Hazard Analysis and Critical Control Points (HACCP) (Lecture 8)

Food safety in the early twenty-first century is an international challenge requiring close cooperation between countries in agreeing standards and in setting up transnational surveillance systems. The behavior of consumers has been gradually changing. They currently require not only much higher dietary quality, hygiene and health standards in the products they purchase, but they also look for certification and the reassurance of products' origins (national or geographical) and production methods.

History of HACCP

Hazard Analysis and Critical Control Point (HACCP) was developed in the 1960s in the United States to ensure food safety for the first manned National Aeronautics and Space Administration space missions (NASA). NASA required a 'zero defect' program to guarantee safety in the foods astronauts consumed in space. Since then, HACCP principles have been defined and endorsed in international food standards (Codex Alimentarius Commission), and in European and UK legislation.

The Need For an Effective Food Safety Assurance Method

The HACCP system has grown to become the universally accepted method for food safety assurance. Why?

- Foodborne diseases are a widespread public health problem
- Emergence of foodborne diseases
- Increased knowledge and awareness of the serious and chronic health effects
- New food technologies and processing methods
- Increased awareness of the economic consequences of foodborne diseases
- Increase in the number of vulnerable people
- Industrialization and mass production
- Urbanization
- Changing lifestyle
- Increase tourism and international trade in foodstuffs
- Increase consumer awareness of food safety

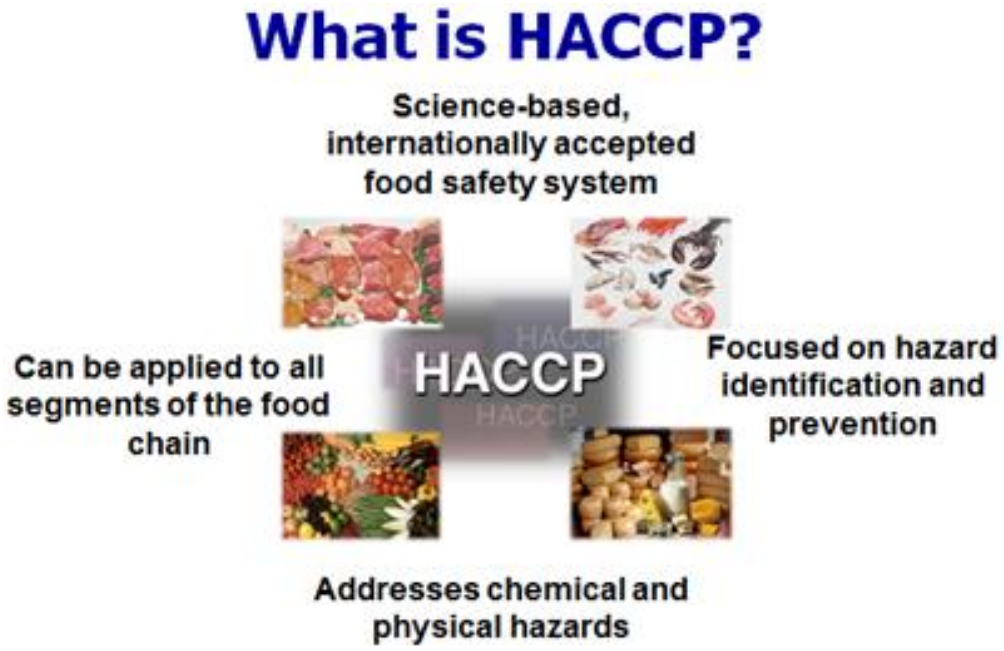
Definition of HACCP

- HACCP is a systematic approach to the identification, evaluation, and control of food safety hazards.
- HACCP is a management tool used to protect the food supply against biological, chemical and physical hazards.

What is HACCP

- **Problems**
  - Foodborne diseases
  - Market access – importance of food safety all along the food-chain
- **Solutions**
  - Food safety system that focuses on preventing problems before they occur
  - Industry-led programme used to improve and verify food safety
- **Answer**

Hazard	Danger to health
Analysis	Investigation of the hazard
Critical	Crucial for containment
Control	Handling of conditions
Points	Position in the process



Hazard
Analysis
Critical
Control
Point

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

Why Adopt HACCP?

A properly functioning HACCP system will result in the production of safer food.

- **Benefits:**
  - △ Improved food safety
  - △ Increased market access
  - △ Protection against liability
  - △ Drive for continuous improvement
  - △ Enhanced process control

Where can HACCP be used?

HACCP can be used in any food sector from production to retail

The Seven Principles of HACCP

1. Conduct hazard analysis
2. Determine critical control points (CCP)
3. Establish critical limits
4. Establish system to monitor control of CCP
5. Establish corrective actions
6. Establish verification procedures
7. Establish documentation

Implementing HACCP

1. **Preliminary Steps for the introduction of a HACCP System**
    - Gathering the resources and information needed
2. **Seven principles of HACCP in action**
    - Completion of all steps will result in a properly functioning HACCP plan

Preliminary steps

1. **Assemble the HACCP team**

- Group of people that will oversee the implementation and maintenance of the HACCP programme
- Multi-disciplinary (i.e. production, sanitation, management, etc.)
- Including a HACCP-trained person

2. **Description of the products**

- A full description of the product should be prepared
- All relevant safety information should be reported including: composition, physical/ chemical characteristics, packaging, storage conditions, etc.

3. **Identification of intended use and consumers**

- Which group(s) will be consuming the food product
- Where will the product be sold
- How will it be prepared

4. **Development and verification of process flow diagram(s)**

- Flow diagram for process should be constructed by HACCP team
- The flow diagram should cover all steps in the operation
- HACCP team should confirm the processing operation against the flow chart

Principle 1: Conduct Hazard Analysis

Hazard

A hazard is a biological, chemical or physical agent that is reasonably likely to cause illness or injury in the absence of its control. In HACCP, hazards refer to the conditions or contaminants in foods that can cause illness or injury.

Types of Hazards

There are 3 types of hazards

- Biological
- Chemical
- Physical

- **Biological hazards can cause illness and include:**
  - △ Bacteria
  - △ Viruses
  - △ Parasites
  - △ Yeasts and moulds
  - △ Any toxin produced by microbiological organisms is also a biological hazard
- **Chemical hazards can cause injury or poisoning and include:**
  - △ Naturally occurring substances (e.g. allergens, plant specific toxins)
  - △ Excessive, intentionally added chemicals: antibiotics, pesticides, herbicides, fungicides, nitrates
  - △ Accidentally added chemicals: cleaning chemicals, paint, pest control chemicals
- **Physical hazards are foreign objects that can cause injury:**
  - △ Glass
  - △ Metal grindings, screws, nuts, bolts
  - △ Stones, pebbles
  - △ Needles
  - △ Hard plastic
  - △ Bones

Hazard Analysis

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

Principle 2: Determine critical control points (CCPs)

A CCP is a point, step or procedure at which a control measure has to be applied to prevent, eliminate or reduce a food safety hazard. CCPs are not necessarily located where the hazard occurs, they may be located at a subsequent step. There may be more than one CCP at which control is applied to address the same hazard.

Control Measure

Any action or activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level. More than one control measure may be required to control a specific hazard and more than one hazard may be controlled by a specified control measure.

CCP vs. CP

- **Critical control point**
  - △ Any point in process that is critical to food safety
- **Control Point**
  - △ Any point in process critical
    - regulatory - weight control, labeling
    - economic - customer quality, mold

Principle 3: Establish Critical Limits (CL)

Critical Limit

- Critical limits are the boundaries that must be met to control a food safety hazard
- The maximum and/or minimum value to which a parameter must be controlled at a CCP
- The critical limit separates acceptability from unacceptability
- The critical limit must be clearly defined and measurable
- Critical limits must be specified and validated for each CCP

For example a bridge can bear

Maximum load: 1 ton and **Maximum speed:** 15 km/h

If you exceed the critical limit, the bridge will break

Principle 4: Establish System to Monitor Control of the CCP

Monitoring is the process of conducting a planned sequence of observations or measurements of control parameters to access whether a CCP is under control.

- Monitoring results must be recorded. If monitoring shows that critical limits are not met, then the process is out of control and the food may be unsafe.
- Monitoring data should be evaluated by designated person with knowledge and authority to take action.
- Frequency of monitoring must be sufficient to ensure effective control.

Principle 5: Establish Corrective Actions

Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.

Corrective Action

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

- Specific corrective actions must be developed for each CCP in the HACCP system in order to deal with deviations when they occur
- Actions must ensure that the CCP has been brought under control
- Deviation and product disposition procedures must be documented

Principle 6: Establish Verification Procedures

Establish procedures for verification to confirm that the HACCP system is working effectively.

Verification

- Verification procedures are those activities, other than monitoring CCPs, that verify the HACCP plan and show the system is operating according to the plan.
- It is usually completed annually or when a system fails or there is a significant change in the product or process.

Principle 7: Establish Documentation

Establish documentation concerning all procedures and records appropriate to these principles and their application.

- Documentation and record keeping should be appropriate to the size and nature of the operation
- Documentation includes: Hazard analysis; CCP and CL determination

- Records of CCP monitoring; Deviations and corrective actions

HACCP System-Summary

- **HACCP systems consist of two elements**
  - △ **Prerequisite programmes**
    - Implemented prior to HACCP plans
    - Control of the overall plant environment
    - Control factors not directly related to food (e.g. water quality, transportation and storage, plant sanitation, employee training)
  - △ **HACCP plans**
    - Implemented following pre-requisite programmes
    - Tailored to a certain product or process
    - Control factors directly related to food production