HACCP (Hazard Analysis and Critical Control Point)

Pankaj Kishore

Quality Assurance and Management Division

ICAR- Central Institute of Fisheries Technology, Cochin

Email: pkishore2007@gmail.com

Introduction:

Food safety is growing concern day by day as it has direct impact on human health. Various hazards viz. physical, chemical, biological,or allergens resulting food-borne illness acrossthe world lead to provide a thought in all processes through which food goes to the consumers. Each year, millions of illnesses can be attributed to contaminated food.Hence a food safety action aimed at ensuring that all food is as safe as possible is must. Food safety policies and actions need to cover the entire food chain, from production to consumption.Food safety in the beginning of twenty-first century is an international challenge requiring close cooperation between countries in agreeing standards and in setting up transnational surveillance systems.The behaviour 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 reassurance of products' origins (national or geographical) and production methods. HACCP or Hazard Analysis Critical Control Points is a scientific and systematic approach to identify, assess and control of hazards in the food production process. With the HACCP system, food safety control is integrated into the design of the process rather than relied on end-product testing. Therefore, HACCP system provides a preventive and thus cost-effective approach in food safety.

Introduction 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.

HACCP is endorsed by the:

- FAO (Food and Agriculture Organization)
- Codex Alimentarius (a commission of the United Nations)
- USFDA (US Food and Drug Administration)
- European Union
- WHO (World Health Organization)

Time Line Development of HACCP:

- **1959** - The Pillsbury Company developed concept for NASA.
- **1971** - HACCP, as we presently know it, took form at the US National Conference on Food Protection, where risk assessment was combined with the critical point concept (1st mention of HACCP).

- **1972** - The Pillsbury Company in the United States began the application of its HACCP concept to the manufacture of its consumer food products. Pillsbury published the first comprehensive treatise on HACCP in 1973.
- **1973**- An HACCP system was adopted for the Low-Acid Canned Food Regulations following the Bon Vivant Vichyssoise Soup botulism incident, in which several people died after eating the soup, due to botulism poisoning.
- **1980** - WHO/ICMSF report on HACCP.
- **1983**- WHO Europe recommends HACCP.
- **1997** - Codex Document on HACCP principles and application
- **1997 December**- FDA's Seafood HAACP program becomes mandatory.
- **1998**- FAO/WHO provide guidance for regulatory assessment of HACCP
- **1998 January** - HACCP becomes mandatory for large meat and poultry manufacturers.
- **2003** - FAO/WHO developed HACCP guidelines.
- **2004** - EC 852/2004 requirement for all food businesses to adopt HACCP principles in EU.
- **2006** - Legal requirements to apply HACCP in food businesses (other than primary production) across EU
- **After 2006** - Increased worldwide use of HACCP in food safety legislation

HACCP- Aglobal requirement for food safety assurance:

An effective food safety assurance methodis required due to emergence of food-borne pathogens and food-borne diseases which has widespread public health problem. Increased knowledge and awareness of the serious and chronic health effects associated with unsafe food products had made HACCP indispensible in all exporting food processing industries. An effective food safety assurance method such as HACCP is important due to the followings:

- New food technologies and processing methods are introduced now and then
- Increased awareness of the economic consequences of foodborne disease
- Increase in the number of vulnerable people
- Industrialization and mass production
- Urbanization
- Changes in lifestyle
- Increase intourism and international trade for foodstuffs
- Increase in consumer awareness about food safety

HACCP Concept:

It is important to always remember that the establishment of effective HACCP programs involves primarily the application of good common sense and preventive considerations to address situations before they become problems. The emphasis is on prediction

rather than reaction, on getting the process right initially rather than correcting it after problems have occurred. It emphasized on identifying potential food safety problems and determining how and where these can be controlled or prevented. Describing what to do and training the personnel, implementation, recording and assurance throughout the food chain are taken care under HACCP system.

The objectives of application of the HACCP system:
- Prevention of food-borne illness
- Reduction of losses due toproduct recall
- Protection of reputation
- Reduction of costsof food analysis
- More efficient quality assurance system
- Focuses on identifying and preventing hazards from contaminating food, based on sound science.
- Permits more efficient and effective government oversight, primarily because record keeping allows investigators to see how well a firm is complying with food safety laws over a period, rather than how well it is doing on any given day.
- Helps food companies to compete more effectively in the world market.
- Reduces barriers to international trade.

Guidelines in the application of HACCP system:
1. Assemble the HACCP team
2. Describe product
3. Identify intended use
4. Construct flow diagram
5. On-site verification of flow diagram
6. List all potential hazards, conduct a hazard analysis and determine control measures
7. Determine CCPs
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 record keeping and documentation**

1. Assemble the HACCP Team:

   A multi-disciplinary HACCP team needs to include knowledge of the following aspects:Raw materials, specialist (quality assurance/technical), operation activities, engineering/equipment technical knowledge of HACCP, process, finished product, hazard expertise, environment (premises, property, surroundings)

2. Describe the product:

   Describe the product giving detail of its composition, physical/chemical structure, and packaging, safety information, processing treatments, storage and

method of distribution. Product name, composition, end product characteristics, method of preservation, primary packaging, shipping, storage conditions, distribution method, shelf life, special labeling, customer preparation

3. <u>Identify the intended use:</u>

   Identify the intended use of the product, its target consumer with reference to sensitive population.Five sensitive groups in the population are categorized such aselderly, infants, pregnant, sick andimmuno-compromised.

4. <u>Construct a process flow diagram:</u>

   Details of all process activities including inspections, transportation, storage and delays in the process are to be given. Inputs into the process in terms of raw materials, packaging, water and chemicals and output from the process e.g. waste – packaging, raw materials, product-in-progress, rework and rejected products also need to be mention

5. <u>On site verification of the process flow diagram:</u>

   It should be done by all members of the HACCP team during all stages and hours of operation. Validate process flow diagram by HACCP team, observe process flow, sampling activities, interview and outline / non routine operations.

Prerequisite Programs (PRP):

PRP focus on employees, facilities, and equipment. Examples of prerequisite programs includes illness policy, cleaning and sanitizing procedures, garbage removal, pest control, equipment selection, employee hygiene.

Principles of HACCP (CODEX):

1. Conduct a hazard analysis

2. Determine the CCPs

3. Establish critical limit(s)

4. Establish a monitoring system

5. Establish corrective actions

6. Establish verification procedures

7. Establish documentation

1) Conduct a hazard analysis:

Identify hazards associated with a specific menu item by preparing a flow diagram that outlines all handling/preparation steps from receiving to service.Listing of likely hazards associated with each step and identification of how to prevent the hazards at each step.Hazards can be biological, chemical, physical or allergens. Also a listof hazards need to be projected that are likely to occur andthat will cause severe consequences if not controlled.Hazards that are low risk and are not likely may not need to be considered.

2) Determine CCPs:

A control point is any point, step, or procedure where biological, physical, or chemical factors can be controlled.A critical control point(CCP) is a point, step, or

procedure where an identified hazard can be prevented, eliminated, or reduced to acceptable levels.Critical control points are monitored much more frequently than are control points.

3) Establish critical limits:

This step involves establishing criteria that must be met to prevent, eliminate, or reduce the identified hazard at the CCP so that the food is safe to eat.Examples of critical limits are temperature, time, physical dimensions, water activity, pH, and available chlorine. Critical limits can come from regulatory standards and guidelines, scientific literature, experimental studies, and consultation with experts.

4) Establish monitoring procedures:

Monitoring is a planned observation or measurement to determine if a CCP is under control. Examples of monitoring include visual observations, temperature measurements, time assessment, pH measurements, water activity measurements, etc.

5) Establish corrective actions:

Corrective actions focus on what to do when a food does not meet the critical limit.Example of a corrective action is temperature of a cooker, throwing out food might be a corrective action.Maintains records of all corrective actions taken.

6) Establish verification procedures:

Four phases of verification needed for a HACCP plan:

1. Determine that the critical limits at all CCPS are sound.
2. Make sure that the establishment's HACCP plan is being properly implemented.
3. Have regulatory personnel review the plan to make sure that it is being properly implemented.
4. Check the accuracy of all monitoring equipment.

7) Establish record keeping:

The following make up the records of a HACCP Plan

– List of HACCP team and their assigned responsibilities

– Description of each menu item

– Flow diagram for each menu item indicating CCPs

– Hazards associated with each CCP and preventive measures

– Critical limits

– Monitoring procedures

– Corrective actions plans

– Record keeping procedures

– Procedures for verification of the HACCP plan

Advantages of HACCP:

Most important advantages related to implementation of HACCP in food sector comprises:

- identifying and preventing hazards resulting food unsafe

- Scientific approach

- permits more efficient and effective government oversight, primarily because the recordkeeping allows investigators to see how well a firm is complying with food safety laws and following practices that reduce the risk of unsafe food over a period rather than how well it is doing on any given day

- rendering responsibility for ensuring food safety appropriately on the food business operators

- reduces barriers to international trade which make food companies to compete more effectively in the world market

Conclusion:

HACCP forms the foundation of European and international legislation for the food industry and is a key component of international trade in food products. HACCP program to be successful need proper implementation and management. This depends largely on regularly scheduled verification activities. The HACCP plan should be updated and revised as requirement. An important aspect of maintaining the HACCP system is to assure that all individuals involved are properly trained so they understand their role and can effectively fulfill their responsibilities. Today food industry standards play a major role in assisting food businesses to achieve compliance with legislation and in many cases exceed legislative requirements. Many of these integrate business operations such as good manufacturing practices (GMP), GHP and HACCP; thereby, providing food businesses with a means to develop an integrated food safety management system. This is a scientific and cost effective system for controlling product safety and quality. This may enable food business operators to ensure consistency in terms of product safety and quality with fair trade across globe.

References:

- Codex Alimentarius Commission. (1997). Hazard analysis and critical control point (HACCP) system and guidelines for its application. *Annex to CAC/RCP*, *1*(1969), Rev-3.
- Ehiri, J. E., Morris, G. P., & McEwen, J. (1995). Implementation of HACCP in food businesses: the way ahead. *Food Control*, *6*(6), 341-345.
- HACCP in microbiological safety and quality. International Commission on Microbiological Specifications for Foods (ICMSF), 1989. Boston, Massachusetts, USA, Blackwell Scientific Publications.
- Pierson, M. D. (2012). *HACCP: principles and applications*. Springer Science & Business Media.
- Reilly, A., &Käferstein, F. (1997). Food safety hazards and the application of the principles of the hazard analysis and critical control point (HACCP) system for their control in aquaculture production. *Aquaculture research*, *28*(10), 735-752.

****