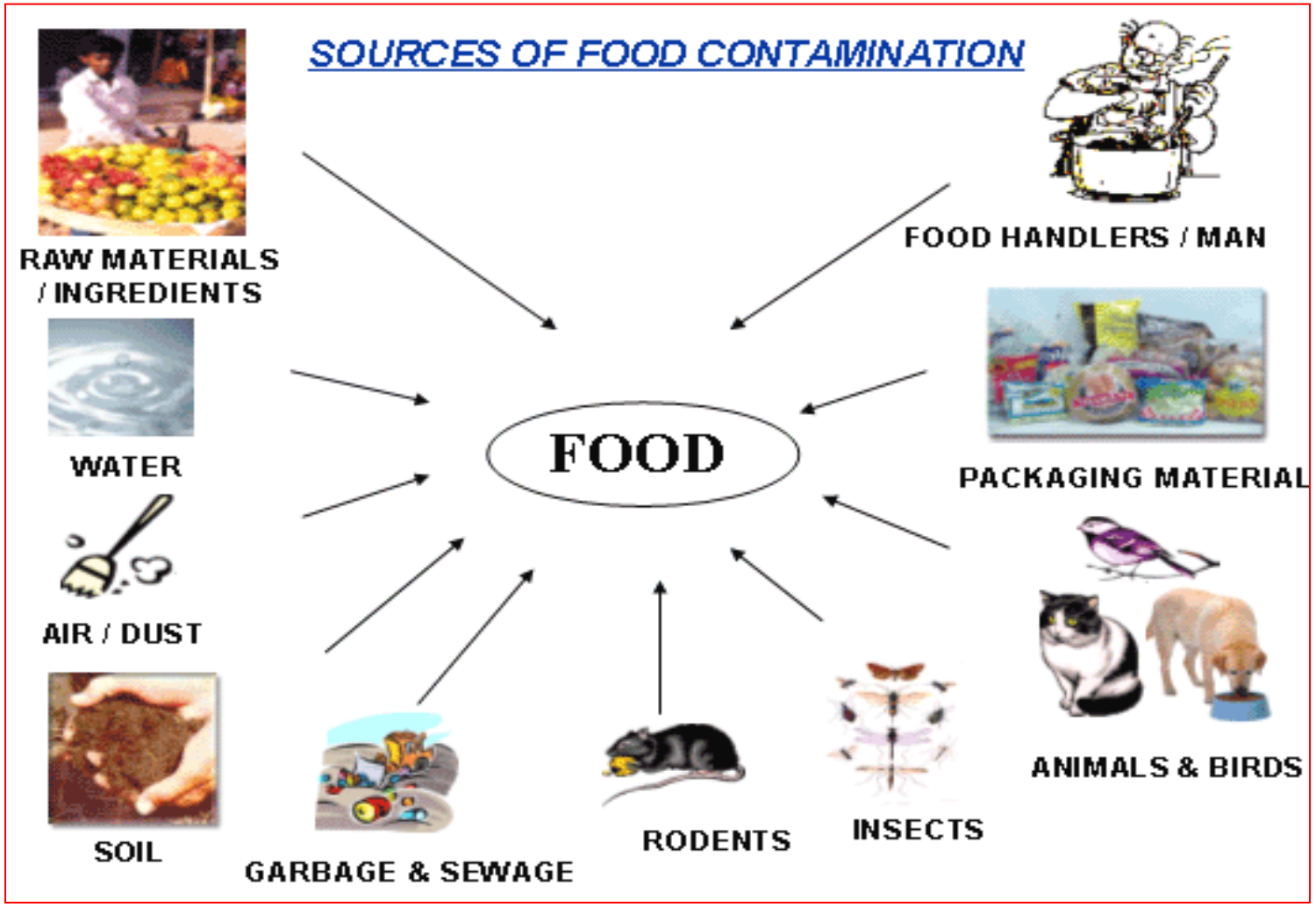
HACCP

HACCP
HACCP

Why Food Safety?

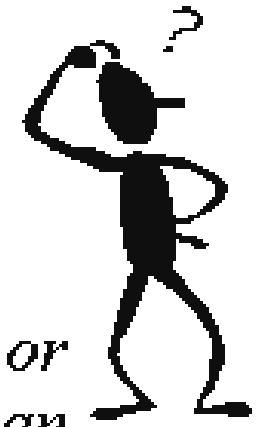


Some of the reasons for concern about food safety?

- Consumer awareness on quality and safety of food and changes in their food habits
- Minimal processed foods with natural taste, color, flavours and shelf life
- Globalization of trade in India :International sourcing → complex supply chains
- Emerging pathogens with low infective dose , high mortality , resistant to antibiotics and other sanitizers & capability to survive under different environmental conditions /processes - Potential for large and widespread outbreaks
- Cross-border translocation of infectious agents
- Global concern during the past decade on adverse public health effects of genetic engineering

International regulatory harmonisation essential

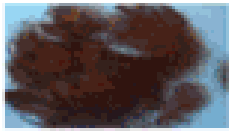
WHAT IS A HAZARD?



A physical, chemical or biological agent in, or condition of food, with the potential to cause an adverse health effect.

Physical Hazards in Food

BIDIS & CIGARETTES



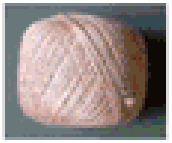
HAIR

STONES

STEMS & SEEDS

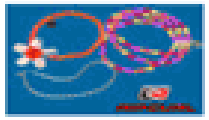
BUTTON

BONE, FRAGEMENTS, FEATHERS



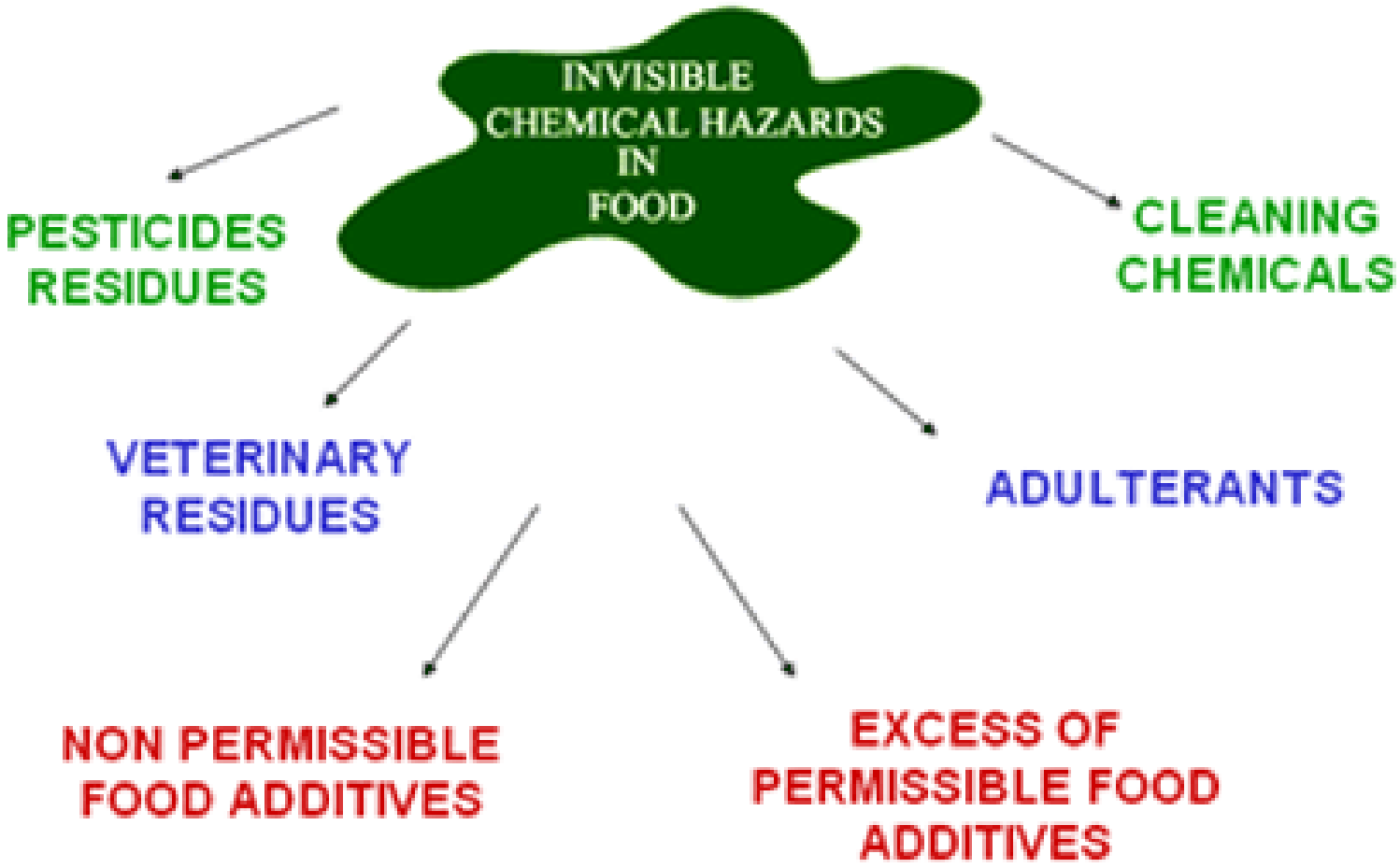
STRINGS, JUTE FIBRES

NAILS, NUTS & BOLTS

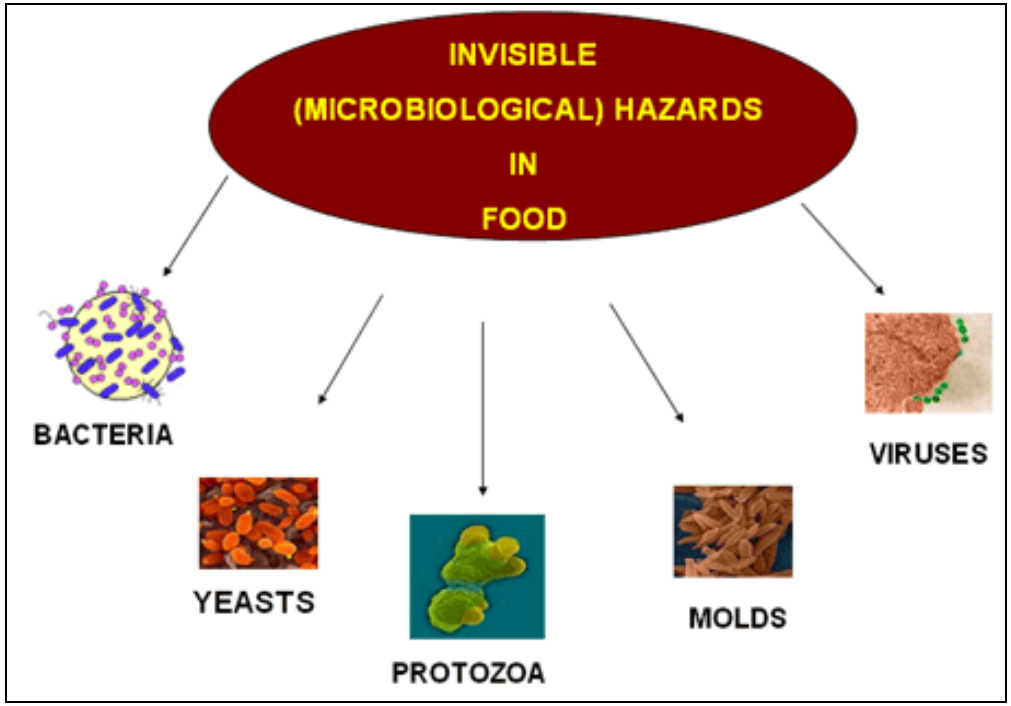


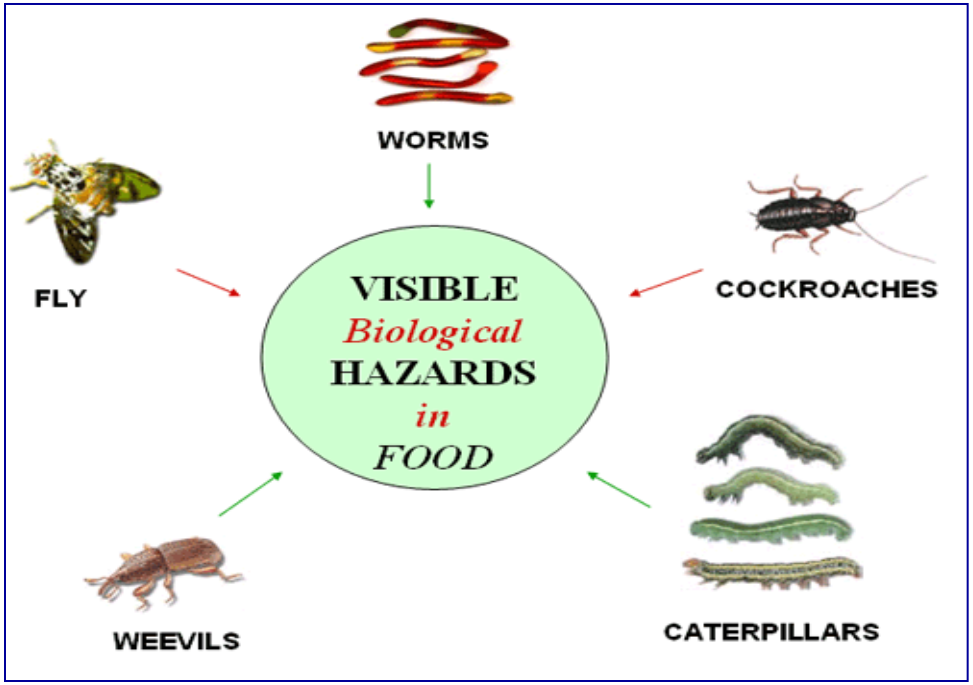
JEWELLERY

MATCHSTICK


INVISIBLE
CHEMICAL HAZARDS
IN
FOOD
PESTICIDES
RESIDUES
CLEANING
CHEMICALS
VETERINARY
RESIDUES
ADULTERANTS
NON PERMISSIBLE
FOOD ADDITIVES
EXCESS OF
PERMISSIBLE FOOD
ADDITIVES

Biological Hazards





HACCP is a system which

Hazard

Analysis

Critical

Control

Point

- **identifies**
- **evaluates and**
- **controls hazards** which are significant for food safety.

HACCP – Answers 3 questions

Hazard
Analysis
Critical
Control
Point

- **WHAT** hazards can enter the product?
- **Where** do these hazards occur?
- **How** can we control or eliminate these hazards?

HACCP

- Science based
- Step wise process:
  - Identifies hazards
  - Installs preventative measures to eliminate or reduce hazards in foods
- Proactive rather than reactive
- Risk based

HACCP

- Does not rely on end product testing
  - hazards not be evenly distributed and can be missed in sampling
  - need to test large quantities
  - product would need to be destroyed or reworked

HACCP

- Starts from the beginning of the process
  - Receiving of ingredients, packaging
- through process steps
- to final product and shipping

Components

- Pre-requiste program
- Hazard analysis

Prerequisites

- Foundation to a HACCP program
- Includes Good Manufacturing Practices
- Addresses food safety at all stages from receiving to shipping
  - Including indirect hazards

Prerequisite program

- Premises
- Transportation and Storage
- Equipment
- Personnel/Training
- Sanitation and Pest Control
- Recall
- Allergen Control
- Supplier Quality Assurance

Premises

- Outside property and building
- Design, construction & maintenance
- Lighting
- Ventilation
- Waste disposal
- Inedible areas
- Employee & sanitary facilities
- Water/Steam/Ice

Transportation and Storage

- **Food Carriers**
- **Temperature Controls**
- **Receiving and Storage**
  - **Incoming ingredients and packaging**
  - **Non-Food Chemicals**
- **Finished Product Storage**

Equipment

- Design and installation
- Maintenance and Calibration

Personnel

- Trained for their job
- Understand food safety

Sanitation and Pest Control

- **Sanitation**
  - **Equipment and Utensils**
  - **Floors**
  - **Locker rooms**
  - **Lunch rooms**
  - **Washrooms**
- **Pest control**

Recall

- Product identification
- Locating product
- Returning product

Allergen control

- Identification of Allergens
- Control of allergens
  - Special handling
  - Segregate
  - Special sanitation procedures
  - Rework
  - Proper labelling

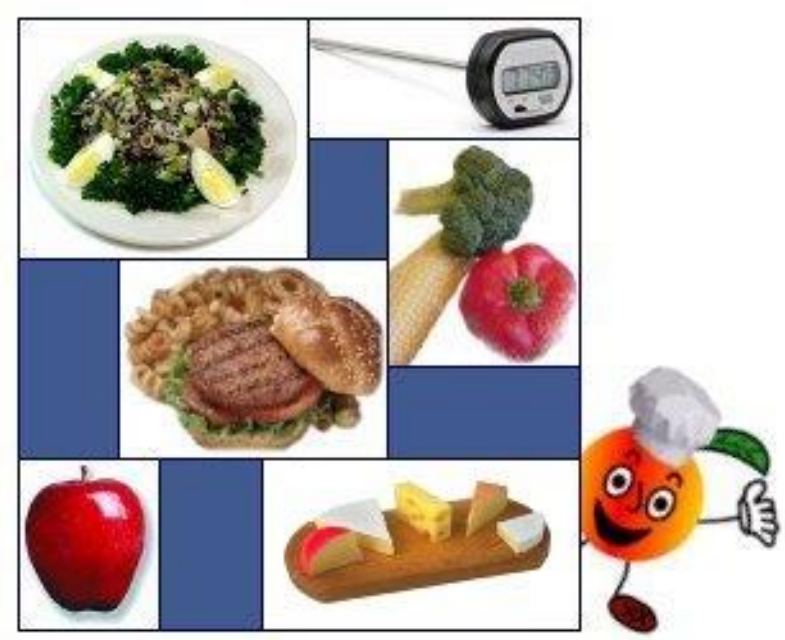
Supplier Quality Assurance

- Vendor approval process
- Product specifications
- Inspect incoming materials

HACCP

- It is a Preventive approach system
- It is not a zero-risk system
- It is designed to minimize the risk of food safety hazards
- It focuses on FOOD SAFETY.

Production to Consumption



- Boat to Throat
- Farm to Fork
- Plow to Plate
- Till to Tooth
- Stable to Table

The HACCP System

The HACCP system is a scientific, rational and systematic approach to identification, assessment and control of hazards during production, processing, manufacturing, preparation and use of food to ensure that food is safe when consumed (i.e. it does not present an unacceptable risk to health).

With the HACCP system, food safety control is integrated into the design of the process rather than the present ineffective system of end-product testing. Therefore the HACCP system provides a preventive and thus a cost-effective approach to food safety.

WHY HACCP CERTIFICATION?

- ✓ Cost effective way of reducing wastage and recalls
- ✓ Demonstrates compliance with regulatory and market requirements
- ✓ Demonstrates commitment to ensure safety of foodstuffs
- ✓ Protection land enhancing brands and private labels
- ✓ Competitive advantage

BENEFITS:

- The HACCP system is a system used as a method of food safety assurance in food production, processing, manufacturing and preparation.

- The HACCP system is amenable to effective food control. It allows for more efficient inspection of food operations, as the role of food inspectors is centered on the assessment of the HACCP plan and confirmation that it is properly designed and operating effectively.

- The HACCP concept can also be used to study food preparation practices, and to identify and assess hazardous behaviour, which should be the focus of health education interventions.

- The HACCP concept can also be used in the management of overall food safety programmes to identify those problems all along the food chain which are of greatest risk to public health, and in order to prioritize interventions.

- The HACCP system provides a scientifically-sound basis for demonstrating that all reasonable precautions have been taken to prevent a hazard from reaching the consumer. In this way, it encourages confidence in the safety of food products and thus promotes both confidence in the food industry and stability of food businesses.

SEVEN PRINCIPLES OF HACCP

1. Conduct hazard analysis
2. Identify critical control points (CCPs) in the process
3. Establish critical limits
4. Monitor each CCP
5. Establish corrective actions
6. Establish verification procedures
7. Establish record-keeping and documentation procedures

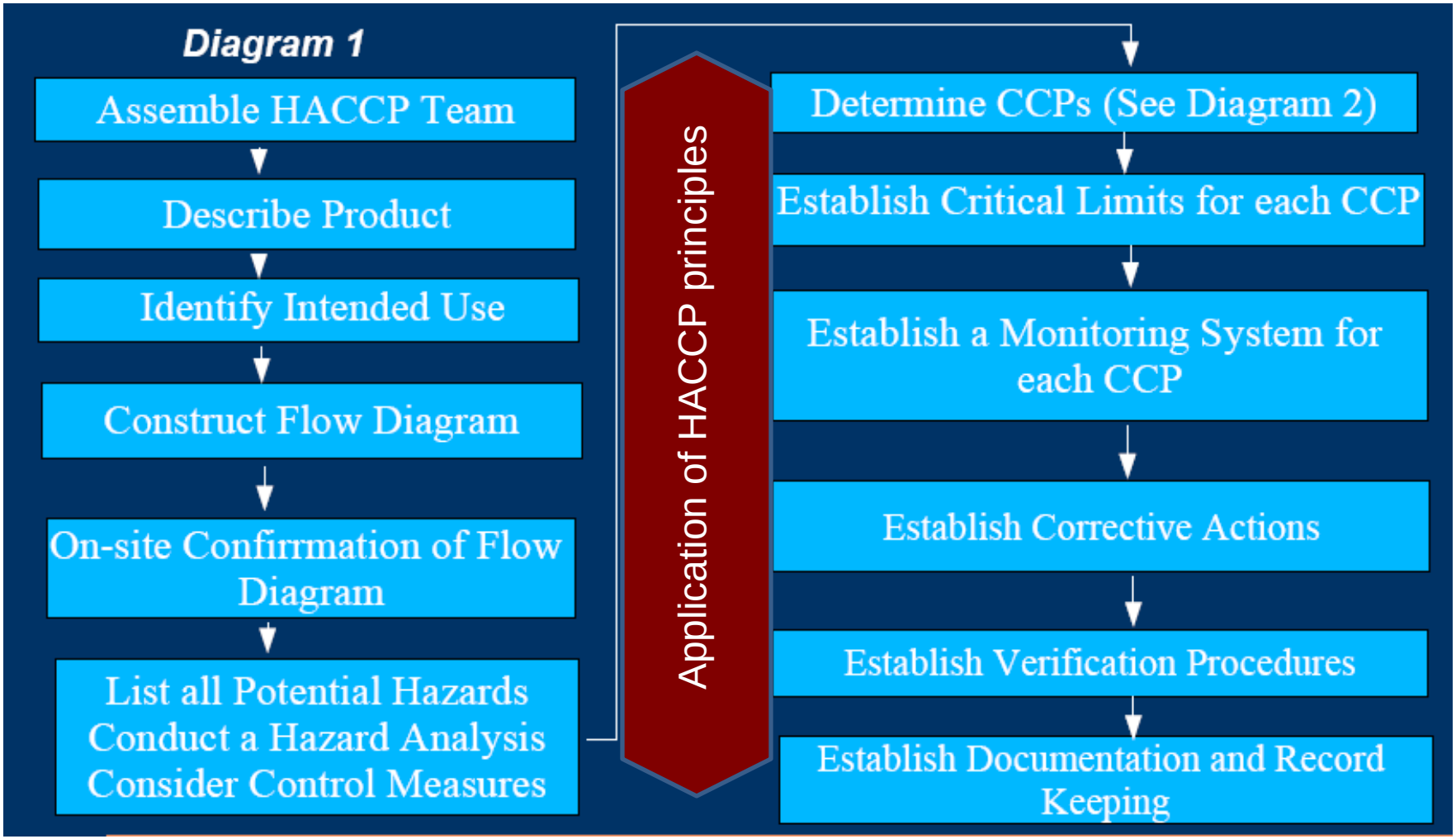
Sequence of 12 Steps

1. Assemble HACCP team
2. Describe product
3. Identity intended use
4. Construct process flow and plant schematic
5. On site verification of flow and schematic
6. List hazards associated with each process step (principle #1)

Sequence of 12 steps

7. Apply HACCP decision tree to determine CCP's (Principle #2)
8. Establish critical limits (Principle #3)
9. Establish monitoring procedures (Principle #4)
10. Establish deviation procedures (Principle #5)
11. Establish verification procedures (Principle #6)
12. Establish record keeping/documentation for principles 1 - 6 (Principle #7)

Logical Sequence for application of HACCP



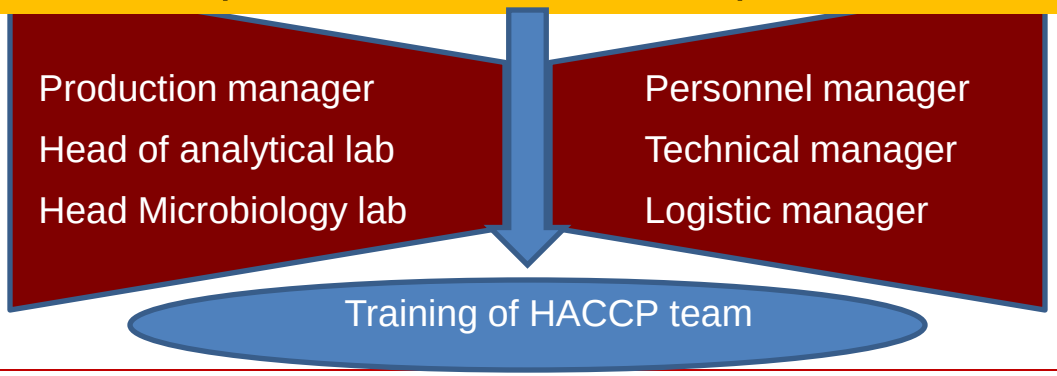
HACCP team

People chosen that have expertise in different areas:

- Production
- Shipping
- Quality Assurance
- Sanitation
- Maintenance
- Sales

1. Assemble HACCP team

A multidisciplinary team. Where such expertise is not available on site, expert advise should be obtained from the other sources.
(4- 6 membered team)



Identification of scope of the HACCP plan:

a) Describe which segment of the food chain is involved

b) General classes of hazards to be addressed (e.g. does it cover all classes of hazards or only selected classes).

c) Organization and documentation of HACCP study

d) Reviewing deviations from critical limits

e) Internal auditing of HACCP plans

e) Communication, education and training of employees in the operation of HACCP system

f) Understanding the stages of the process the team will be monitoring.

Product Description

- **Product Name(s)**
- **Important Product Characteristics**
- **How it is to be used**
- **Packaging**
- **Shelf Life**
- **Where it will be sold**
- **Labelling Instructions**
- **Special Distribution Control**
- **Specific Ingredients**

2. Describe product

A full description of the product should be drawn up, including relevant safety information such as:

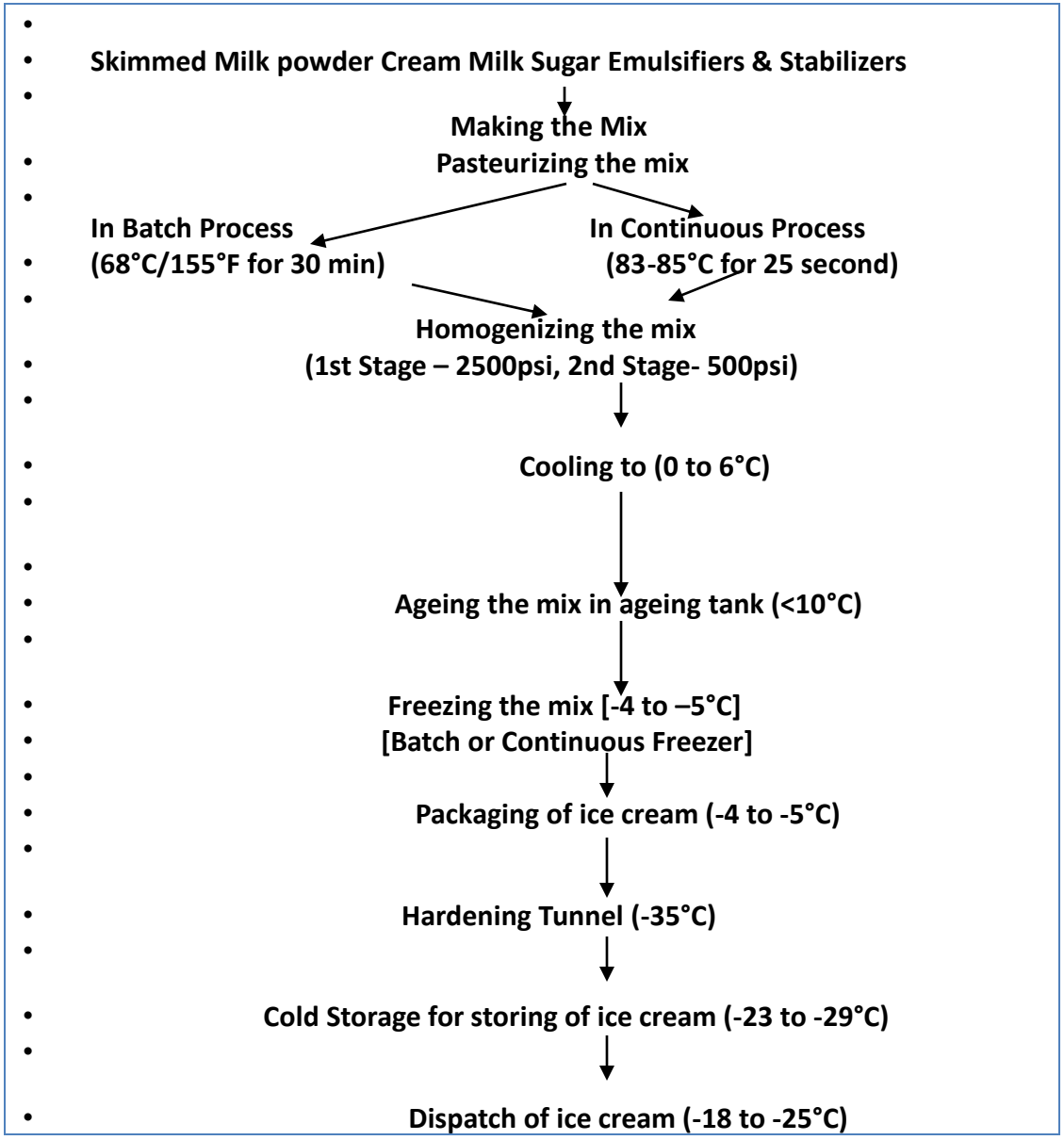
1. Common name of the product
2. Composition
3. Physical/ chemical structure (including Aw, pH, etc.),
4. Microcidal/ static treatments (heat-treatment, freezing, brining, smoking, etc.),
5. Packaging,
6. Labelling instructions if needed
7. Intended use (Regulatory requirements)
8. Durability and storage conditions and method of the distribution.

3. Identify intended use

The intended use should be based on the expected uses of the product by the end user or consumer. In specific cases, vulnerable groups of the population.

1. Product has to be prepared prior to consumption e.g. By heating or directly consumed?
2. Intended consumer is general public or particluar segment of the population? E.g. immunocompromised individuals/ elderly people etc.

4. Construct Flow diagram



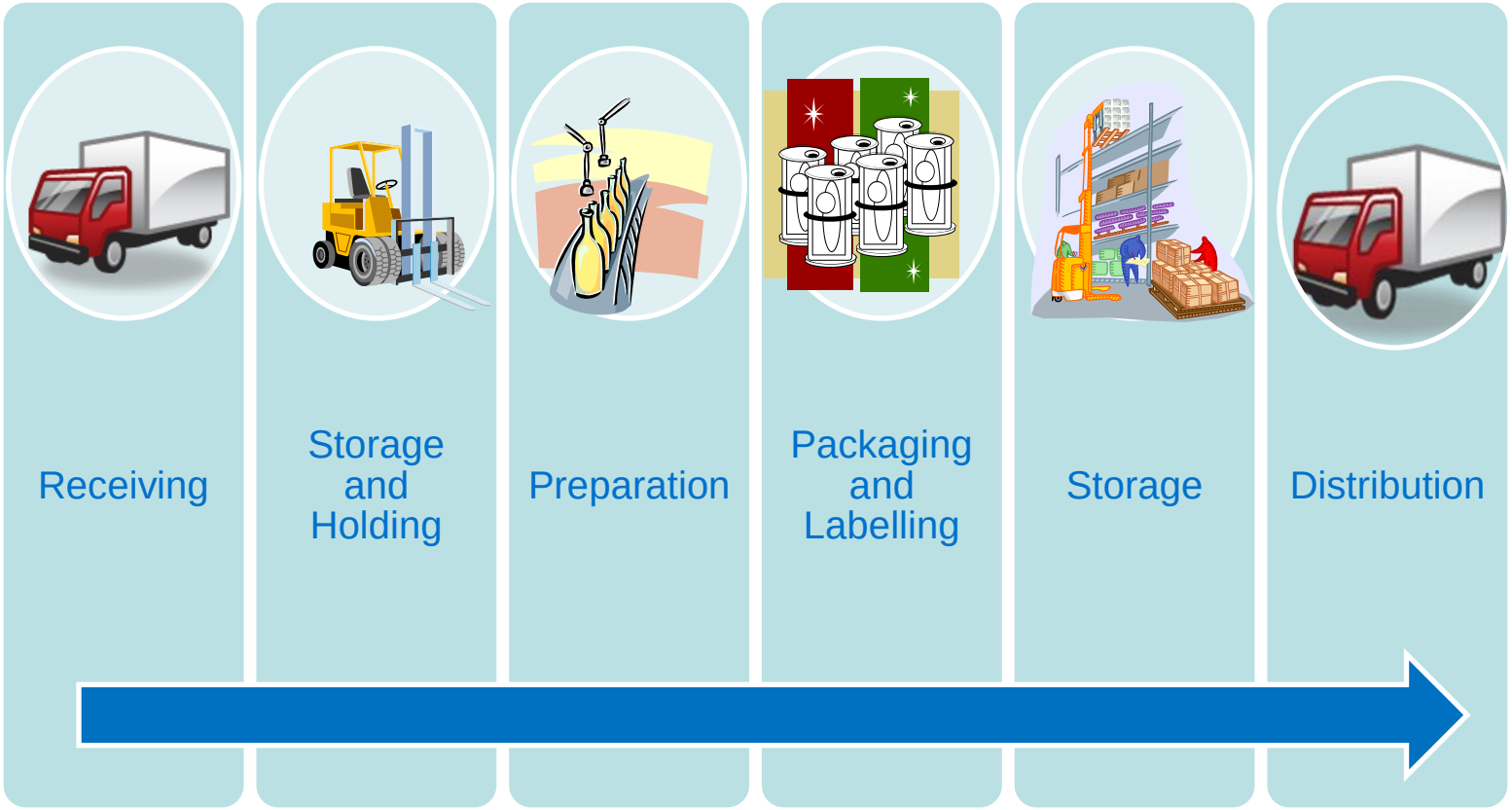
By HACCP team and team should be fully familiar with process

Should cover all the steps in the operation.

5. Onsite confirmation of flow diagram

A FLOW CHART REGARDING COMMERCIAL PREPARATION OF ICE CREAM

Define the processing steps



Determine hazards

- Look at each input- ingredients
- Determine possible hazards
- How are they controlled?

Principle 1: Conduct a hazard analysis

Any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.

Identification

Identify any hazardous biological, chemical or physical properties in raw materials and processing steps.

Evaluation

Assessment of likely occurrence and potential to cause food to be unsafe for consumption.

HACCP team

- ✓Experience
- ✓Epidemiological data
- ✓Available information in the literature

Principle 2: Identify critical control points

Steps at which controls can be applied to prevent, reduce or eliminate the hazards to a significant level.

Common points where CCPs can be applied:

- Chilling
- Testing of ingredients
- Cooking temperature (Time/ Temp combinations)
- Product formulation controls (pH, Aw, addition of cultures)
- Metalic contaminants testing
- Processing procedures (Filling, packaging)
- Slaughter procedures (evisecretion or antimicrobial interventions)

HACCP team

CCPs

- Critical control points
- Place where you can prevent, remove or reduce a hazard
- if there is not step in the process that can eliminate or reduce the hazards- use labelling, cooking instructions to inform how control can be achieved

Principle 3: Establish critical limits for each CCP

The maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level.

Upper limit: Set amount or level can not exceed

Lower limit: Minimum amount required to produce the safe effect.

✓Available information in the literature

HACCP team

Principle 4: Establish critical control point monitoring requirements and procedures

Observations or measurements to assess whether a CCP is under control and determines the point deviation has occurred.

✓Continuous is preferred

✓If not possible – Determine the frequency of non continuous

HACCP team

Important steps to monitor

✓Cooking
✓ Cooling
✓ reheating
✓ hot holding

Some tools/ forms for monitoring

- Raw material evaluation sheet
- Supplier guarantee
- Cooker log
- Pack room inspection report
- Cooking equipment validation letter
- Equipment calibration log
- Corrective action report
- Employee training report

Principle 5: Establish corrective actions

Procedures to be followed when a deviation occurs. i.e there is a failure to meet critical limits.

To adjust the process (cooling, heating etc.) to maintain the control or prevent a deviation
To correct the cause of deviation
To re- establish control over process and CCP
To determine safety and proper disposition of defective food
To maintain records of corrective actions

- Prepare a corrective action document with a list of n – number of possible corrective actions

Decision regarding disposal of non- complying material

Correcting the cause of deviation

Demonstrating that CCP is once again in control

Maintaining the records of corrective actions

HACCP team

Principle 6: Establish procedures for verification to confirm that HACCP system is working effectively

Application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with HACCP plan.

Phase--I

Verify that critical limits established for CCP will prevent, eliminate or reduce hazards to acceptable levels

Phase--II

Verify that overall HACCP plan is functioning effectively

Basic verification procedures

- ✓ Initiation of appropriate verification inspection schedules
- ✓ Review of HACCP plan for completeness
- ✓ Confirmation of accuracy of flow diagrams
- ✓ Review of CCP record
- ✓ Review of records of deviations and corrective actions
- ✓ Review of Critical control limits to verify if they are adequate to control significant hazards
- ✓ Review of modifications made to HACCP plan
- ✓ A random sample collection and analysis

- ✓ Visual inspection of food production operations to determine CCPs that are under control.
- ✓ A review of departure from critical limits and how they were corrected

Principle 7: Establish documentaion concerning all procedures and records appropriate to these principles and their application

Record keeping and documentation systems should meet the needs of the business and be adequate to show that the food system programme is working

Level of documentation

Need and complexity of the food business

Documents needed:

1. The HACCP plan
2. Hazard Analysis
3. CCP determinations
4. CCP monitoring sheet
5. Corrective actions
6. Audit records
7. HACCP team meeting minutes
8. Calibration records.

6. Conduct Hazard Analysis

List all potential Hazards & Control Measures

Biological

- Pathogen (bacteria & Virus)
- Parasite

Chemical

- Natural Toxin
- Chemical
- Pesticide
- Drug Residue
- Unapproved food & colour additives
- Food Ingredient

Physical

- Metal, glass, wood, plastic, stones

Principle 1

Potential Food safety hazards in supply chain

1. Bacteria & other microbial agents including toxins resulting from improper food handling
2. Udder infection, treatment with drugs and public health implications:
3. Environmental contaminants (e.g., air, water, soil)
4. Residues of substances used in agricultural production and processing: such as pesticides

Milk As A Potential Carrier Of Pathogenic Bacteria

Pathogen	On farm source
Salmonella sp.	Intestinal tract of most domesticated and wild animals
Listeria monocytogenes	Widespread in soils, fresh and salt water, composts, sewage, wild and domesticated animals and birds, animal manure
Escherichia coli	Intestinal tract of ruminant's esp. cattle and sheep. Animal manure and slurry
Bacillus cereus	Soils , manure and bedding materials
Staphylococcus aureus	Humans, animals and birds on skin as well as on various parts of body e.g. nose and throat
Cl.botulinum	Soil, fresh water, carcasses and animal
Yersinia enterocolotica	Mouth and intestines of wild and domestic animals, shellfish & mollusks
Campylobacter jejuni	Intestinal tract of domestic and wild animals and birds. Faecally contaminated water. Humans can also be carriers without symptoms

Major Hazards at Dairy Farm

TYPE OF HAZARDS	RISK FACTORS
E.coli, Salmonella, clostridium	Transmission by milkman/ animal through Fecal source
Listeria, Pseudomonas ,Enterobacter sp, yeast & fungus	Milk contamination through Environment: water and soil etc
M. tuberculosis, M bovis, Brucella	Healthy carrier animals and man
Staph .aureus, , Listeria, , E.coli , Streptococcus	Mastitis infection
Drug residues ,pesticides ,heavy metals and toxins	Non–respect of withdrawal periods of Drug residues, non compliance to GAP , GHP etc

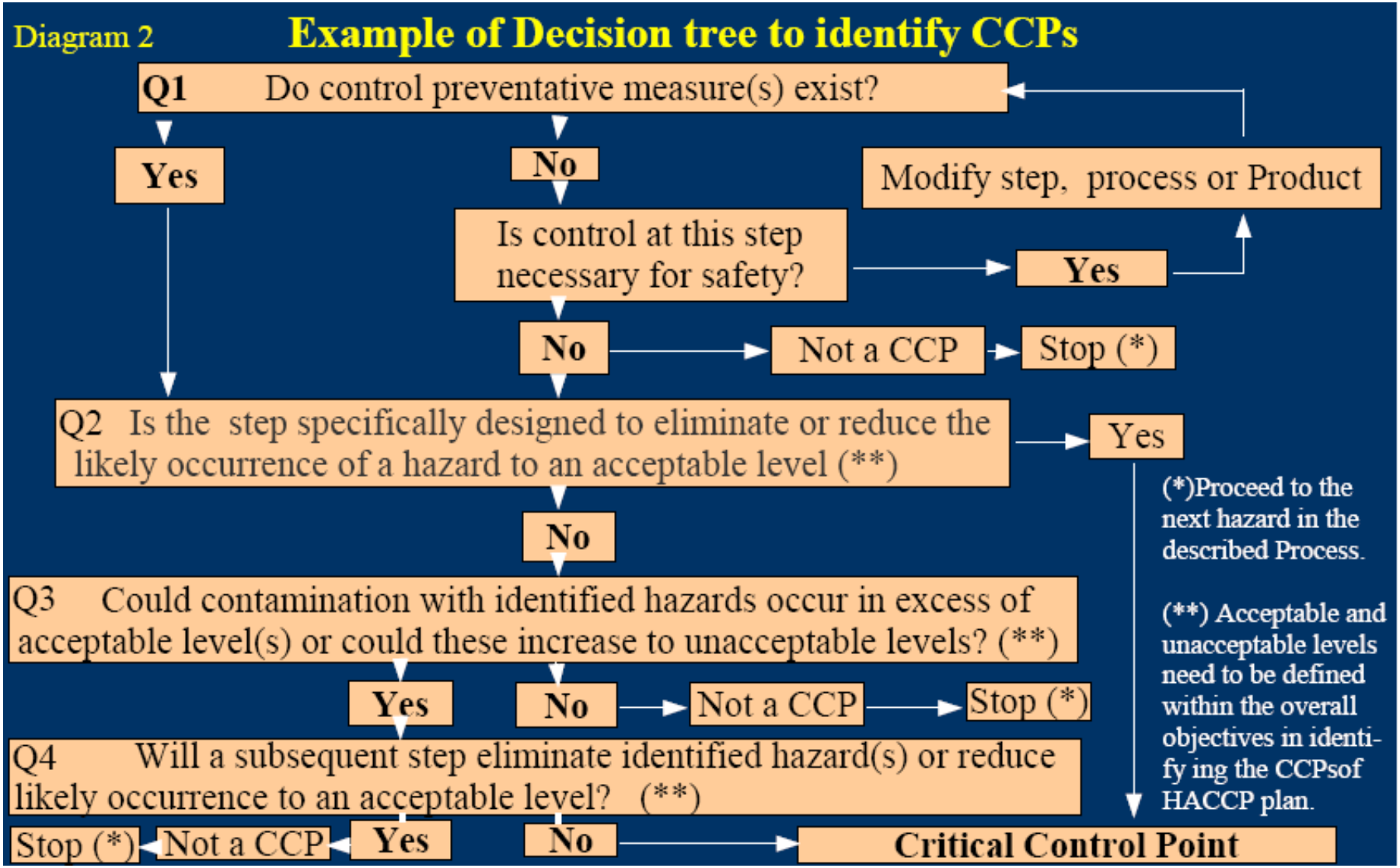
Major Hazards during transportation & milk collection

TYPE OF HAZARDS	RISK FACTORS
Grow of microorganisms	High temp. of storage & carrying time too long
Thermoduric / thermophilic bacteria from equipment surfaces	Inefficient Cleaning & disinfection
Entry of pathogens	Hand contacts with the milk
Faecal Spoilage bacteria	Use of contaminated water
Heat resistant proteolytic enzymes	Temperature of cooling tanks not regulated
Development of coliform flora	Absence of cooling
Spoilage bacteria	Manual filling of the tanks

Major Hazards during processing , storage and distribution

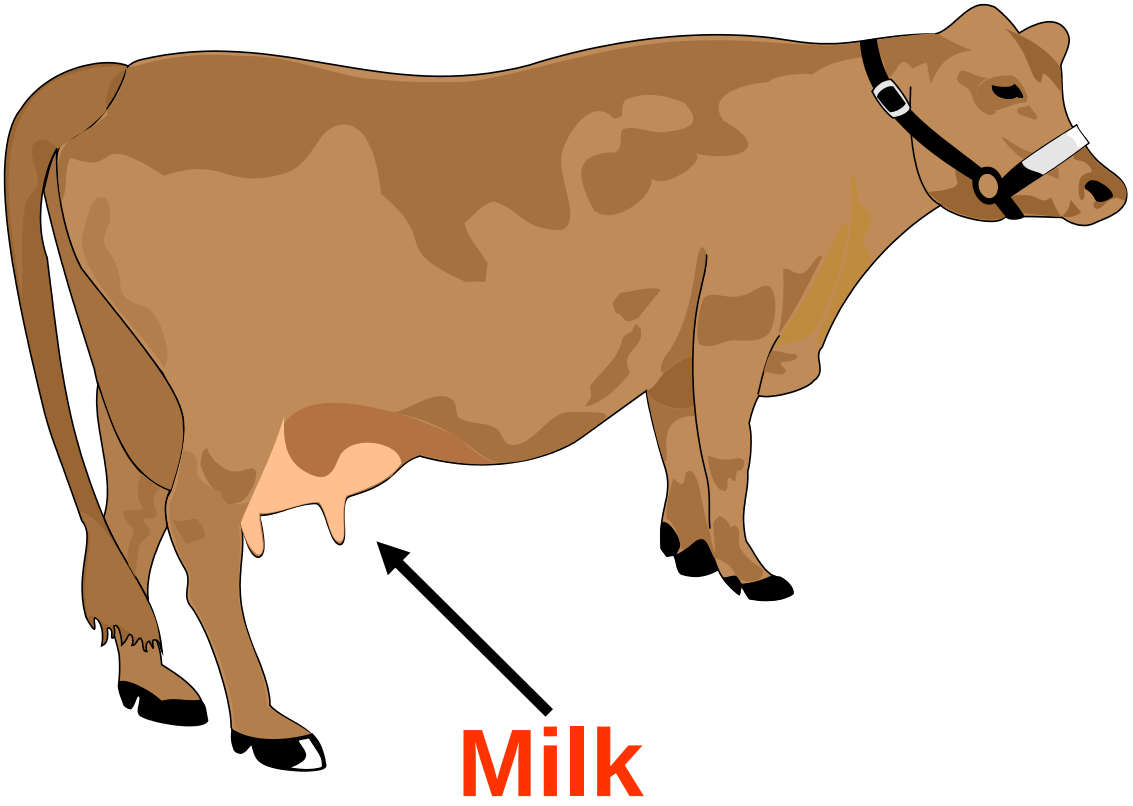
TYPE OF HAZARDS	RISK FACTORS
Spoilage bacteria from equipment surfaces	Poor implementation of SSOP
Enterobacter sp, yeast and fungus	Improper sealed packing & hygiene during packaging
Persistence of micro-organisms	Absence / or insufficient thermal treatment time /temperature
Diarrheic syndrome listeriosis , tuberculosis , brucellosis	Consumption of contaminated raw milk
Mesophilic bacteria	Poor quality , high temperature and too lengthy preservation

Determination of CCP

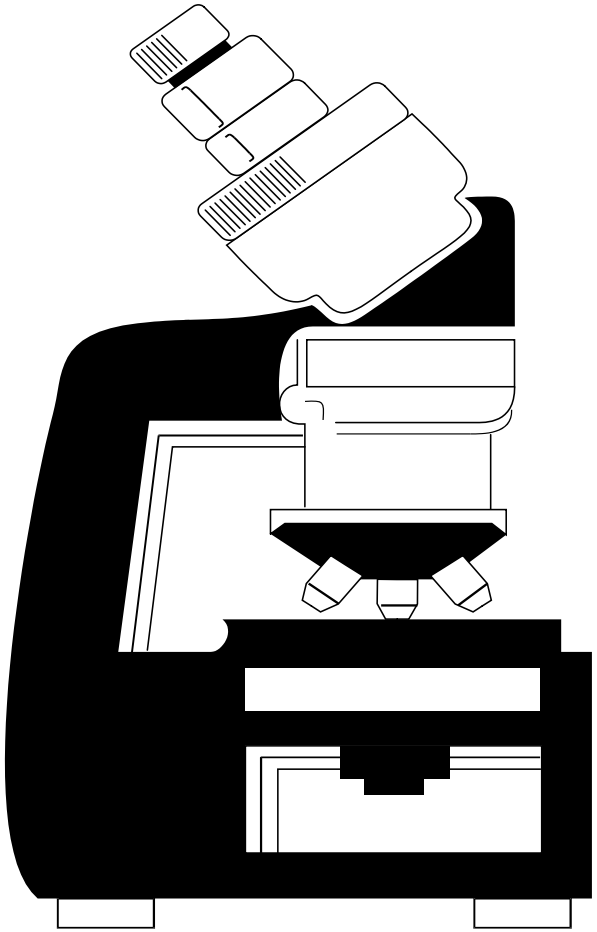


Example of processing for safety

RAW MATERIAL



Potential hazards

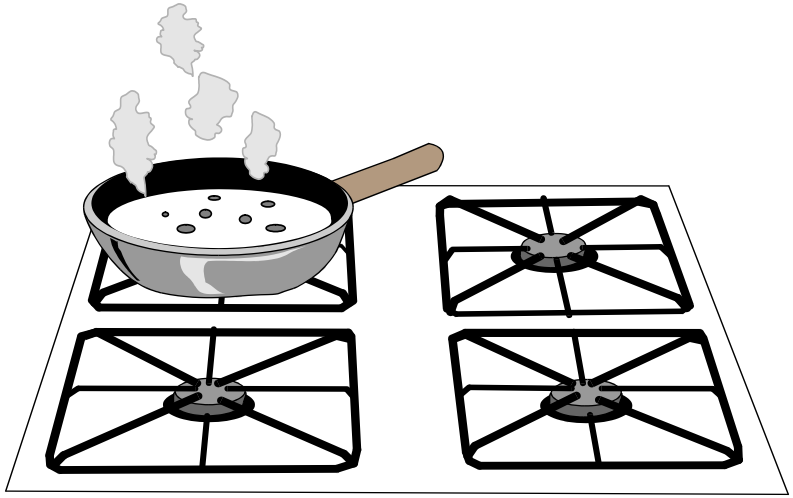


Salmonella
Campylobacter

Control measure

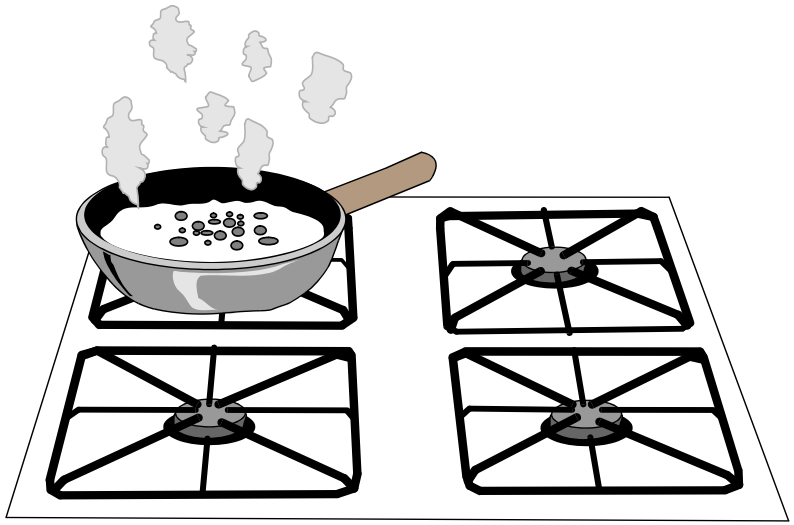
Heating

Critical Control Point



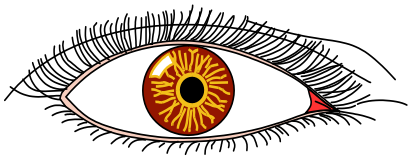
Boiling in pan

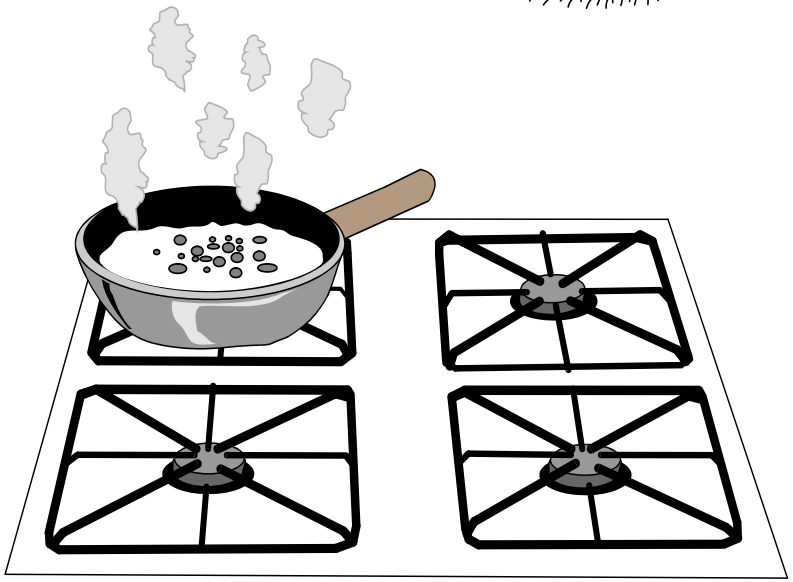
Critical limit



Foam formation

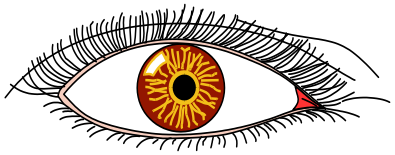
Monitoring

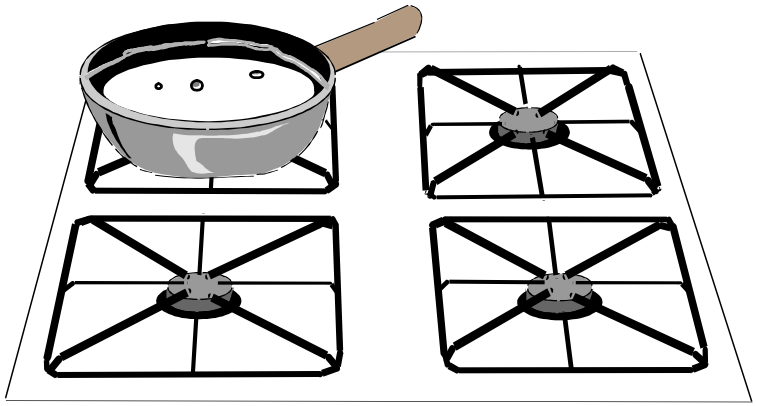




Observation of foaming

Verification





Observation of foam residues

Use

Drinking while still hot

(This prevents recontamination and growth which may lead to hazards)

Advantages of HACCP

- ✓ More effective use of resources, savings and timely response to food safety problems.
- ✓ Internationally recognized.
- ✓ Promoting international trade
- ✓ Gain in confidence of staff and business owners to face third party audits, inspectors, consultants, trading partners, consumers and others.
- ✓ Strengthening of regulatory approach to food safety by providing food control authorities with an opportunity to revisit their methods of food inspection and training provided to food inspectors.
- ✓ More focused control on process critical to food safety
- ✓ Flexibility to accommodate additional changes in production, quality or other specific measures.
- ✓ Demonstrable improvements to food quality and safety standards, thereby reducing the potential of food born diseases, customer complaints, wastage and damage to the reputation of the business.

Disadvantages of HACCP

- ✓ Resource intensive during development
- ✓ Difficult to anticipate all hazards introduced by subtle variations, thus needs constant vigil.
- ✓ Element of technical knowledge required.
- ✓ Perceived complexity and bureaucracy by smaller businesses.
- ✓ Lack of proper knowledge and adequate training.
- ✓ The cost of ongoing training against a backdrop of high staff turnover.

1. Product Description

1. Product Name	Cheddar Cheese
2. Important product characteristic (moisture,pH, salt, preservatives…)	Hard cheese Moisture%: 30-45% PH: 5.2-5.4 Salt: 1.5 -2.0%
3. How it is to be used	Ready to eat
4. Packaging	Cryovac, vacuum seal
5. Shelf life	Several years
6. Where it will be sold	Retail store
7. Labeling instruction	Keep refrigerated
8. Distribution condition	Refrigerated

Hazards in Ingredient and Incoming Material Analysis Chart

Ingredient & material	Hazards	Preventative measure
Milk	MCP	Store < 4 ºC, Proper transfer equipments, Sanitize equipment Proper personal hygiene and handling
Starter culture	M	Qualified product supply, store < -40 ºC
Rennet	M	Qualified product supply, store < 4 ºC
Salt	MP	Qualified product supply, store at Room temp. Proper personal hygiene and handling
Water	MCP	Supply quality water
Cryovac	MCP	Qualified product supply

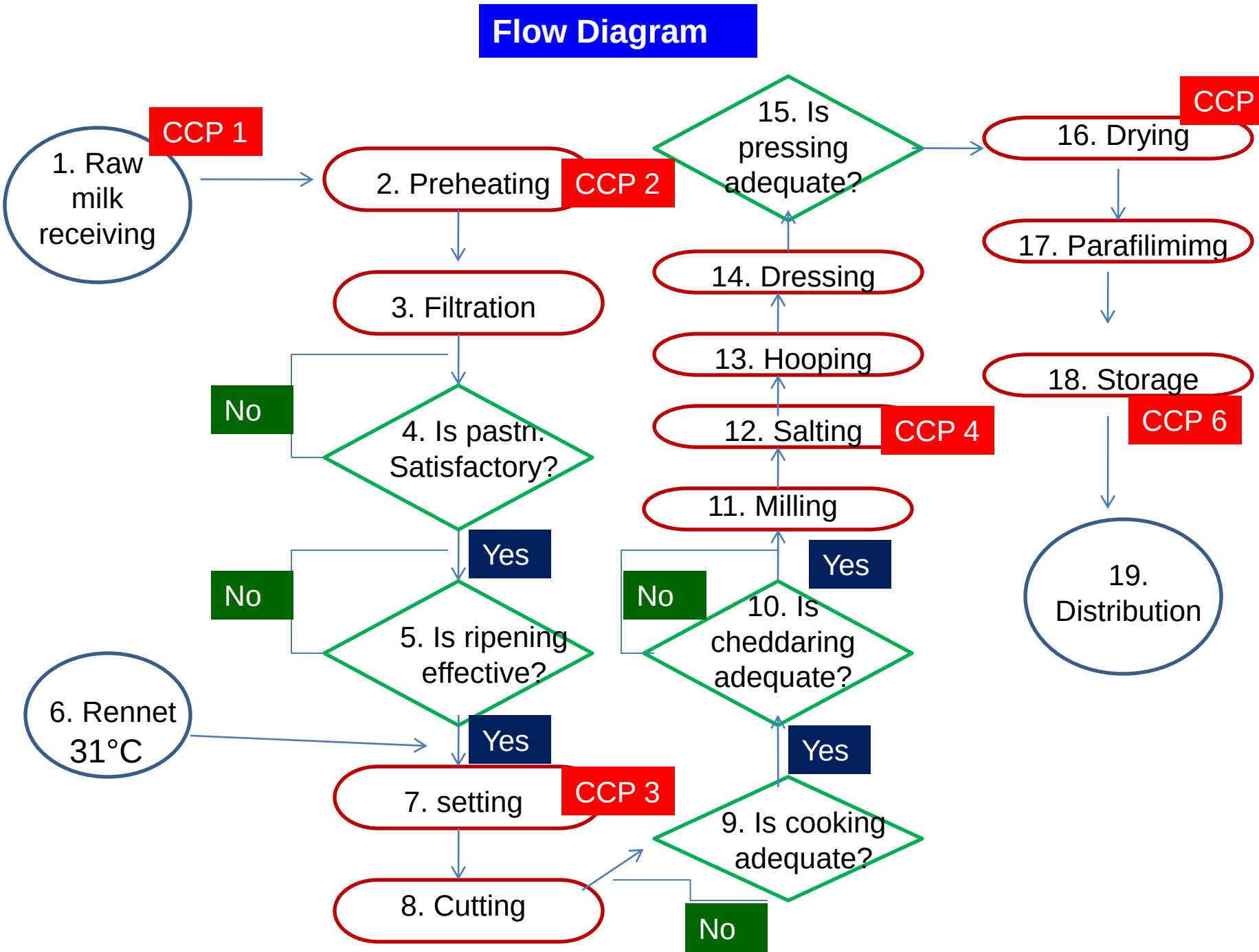
HACCP ANALYSIS FOR CHEESE

Process step	Hazards	Preventative measure	Critical limits	Monitoring procedure	Monitoring frequency	Corrective action
Raw & packaging material CCP # 1	Microbiological chemical & physical contamination	Qualified starter & rennet supply Qualified cryvoac supply	No unqualified material be used	Apply supply quality assurance	Each supply	Change supplier Operator training
Pasteurization CCP #2	Survival of pathogens such asE.coli, Staphylococcus aureus, Bacillus cereus, etc.	Pasteurizer checks: -check the heat plate -check the temperature controller -check the flow diversion	Temperature set at 72ºC Time set at 16 sec	Check thermometer and time check equipment is properly running Supervisor managing and record keeping	Each batch Routinely Each batch	Adjust the temperature And time by setting the equipment well Call the engineer to repair

Filling CCP #3	**Microbiological contamination**	**Proper temperature setting**	**Temperature set at 32ºC**	**Check thermometer Record keeping**	**Each batch Each batch**	**Adjust the heater to change temperature**
Adding starter & rennet CCP #4	Microbiological contamination Physical contamination	Proper additional rate Agitate properly	Starter: 2cans, Rennet: 40 mL per 1000 lbs milk pH is measured at 6.6 before adding rennet Agitator set at medium	Check the additional rate of the starter and rennet & pH check the rate of the agitator Record keeping	Each batch Each batch	Applying more testing on pH Use active starter culture Adjust agitate rate Operator training
Coagulation CCP #5	Microbiological contamination Physical contamination	Proper time setting and recording Take the stirring tools out of the tank	Time is set at 30min Tools prevent coagulation	Check the time and the stirring tools Record keeping	Each batch Each batch	Reject product Operator training

Cutting, scalding & stirring CCP #6	**Microbiological contamination**	**Proper time & temperature setting**	**Temperature is set at 38ºC, scalding for 30min and stirring for 20min**	**Check the temperature and the time Record keeping**	**Each batch Each batch**	**Adjust the heater to change temperature Operator training**
Milling CCP #7	Microbiological contamination	More cheddaring time control the pH Use of an active starter culture at the correct addition	pH is measured at 5.2-5.4	Consistently monitor pH during cheddaring Supervisor's managing and record keeping	Each batch	Reject product Applying more testing on pH Operator training
Salting CCP #8	Microbiological contamination	Correct level of salt Correct mixing during salting	Salt%=1.5-2.0%	Records and testing	Each batch	Incorrectly salted curd must not be allowed to progress

Flow Diagram



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