Hazard Analysis and Critical Control Point (HACCP)

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Definitions

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

**Hazard analysis:** The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.

**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.

**HACCP:** A system which identifies, evaluates, and controls hazards which are significant for food safety.

**HACCP plan:** A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.
Definitions

**Control measure:** Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

**Corrective action:** Any action to be taken when the results of monitoring at the CCP indicate a loss of control.

**Critical limit:** A criterion which separates acceptability from unacceptability.

**Step:** A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.

**Validation:** Obtaining evidence that the elements of the HACCP plan are effective.

**Verification:** The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

**Monitor:** The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.
General food hygiene principles

*Food must be safe and suitable for its intended use!*

All food and feed business operators at all stages of production, processing and distribution

- must ensure that their products are safe and suitable
- are obliged to carry out self-monitoring to demonstrate product safety and document the results
- must apply HACCP to ensure online-process control
- shall be able to
  - identify any person *from whom* they have been supplied with a food, a feed, a food-producing animal, or any substance intended to be incorporated in food
  - identify the other businesses *to which* their products have been supplied ("traceability")
Primary production

RATIONALE:
reduce the likelihood of introducing a hazard which may adversely affect the safety of food, or its suitability for consumption, at later stages of the food chain

this includes:

- avoiding the use of areas where the environment poses a threat to the safety of food
- controlling contaminants, pests and diseases of animals and plants in such a way as not to pose a threat to food safety
- adopting practices and measures to ensure food is produced under appropriately hygienic conditions.
Food handling establishments

location, design and construction of premises, equipment, facilities must ensure that:

• contamination is minimized
• design and layout permit appropriate maintenance, cleaning and disinfections and minimize air-borne contamination
• surfaces and materials, in particular those in contact with food, are non-toxic in intended use and, where necessary, suitably durable, and easy to maintain and clean
• where appropriate, suitable facilities are available for temperature, humidity and other controls
• there is effective protection against pest access
Product information and consumer awareness

Products should bear appropriate information to ensure that:
- adequate, accessible information is available to the next person in the food chain to enable them to handle, store, process, prepare and display the product safely and correctly
- the lot or batch can be easily identified and recalled if necessary

Consumers should have enough knowledge of food hygiene to enable them to:
- understand the importance of product information
- make informed choices appropriate to the individual
- prevent contamination and growth or survival of foodborne pathogens by storing, preparing and using it correctly

Information for industry or trade users should be clearly distinguishable from consumer information, particularly on food labels.
Control of food hazards

Food business operators should control food hazards through the use of systems such as HACCP.

They should

- **identify** any steps in their operations which are critical to the safety of food
- **implement** effective control procedures at those steps
- **monitor** control procedures to ensure their continuing effectiveness
- **review** control procedures periodically, and whenever the operations change
HACCP principles

(a) establishing **documents and records** commensurate with the nature and size of the food business to demonstrate the effective application of the measures outlined in subparagraphs (a) to (f)

(b) identifying the **critical control points** at the step or steps at which control is essential to prevent or eliminate a hazard or to reduce it to acceptable levels

(c) establishing **critical limits** at critical control points which separate acceptability from unacceptability for the prevention, elimination or reduction of identified hazards

(d) establishing and implementing effective **monitoring** procedures at critical control points

(e) establishing **corrective actions** when monitoring indicates that a critical control point is not under control

(f) establishing procedures, which shall be carried out regularly, to **verify** that the measures outlined in subparagraphs (a) to (e) are working effectively

(g) identifying any **hazards** that must be prevented, eliminated or reduced to acceptable levels
Application of HACCP principles

1. Assemble HACCP team
2. Describe product
3. Identify intended use
4. Construct flow diagram
5. On-site confirmation of flow diagram
6. List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards
7. Determine Critical Control Points
8. Establish critical limits for each CCP
9. Establish a monitoring system for each CCP
10. Establish corrective actions
11. Establish verification procedures
12. Establish Documentation and Record Keeping
1. Assemble HACCP team

ideally multidisciplinary team

appropriate product specific knowledge and expertise

expert advice from other sources:

• HACCP literature
• approved guidance documents
• regulatory authorities
• academia
• other independent experts
• industry associations
Application of HACCP principles

2. Describe product

- composition
- physical/chemical structure (including $a_w$, pH, etc.)
- microcidal/-static treatments (heat treatment, freezing, brining, smoking)
- packaging
- durability
- storage conditions
- method of distribution

Group products with similar characteristics or processing steps
Application of HACCP principles

3. Identify intended use
   - intended use of the product
   - probable handling by the consumer/end-user
   - consider vulnerable groups

4. Construct flow diagram
   - cover all steps in the operation for a specific product
   - may be used for a number of products with similar processing steps
   - consider steps preceding and following the specified operation
   - benefit: helps managers / food handlers to better understand the flow of materials through their business!

5. On-site confirmation of flow diagram
   - during all stages & at all hours of operation
Process flow diagram – pasteurised apple juice

Reception of raw material
  Weighing
  Prewashing
    Sorting
    Washing
      Cutting
        Fruit pulp extraction

At which steps could hazards be introduced?
Application of HACCP principles

6. List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards

• list all hazards that may occur at each step
• analyse for each hazard:
  how likely is it that the hazard occurs?
  how severe is its adverse health effect?
  how can the hazard be detected (qualitatively and/or quantitatively)
  can the microorganisms of concern survive?
  which conditions can lead to occurrence of the hazard?
  what is the quality of raw materials?
  how can I control the hazard?
## Hazard analysis – example pasteurised milk

<table>
<thead>
<tr>
<th>Processing step</th>
<th>Identify potential hazards introduced, controlled or enhanced at this step</th>
<th>Are any potential food safety hazards significant? (YES/NO)</th>
<th>Justify your decision for previous column</th>
<th>What control measures can be applied to prevent the significant hazards?</th>
<th>Is this step a critical control point (YES/NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk reception</td>
<td>Biological</td>
<td>YES</td>
<td>pathogenic bacteria</td>
<td>Control achieved at farm level</td>
<td>NO</td>
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<tr>
<td></td>
<td>Chemical</td>
<td>YES</td>
<td>residual antibiotics</td>
<td>Quality should be checked before reception</td>
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<tr>
<td></td>
<td>Physical</td>
<td>YES</td>
<td>Hair, etc.</td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Standardise</td>
<td>Biological</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
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<td></td>
<td></td>
<td>NO</td>
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<td>Sterify</td>
<td>Biological</td>
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<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
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<td>Homogenise</td>
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<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
<td>NO</td>
<td></td>
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<tr>
<td>Heating</td>
<td>Biological</td>
<td>YES</td>
<td>Presence of active</td>
<td>Heating for approved</td>
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<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td>vegetative and spore forming pathogens</td>
<td>temperature time</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Cooling</td>
<td>Biological</td>
<td>YES</td>
<td>Prevent</td>
<td>Monitoring physical</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td>recontamination</td>
<td>condition of plant</td>
<td>NO</td>
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<tr>
<td></td>
<td>Physical</td>
<td>NO</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Packaging and Distribution</td>
<td>Biological</td>
<td>YES</td>
<td>Cross-contamination</td>
<td>Pre-sterilisation of plant</td>
<td>NO</td>
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<tr>
<td></td>
<td>Chemical</td>
<td>NO</td>
<td></td>
<td>Installation of filler in “clean” area with control of air flow and</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
<td>NO</td>
<td></td>
<td>pressure</td>
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</table>
Application of HACCP principles

7. Determine Critical Control Points
   - logical consideration of all steps where hazards can be controlled
   - facilitated by the application of a decision tree (facilitates transparency and verification)
   - control can be applied to address a given hazard at more than one CCP

   - Can control be applied at this step or process?
   - Will a loss of control at this point result in a potential hazard in the finished product?

NOTE:
If a hazard has been identified at a step where control is necessary for safety and no control measure exists at that step, or any other, then the product or process should be modified at that step, or at any earlier or later stage, to include a control measure !!!
Q1  Do control preventative measure(s) exist?

Yes

Is control at this step necessary for safety?

No

Modify step, process

Not a CCP

Yes

Q2  Is the step specifically designed to eliminate or reduce the likely occurrence of a hazard to an acceptable level?

No

Not a CCP

Yes

Q3  Could contamination with identified hazard(s) occur in excess of acceptable level(s) or could these increase to unacceptable levels?

No

Not a CCP

Stop

Yes

Q4  Will a subsequent step eliminate identified hazard(s) or reduce likely occurrence to an acceptable level?

No

CRITICAL CONTROL POINT

Not a CCP

Stop

Yes
Application of HACCP principles

8. Establish critical limits for each CCP
   • for each critical control point
   • realistic & sufficient to provide necessary food safety assurances
   • measurable, observable criteria
     e.g. temperature, time, pH, level of available chlorine

   not always possible in small businesses, but:
   make best use of the temperature and time criteria
   combine with sensory evaluation (visual appearance, texture)

9. Establish a monitoring system for each CCP
   • monitoring procedures must be able to detect loss of control at the CCP
   • frequency of monitoring must be sufficient to guarantee that no unsafe product reaches the consumer
   • record and evaluate results (by person trained to carry out corrective actions)
10. Establish corrective actions

What needs to be done to bring the CCP under control?
How can I ensure that potentially unsafe products are not marketed?
Corrective actions should be:

• easily implemented and understood
• documented and communicated to management
• corrective action should be carried out immediately:
  continuing to heat food to the required temperature
  rejection of a load of incoming ingredients
11. Establish verification procedures

- to determine if the HACCP system is working correctly
- to highlight deficiencies
- simple to perform and easy to record
- usually performed by someone other than the person responsible for monitoring

Verification activities should ensure that:

- prescribed practices are consistently followed
- personnel have the tools and facilities for proper personal hygiene and sanitary practices (e.g. hand-washing facilities, sanitizing equipment, cleaning supplies, temperature measuring devices, sufficient gloves)
- calibrations have been conducted as needed and according to the requirements of the equipment
- control procedures are being followed
Application of HACCP principles

12. Establish Documentation and Record Keeping

Documentation of:
- Hazard analysis
- CCP determination
- Critical limit determination

Records of:
- Monitoring activities, e.g. recorded temperature
- Corrective actions taken
- Verification procedures performed

use existing paperwork, e.g. delivery invoices, simple checklists for documenting product temperatures etc.
HACCP worksheet

- Description of product
- Process flow diagram

<table>
<thead>
<tr>
<th>Step</th>
<th>Hazard(s)</th>
<th>Control Measure(s)</th>
<th>CCPs</th>
<th>Critical Limit(s)</th>
<th>Monitoring Procedure(s)</th>
<th>Corrective Action(s)</th>
<th>Record(s)</th>
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Thank you for your attention

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