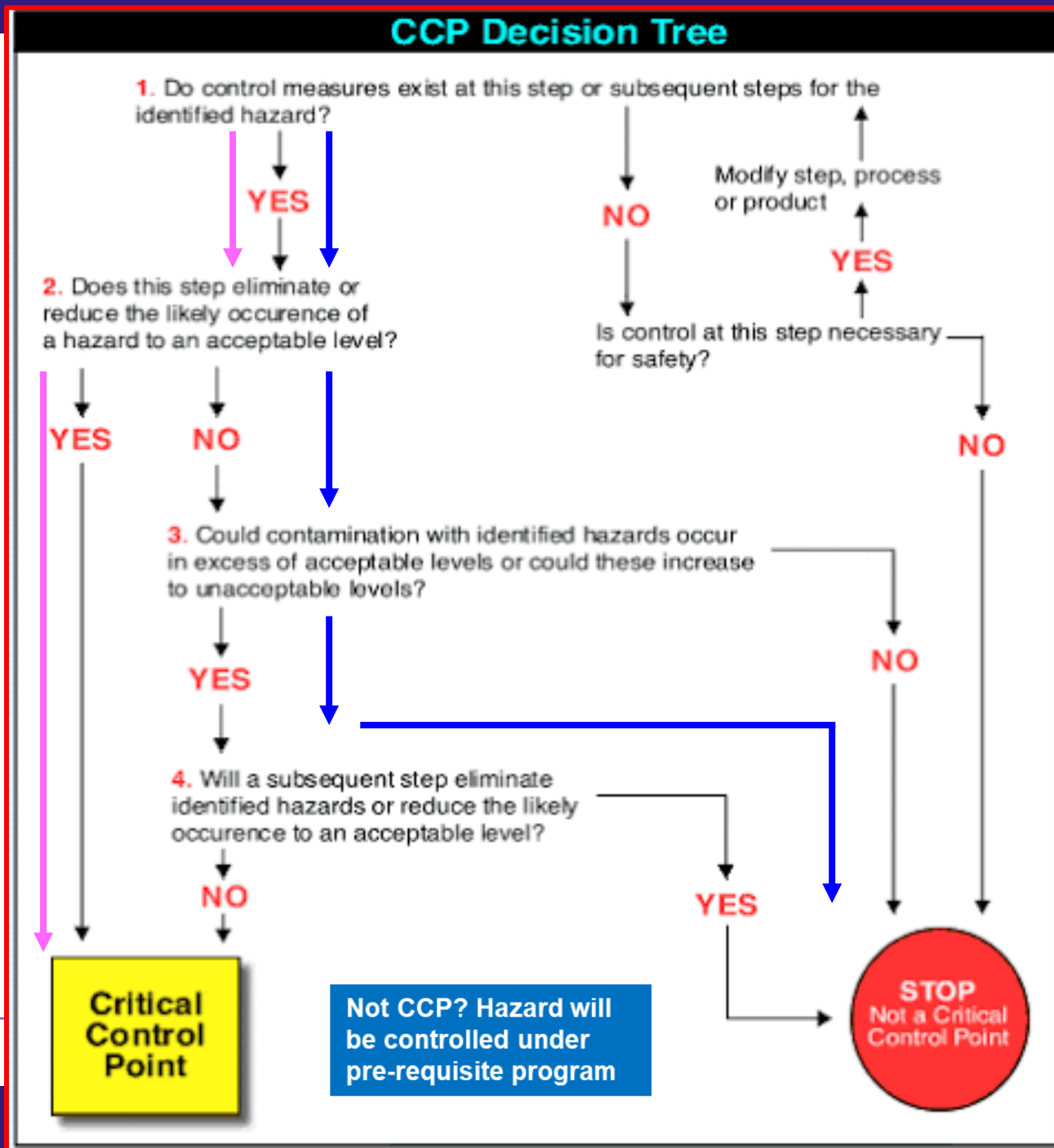
Hazard: Pathogens (e.g. *Listeria*, pathogenic *E. coli*, etc..)

Washing

- Hazard – Pathogenic m/o from water
- Control by GMP – Assurance of hygienic condition in the processing facilities, potable water
- CCP?? – No, the next processing step will eliminate the hazard

Frying

- Hazard – Survival of pathogenic m/o in raw material
- The process cannot be controlled by GMP
- CCP?? – Yes, time & temperature control is needed during the processing



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Hazard Analysis Critical and Control Point (HACCP) - 2

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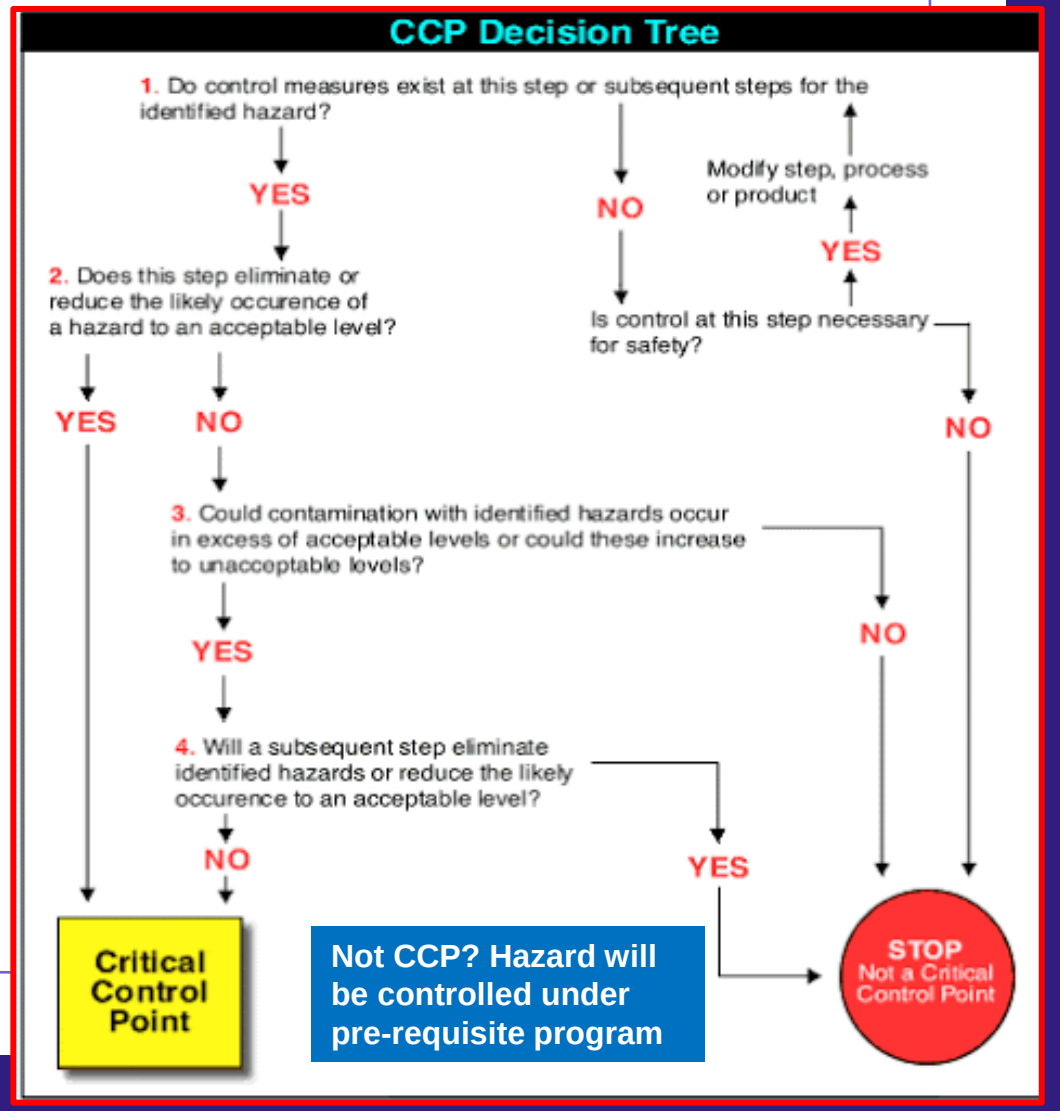


Some hazards can’t just be removed once they are present, the key is to prevent.

Spoilage of fish species such as tuna, mahi-mahi, can result in the production of toxic levels of histamine due to time & temperature abuse

Histamine can’t be removed once it is formed

Prevention: keep fish cold soon after removing it from water; Cook the fish immediately to destroy the histidine decarboxylase enzyme)

Some hazards can’t just be removed once they are present, the key is to prevent.

Nuts, spices, and dried fruits are prone to aflatoxin contamination by *Aspergillus flavus*

Aflatoxin can’t be removed once it is formed

Prevention: Avoid hot and humid storage condition, CoA from supplier

Critical control point (CCP)

Example of CCPs

- Thermal processing (cooking, pasteurization, boiling, frying)
- Chilling / freezing
- Receiving of raw material – RTE food
- Metal detection

Single hazard can be controlled by multiple CCPs

- Pathogens in milk – pasteurization + chilling

Multiple hazards can be controlled by single CCP

- Pathogens + acrylamide in potato chips – frying

Starch containing product

(e.g. potatoes)

Fried in temperature

> 171°C

Microorganisms are destroyed

Acrylamide

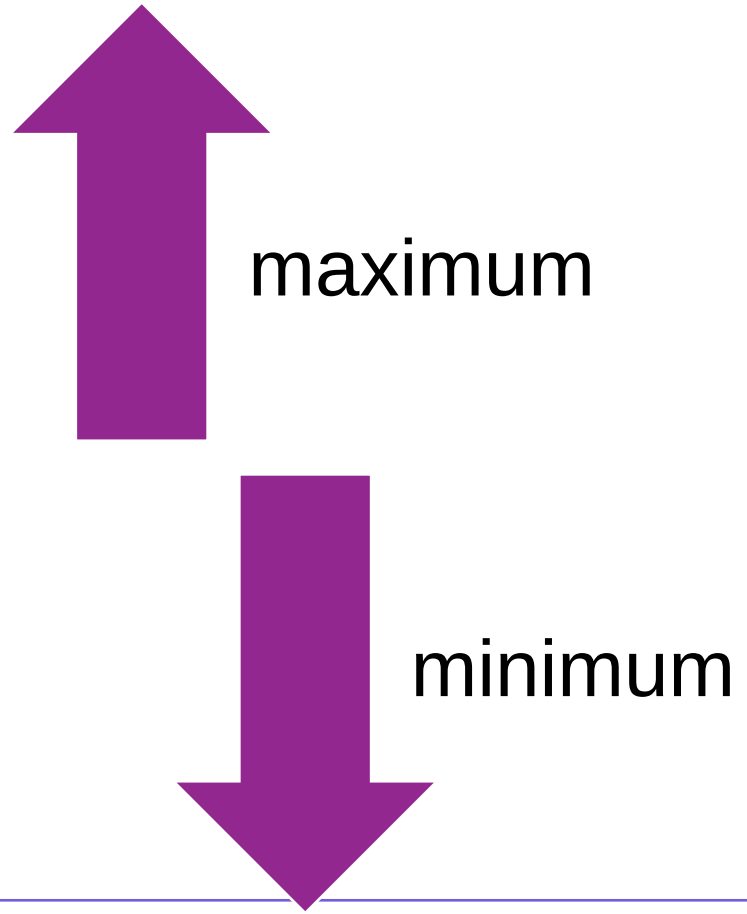
(reaction between sugar and amino acids during high-temperature cooking.

promote carcinogenesis)

Need time & temperature control (Frying - CCP)

Principle 3: Establish critical limit

- Critical limit is a maximum and / or minimum value to which a biological, chemical, or physical parameter must be controlled at a CCP to prevent, eliminate or reduce food safety hazard to an acceptable level.
- For each CCP, there is at least one criterion for food safety that is to be met
- A critical limit is used to distinguish between safe and unsafe operating condition at a CCP
- It must be scientifically based – derived from sources such as regulatory standards and guidelines, literature surveys, experimental result, and experts.



Salt concentration

temperature

pH

Water activity

time

Preservatives

CRITICAL LIMIT

Moisture level

Physical dimension

humidity

Example: Critical limit of beef patties

Information needed to ensure than an acceptable level is consistently achieved:

- Probable number of pathogens in raw patties
- Their heat resistance
- Factors that influence the heating of patties
- The area of the patty which heats the slowest

These are the basic information for the establishment of the critical limit

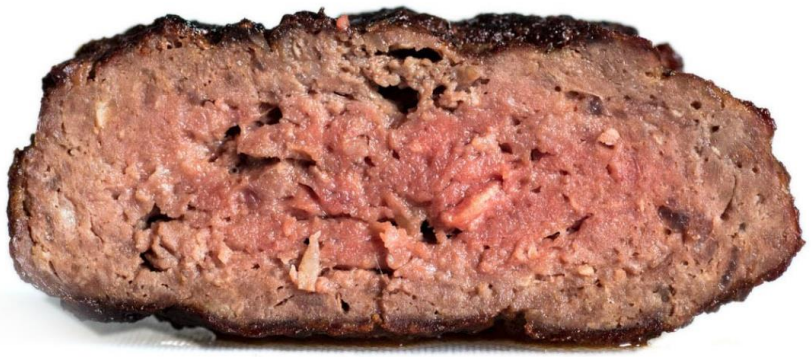
EXAMPLE:
The HACCP team concluded that thermal process equivalent to 71°C for 16 seconds would be necessary to assure the safety of this product.

Option 1: Need to establish critical limit for the **oven temperature**, **humidity**, **belt speed** (time in oven), **patty thickness, composition**

Option 2: Processed to the **internal temperature** of 155 and hold for 16 secs.

Example: Critical limit of beef patties (Option 1)

Process Step	CCP	Critical Limits
5. Cooking	YES	Oven temperature:___° F Time; rate of heating and cooling (belt speed in ft/min): ____ft/min Patty thickness: ____in. Patty composition: e.g. all beef Oven humidity: ____% RH



Example: Critical limit of fried fish cake

- A variety of options exist to control a particular hazard
- Different control options require different critical points

Hazard: Pathogenic *E. coli, Salmonella*
CCP: Frying / Fryer step

Example: Critical limit of fried fish cake (Option 1)

Option #1			
Product	***Hazard***	***CCP***	***Critical Limit***
Fried Fish Patties	**Bacterial pathogens**	**Fryer**	**No pathogens detected**

- Critical limit – based on microbiological analysis
- Limitation - not practical for routine monitoring
  - Difficult to monitor
  - Longer time is required for m/o analysis (several days)
  - Requires large number of samples for a meaningful testing

Example: Critical limit of fried fish cake (Option 2)

Option #2			
Product	***Hazard***	***CCP***	***Critical Limit***
Fried Fish Patties	**Bacterial pathogens**	**Fryer**	**Internal product temperature 150°F for 1 minute**

- Critical limit - Conditions (time & internal temperature) needed to kill the pathogens at the CCP
- Source - scientific information, regulatory guidelines
- Information - Heating food to an internal temperature of minimum 150°F / 65°C for 1 minute will kill pathogens
- Limitation - Difficult to measure internal temperature and cooking time during frying

Example: Critical limit of fried fish cake (Option 3)

Option #3			
Product	***Hazard***	***CCP***	***Critical Limit***
Fried Fish Patties	**Bacterial pathogens**	**Fryer**	**350°F minimum fryer oil temp. 1/4 inch maximum patty thickness 1 minute minimum cook time**

- Critical limit – the minimum conditions needed to ensure that the necessary internal temperature and time is achieved during frying
- Parameter to be monitored:
  - Oil temperature
  - Fish patty thickness
  - Frying time
- Easier to monitor the fryer temperature and cooking time

Other examples of critical limits

Product	Critical limits	Remarks
Milk	Min 161 °F, 15 sec	HTST
	Min 145 °F, 30 min	Batch pasteurization
Liquid egg whites and yolks	Lower temperature (126 °F, 1.5 min, and use of hydrogen peroxide.	10% hydrogen peroxide is injected at a level of 0.875 lb per 100 lb of egg white. The mixture is then heated to 51.7°C for 3.5 min. After cooling, catalase is added to remove residual hydrogen peroxide.
Ground meats	160 °F	Minimum internal temp
All poultry	165 °F	Minimum internal temp
Fish and shellfish	145 °F	Minimum internal temp

Principle 4: Establish monitoring procedures

- To conduct a planned sequence of observations or measurements to assess whether a CCP is under control and to produce an accurate record for future use in verification
- Purpose of monitoring
  - Track the operation of the process and enable the identification of trends toward a critical limit that may trigger process adjustments
  - Identify when there is a deviation / failure to meet critical limit
  - Provide written documentation of the process control system

Deep fryer with time and temperature control

Designing a monitoring system

1. **What** will be monitored? E.g. time, temp. pH
2. **How** the critical limits and control measures will be monitored.? E.g. timer, thermometer, pH meter
3. The **frequency** of monitoring? E.g. continuous (deep frying or pasteurization temp), every batch (pH), etc..
4. **Who** will performed the monitoring? E.g. QC personnel, equipment operators, etc..

Example : Apple juice

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Correc-tive Action	Verification	Record keeping
			What	How	Frequency	Who			
CCP 1 Culling	Patulin	No more than 1% by weight rot after culling	Rot in 5000 g sample	Cut rot and weigh rot	Twice per production run	QC staff			
CCP 2 Screen	Metal inclusion	Screen is intact	Integrity of screen	Visual	Daily Pre-op and post-op	Produc-tion em-ployee			
CCP 3 Pasteurizer	*E. coli* O157:H7 and *Cryp-tosporidium parvum*	≥160°F for ≥ 6 s 71°C, 6 sec	1. Temp. of juice	Temp. recorder	Continuous recording with hourly visual check of record.	Pasteur-izer operator			

Most monitoring procedures need to be RAPID because they relate to on-line, “real-time” processes and there will not be time for lengthy analytical testing

How to monitor the safety of pasteurized milk?

Preferred: monitor heating time & temperature

Microbiological test??

Principle 5: Establish corrective actions

- Corrective actions are procedures to be followed when a **deviation** occur
  - Deviation: failure to meet a critical limit

Two components

1. To **correct** and **eliminate** the cause of the deviation and **restore** process control

2. To identify the product that was produced during the process deviation and determine its **disposition**

Example

IF Deviation	THEN corrective action
Product :pasteurize fruit juice Deviation: Product does not reach required internal temperature for the required time	Isolate affected product Reprocess or destroy product Determine the reason for the deviation and make necessary adjustments

Any corrective action report should contain:

1. Product identification (e.g. product description, amount of product on hold)
2. Description of the deviation
3. Corrective action taken including final disposition of the affected product
4. Name of the individual responsible for taking the corrective action
5. Result of the evaluation

Principle 6: Establish verification procedures

- Verification is the activities (other than monitoring), that
  - **determine the validity** of the HACCP plan
  - determine whether the system is operating according to the plan.

- Verification activities are conducted by
  - Individuals within a company (e.g. plant manager)
  - Third party expert (e.g. consultant)
  - Regulatory agencies customers, certification bodies, etc

Several approached to validating the HACCP plan

- Incorporation of fundamental scientific principles
- Use of scientific data
- Reliance of expert opinion
- Conducting in-plant observation
- Conducting test

Initial validation: It occurs before implementation of the plan

Revalidation: it occurs when there are significant changes to the plan

Element of verification

- Validation - *“am I doing the right thing?”*
  - focused on collecting and evaluating scientific and technical information
  - to determine if the HACCP plan will effectively control the hazards when it is properly implemented.

- Verification – *“am I doing what I should be doing”*
  - Verification of **prerequisite** program – to ensure the programs are operating as planned.
  - Verification of **CCPs** – calibration of monitoring devices, review calibration records, targeted sampling & testing, CCP record review (monitoring & corrective action records)
  - Verification of the **HACCP plan** – ensure that the implementation of HACCP plan complies with the written HACCP plan, include on-site audit & review)

- Review – *“Is the HACCP plan up to date?”*

Example: Verification of CCP

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record keeping
			What	How	Frequency	Who			
CCP 3 Pasteur-izer	*E. coli* O157:H7 and *Cryptospori-dium parvum*	≥160°F for ≥ 6 s	1. Temp. of juice	Temp. recorder	Continuous recording with hourly visual check of record. Visual daily check of MIG ther-mometer	Pasteur-izer operator	Segregate and hold product for repasteuri-zatin or divert to nonfood use Adjust pas-teurizer tem-perature to achieve ≥ 161°F and/or Adjust pump to deliver ≥ 6s	Documentation of process establishment Check the accu-racy of the tem-perature recording device against the MIG thermometer daily Calibrate the MIG and certified thermometer annually	
			2. Set pump speed to 5 to deliver ≥ 6 s	Visual check of positive displace-ment pump at set speed	Daily at be-ginning of production	Pasteur-izer Operator	and/or Clean and sanitize all equipment post-pasteurization	Confirm that pump setting delivers correct flow rate by performing the salt test Review all records within one week of preparation	

Circumstances that would initiate a review / revalidation.

1. Changes in raw materials or product formulation
2. Introduction of new product
3. Change in raw materials supplier
4. Change in processing system
5. Change in layout or environment
6. Modification to process equipment or new equipment
7. Failures in system e.g. corrective action or product recall
8. Any report from the market place that indicates a health or spoilage risk associated with the product – consumer complain
9. Emergence of a new foodborne pathogen (such as bacteria that can cause illness) with public
10. Changes in legislations

Key points

- The HACCP plan must be validated prior to implementation
- There must be evidence that the HACCP plan is capable of producing safe food (validation)
- Auditing should be used to provide evidence of compliance with the HACCP plan (verification)
- There must be evidence that the HACCP system is working in practice (verification)
- The HACCP system must be reviewed by the HACCP team at least annually
- Records of validation, verification and review activities must be maintained.

Principle 7: Establish record keeping and documentation procedures

Records needed

- Hazard analysis / HACCP plan and supporting documentation used in the developing plan
- Records of CCP monitoring
- Records of corrective actions
- Records of verification activities

All HACCP monitoring records shall contain

- Form title
- Company name and location
- Time and date
- Product identification
- Actual observation or measurement
- Critical limits
- Operator’s signature or initials
- Date of review

HACCP Plan Form

Firm Name: ABC Shrimp Company

Firm Address: One Water Lane
Bayside, USA

Product Description: IQF cooked, headless, peeled and de-veined shrimp

Method of Storage and Distribution: Frozen

Intended Use and Consumer: Cooked, ready-to-eat Shrimp for sale to the general public

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Critical Control Point (CCP)	Significant Hazard(s)	Critical Limits for each Preventive Measure	Monitoring				Corrective Action(s)	Verification	Records
			What	How	Frequency	Who			
Cooker	Bacterial pathogen survival	Cook at 212°F for 3 minutes	Cooker temp and cook time	Continuous temperature recorder and conveyor belt time checks with a marked block	Continuous temperature monitoring with hourly checks of continuous temperature log and conveyor belt speed using a marked block	The cooker operator	If cooker temperature <212°F the cook time <3 minutes, then processing line is stopped until temperature is 212°F or > or cook time is > 3 minutes. Affected product is re-cooked or destroyed.	Thermometer calibrated quarterly. Records reviewed daily. Cooked shrimp tested semi-annually for pathogens. Time and temperature critical limits and cooker equipment performance validated as needed. HACCP system verification annually and as needed.	Shrimp Cooker Log and Continuous Temperature Recording Charts

Signature of Company Official: _____ Date: _____

ABC Shrimp has chosen to use a continuous recording thermometer as one of their monitoring instruments and hourly checked of both time and temperature.

Both the continuous temperature charts and the Shrimp Cooker Log where the results of the hourly measurement are recorded should be identified in the HACCP plan.

Example of Hazard analysis

APPLE JUICE

https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-juice-hazard-analysis-critical-control-point-hazards-and-controls-guidance-first

Hazard analysis summary table for Apple Juice

(1) Ingredient/processing step	(2) Identify potential hazards introduced, controlled, or enhanced at this step	(3) Are any potential food-safety hazards significant? (Yes/No)*	(4) Justify your decision for Column 3	=(5) What control measure(s) can be applied to prevent the significant hazards? =	(6) Is this step a Critical Control Point? (Yes/No)
Receiving (raw apples)	**Biological(B)** - Vegetative and protozoan enteric pathogens (i.e., *E.coli* O157:H7 and *Cryptosporidium parvum*)	Yes	History of outbreaks for apple juice.	Pasteurization	No
	Chemical(C) - 1. Pesticides	No	In U.S. produce unapproved pesticide residues occur infrequently and public health impact is typically not severe.		No
	2. Patulin	Yes	May have adverse effects	Supplier guarantee (apples harvested to exclude fallen fruit) and culling or trimming defective (i.e., moldy, rotten, bruised and damaged) apples.	Yes

Hazard analysis summary table for Apple Juice

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Cold Storage	**B** - Growth of pathogens such as salmonella and *E. coli* O157:H7 due to temperature abuse	No	Growth not likely due to the pH of apples.		
	C - Patulin	Yes	Patulin levels may increase in storage.	Cull or trim defective apples	No
	P - None				
Cull	**B** - None				
	C - Patulin	Yes	Patulin levels are reduced by culling defective apples.	Cull or trim defective apples.	Yes
	P - None				

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Grind	**B** - None				
	C - None				
	P - Metal fragments	Yes	Metal fatigue, worn and damaged blades can cause contamination of slurry.	Screen	No
Screen	**B** - None				
	C - None				
	P - Metal fragments	Yes	Intact screen filters out the metal fragments	Screen	Yes

Hazard analysis summary table for Apple Juice

(1) Ingredient/processing step	(2) Identify potential hazards introduced, controlled, or enhanced at this step	(3) Are any potential food-safety hazards significant? (Yes/No)*	(4) Justify your decision for Column 3	=(5) What control measure(s) can be applied to prevent the significant hazards? =	(6) Is this step a Critical Control Point? (Yes/No)
Holding Tank	**B** - None				
	C - Sanitizing chemicals	No	Not likely to occur because of SSOP for cleaning and sanitizing; residue levels not reasonably likely to cause illness.		
	P - None				
Pasteurize/Cool	**B** - Vegetative and protozoan enteric pathogens (*E. coli* O157:H7 and *Cryptosporidium parvum* are the pertinent microorganisms	Yes	Microbial contamination on incoming apples.	Pasteurization	Yes
	C - None				
	P - None				

Example of HACCP plan

APPLE JUICE

https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-juice-hazard-analysis-critical-control-point-hazards-and-controls-guidance-first

HACCP plan for Apple juice

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record keeping
			A. What	B. How	C. Frequency	D. Who			
CCP1 Receiving	Patulin	A supplier guarantee specifying that the shipment includes only apples harvested to exclude fallen fruit.	Ensure supplier guarantee exists for each incoming shipment of fruit.	Supplier guarantee is visually confirmed.	Each incoming fruit shipment	Receiving manager	Reject fruit if not accompanied by supplier guarantee.	Review monitoring corrective action and verification records within one week of preparation Audit the supplier periodically for adherence to guarantee Periodically test juice for patulin levels	Supplier guarantee Receiving log Supplier audit report Patulin test results

HACCP plan for Apple juice

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record keeping
			A. What	B. How	C. Frequency	D. Who			
CCP 2 Culling	Patulin	Undamaged apples[15]	Moldy, rotten, bruised or otherwise damaged apples	Visual inspection	Continuous	Culling inspector	Stop belt and remove damaged fruit AND Adjust belt speed if necessary	Review monitoring, corrective action, and verification records within one week of preparation Periodically test juice for patulin levels	Culling log Patulin test results

HACCP plan for Apple juice

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record keeping
			A. What	B. How	C. Frequency	D. Who			
CCP 3 Screen	Metal inclusion	Screen is intact and in place	Integrity of screen	Visual	Daily	Production Employee	Segregate product and rework to eliminate metal pieces, run product through metal detector, divert to nonfood use, or destroy AND Replace screen.	Calibrate screen to ensure metal pieces 7 mm or greater do not pass screen, semi-annually. Review monitoring corrective action and verification records within one week of preparation	Screen integrity log Screen calibration log

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record keeping
			A. What	B. How	C. Frequency	D. Who			
CCP 4 Pasteurize	*E. coli* O157:H7 and *Cryptosporidium parvum*	Minimum 160° F and 6 seconds (provides a 5-log reduction)	1.Temperature of juice 2. Flow rate	1.Temperature recorder 2. Visual check of positive displacement pump setting	Continuous monitoring with visual check hourly Daily	Pasteurizer operator Pasteurizer operator	Segregate and hold affected product for evaluation, destroy, or divert to nonfood use AND Adjust pasteurizer (temperature or flow rate) to achieve the critical limit. AND Reprocess any product that did not undergo 5-log pathogen reduction	Documentation of process establishment; Check the accuracy of the temperature recording device (TRD) against a mercury and glass thermometer daily; Calibrate the mercury and glass (MIG) thermometer annually; Flow rate test and resealing of pump speed monthly; Review monitoring, corrective action, and verification records within one week of preparation.	Operator's log Recorder Thermometer Chart TRD, MIG and pump check and calibration records

For this example, it is assumed that the pasteurization process is performed using a continuous (non-batch) system with a positive displacement (constant flow) timing pump.

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Hazard analysis and critical control point of frying – safety assurance of fried foods

Deep frying can pose hazards due to oil deterioration (oxidation, polymerization, hydrolysis) and harmful components formation such as *trans* fatty acids, highly oxidized or polymerized constituents of fatty acids and acrylamide. An analysis of safety hazards of the production of the potato chips and french fries, was carried out from potato harvesting until final products packaging according to hazard analysis and critical control point approach focusing mainly on the first three principles. Since frying is considered a critical control point, the critical limits for the frying temperature and for the potential hazards must be controlled in order to ensure fried products safety.

Keywords: Food safety, potato chips, fried products, HACCP.

THANK YOU

SUMMARY

- Preliminary tasks
  - ✓ Build a team
  - ✓ Describe the food and its distribution
  - ✓ Intended use and the consumer
  - ✓ Flow diagram
  - ✓ Verify the flow diagram

  A
- HCCP principles
  - ✓ Hazard analysis
  - ✓ Determine the CCP
  - ✓ Establish critical limits
  - ✓ Establish Monitoring procedure
  - ✓ Establish corrective action
  - ✓ Establish verification procedures
  - ✓ Establish record keeping and documentation procedure