UNIT 3  FOOD SAFETY MANAGEMENT

Structure

3.0  Objectives
3.1  Introduction
3.2  Food Safety
   3.2.1  Food Hazards
   3.2.2  Importance of Safe Foods
3.3  Food Safety Programmes
   3.3.1  Good Manufacturing Practices (GMP)
   3.3.2  Hazard Analysis Critical Control Points (HACCP) System
   3.3.3  International Organization for Standardization (ISO)
   3.3.4  Total Quality Management (TQM)
3.4  Let Us Sum Up
3.5  Key Words
3.6  Answers to Check Your Progress Exercises
3.7  Some Useful References

3.0  OBJECTIVES

After reading this unit, you should be able to:

- explain the importance of food safety and understand different food safety programmes like:
  - good manufacturing practices;
  - hazards analysis and critical control points;
  - international organization for standardisation; and
  - total quality management.

3.1  INTRODUCTION

The demand for fresh and processed foods throughout the world is increasing steadily along with the increasing population. This has necessitated bulk handling, processing, storage and distribution of foods. There is every possibility that some times these operations are carried out defectively introducing food hazards. The developments in food science have opened up the possibility of using numerous food additives capable of preserving and modifying foods to the requirements of the consumer. However, inadvertent use of these additives can also result in food hazards.

The conventional quality control methods in which the quality of the fresh or processed foods is tested just before distribution, though has been very useful in ensuring food safety, is a post-mortem exercise. This means that if the food at the distribution
stage is found to be defective, there is no way to salvage it. In order to overcome this drawback, new Food Safety Management Systems have evolved. These systems, besides ensuring food safety, also enable production of food products with no or minimum defects. You will be learning the basic aspects of some of these systems in this unit.

3.2 FOOD SAFETY

Food is comprised of an array of chemicals, namely; proteins, fat, carbohydrates, vitamins, minerals and fibre which are required to sustain life. These constituents of food have nutritional value. We all expect food to be nutritious, wholesome, and safe. Absolute safe food is the one, which will not cause any damage or harm. However, our food is subject to contamination and therefore, relative food-safety can be defined as the practical certainty that injury or damage will not result from a food used in a reasonable and customary manner and quantity.

Food safety can be understood in a better way if we use two basic concepts – Toxicity and Hazard. Toxicity is the capacity of a substance to produce harm or injury. Hazard is the relative probability that harm or injury will result when the substance is used in a proposed manner and quantity.

3.2.1 Food Hazards

You have already learned some aspects of food hazards in an earlier unit. A hazard is a biological, chemical or physical agent in a food, which has the potential to cause harm or injury to the health.

Biological hazards include pathogenic bacteria, fungus, virus and parasites and toxins elaborated by these organisms. They may cause infections and produce toxins.

Chemical hazards include naturally occurring toxicants such as trypsin inhibitor, solanins, haemagglutinins, phytates, cyanogenic glycosides and alkaloids; heavy metals such as lead, cadmium, arsenic and mercury; pesticide residues like DDT, malathion, parathion, endosulfan, etc. Chemical hazards can also be mycotoxins like aflatoxins developed on nuts and corns, veterinary drug residues and also unapproved food additives or additives added in excess.

Physical hazards include extraneous matter such as stones, glass fragments, dirt, metal bits, etc.

3.2.2 Importance of Safe Foods

A safe food ensures prevention of food borne diseases, and provides nutrition and good quality to the consumer. It also promotes international trade and stimulates economic development.

Maintaining food safety and quality is essential in the entire chain of food production ranging from raw agricultural commodity at farm level; primary food processing at the farm, dairy, abattoir (slaughter house) and grain mills; secondary food processing level such as canning, freezing, drying and brewing and packing; food distribution both at national and international level; food retailing and food catering and domestic food preparation.
3.3 FOOD SAFETY PROGRAMMES

Consumer confidence in the safety and quality of the food supply is an important requirement. A successful safety programme involves a shared responsibility among Food Industries, Government and Consumer. Food Safety Management has progressed rapidly in recent years. The international agencies like Food and Agriculture Organization (FAO) and World Health Organization (WHO), Codex Alimentarius Commission (CAC)—a joint FAO / WHO programme, and International Organization for Standardization (ISO) are playing vital role in the safety management of foods.

3.3.1 Good Manufacturing Practices (GMP)

Good Manufacturing Practices can achieve food safety. Good Manufacturing Practices in manufacturing and packing are pre-requisites for acceptable food safety. GMPs are essential for the manufacture and distribution of foods that are safe from microbiological, chemical, and physical hazards. It is essential that the food industry manage a comprehensive programme that evaluates, identifies, and controls potential hazards at every step in the production, development and manufacturing environment.

Requirements for GMP for Food Industry

Good Manufacturing Practices are prescribed to ensure that:

- Factory is at proper location.
- Factory has right layout and building design.
- Raw materials used in the products are of right specifications.
- Manufacturing processes are properly prescribed and implemented to ensure right quality finished products.
• Adequate quality standards are in place.
• All critical control points are specified by hazard analysis.
• Finished products are released for market only after prescribed quality analysis.
• These are stored and transported in hygienic manner.
• All market returns are properly stored, analyzed, reworked or disposed of with proper procedure.
• Traceability procedure is in place.

To achieve the above objectives each manufacturer ensures that each step is properly followed with detail procedures in place.

3.3.2 Hazard Analysis and Critical Control Point (HACCP) System

Hazard Analysis Critical Control Point (HACCP) system is a prevention system. Here the focus for control is on the manufacturing process. Various monitoring and control methods are applied to reduce or eliminate the possibility of contamination. HACCP is a worldwide – recognized systematic and preventive approach that addresses biological, chemical and physical hazards through anticipation and prevention during manufacturing process.

Important Definitions

Hazard: the potential to cause permanent or temporary injury to a consumer

Severity: The magnitude of consequences resulting from a hazard.

Risk: An estimate of the probability of a hazard occurring.

Control: Actions taken or conditions applied either to reduce to acceptable levels or to eliminate a hazard.

Critical Control Point: A point in the food manufacturing, distribution and use chain where control is exercised.

Benefits of HACCP Certification

• It will reduce the risk of customers being food poisoned.
• It will increase quality of the product.
• It will ensure compliance with the law.
• It will reduce reliance on end-product inspection and testing.

Principles of HACCP

Food Safety Management System by HACCP has seven principles:

1. Identify the hazards:
   Look at each step (e.g., purchasing, delivery, storage, preparation, cooking, serving and display, etc.) in your operation and identify what can go wrong.

2. Determine the Critical Control Points (CCPs):
   Identify the points in your operation that ensures control of hazards, e.g., adequate cooking will kill E.coli and other pathogens.

3. Establish Critical Limits:
   Set limits to enable you to identify when a CCP is out of control, e.g., the critical limit for hot holding of cooked foods is +63°C.
4. Establish a system to monitor control of CCP you should decide
   - Who should check that the critical limit has not been exceeded,
   - How often the check should be done, and
   - What exactly the check involves.

5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
   When monitoring indicates that a CCP is not under control, corrective action must be taken, e.g.
   - Discard the food when it is past the use before a particular date

6. Establish procedures for verification to confirm the HACCP system is working effectively. Review and correct the system periodically and whenever you make changes to your operations, e.g.,
   - Change of recipe, installation of new equipment, etc.

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

For the successful implementation of the system, appropriate documentations and records must be kept and be readily available, e.g., - Temperature record sheets.

A safety food management system based on these principles will enable hazards to be identified and controlled before they threaten the safety of the food served to customers and damage the reputation.

Check Your Progress Exercise 2

Note: a) Use the space below for your answer.
   b) Compare your answers with those given at the end of the unit.

1. List the requirements of GMP for food industry.

2. Define ‘Hazard’ and ‘Critical Control Point’.

3. List the benefits of HACCP certification.

4. List the principles of HACCP.

3.3.3 International Organization for Standardization (ISO)

The global market place provides opportunities for food processors and also creates concerns for consumers. International standards provide tools to reduce consumer concerns and provide tools for the promotion of food trade.

The International Organization for Standardization (ISO) is a non-governmental organization located in Geneva, Switzerland. It was formed in 1947 to develop a common set of manufacturing and trade standards to facilitate international trade. ISO is made up of 138 nations.

ISO: 9000 – 1994 is an international standard directed at the quality management process of an organization; it includes the group of standards ISO-9001, ISO-9003 and ISO-9004.

ISO-9001 standard is a management tool that focuses on meeting the customer’s needs and expectations; every step in achieving the quality is documented. The documented system defines policies, objectives, and expected performance.

“Quality Management” refers to “all activities of the overall management function that determines the quality policy, objectives and responsibilities of the quality system”.

Quality System is “organizational structure, procedures, processes and resources needed to implement the quality management. The ISO-9001: 1994 standard focuses on the existence, implementation, and effectiveness of the quality system as a whole. ISO-9001: 2000 is the latest Quality Management system.

ISO Certification is provided to the organization that has a quality management system that meets the scope of the stated standard.

Certification is the procedure by which third party gives assurance that a product, process, or service conform to specific requirements. [First party is the manufacturer and second party is the consumer. Here third party is ISO certifying agency.]
Benefits of ISO Certification

Improved efficiency through both documentation and communication
- Improved consistency of manufactured items.
- Reduction in amount of re-work and non-conforming product.
- Improved customer satisfaction.
- **Improved motivation and employee involvement** through all levels of process.
- Reduced customer complaints.

3.3.4 Total Quality Management (TQM)

Japanese designed and built goods such as motorcars, cameras, radio and TV sets have quality and reliability. It is because Japanese industry has the ability to cope up with change and accordingly improved their management skill by adopting Total Quality Management System (TQM).

**Definition:** TQM is the application of quantitative methods and human resources to improve:

i) The material and services supplied,

ii) All the processes within the organization, and

iii) Degree to which the needs of the customers are met.

The TQM is a process and a journey and continuous; it is not a destination. It is a philosophy, culture and a way of doing business.

**Basic Tenets of TQM**

- Focus on customer satisfaction,
  - Internal customers
  - External customers
- Continuous improvements,
- Employee investment and empowerment,
- Measurement and documenting the work,
- Doing it right the first time,
- Effective communication, education and training,
- Leadership from top,
- Providing everyone with the opportunity to do their job properly.

**Benefits of TQM**

- Improvements in leadership qualities and more visible leadership from executives and senior managers.
- Involving personnel in decision making process.
- Increased confidence of personnel in their ability to carry out their work and to achieve targets.
- Reduction of mistakes, increased pride in work, sense of achievement for workers.
- Opportunity for self-development and self-improvement of personnel through a pro-active involvement in work.
- Opportunity to engage in creative thinking to improve product quality and work environment.
- Increased co-operation quality and work environment.
- Increased co-operation, improved teamwork and reduced conflict.

Check Your Progress Exercise 3

Note: a) Use the space below for your answer.
       b) Compare your answers with those given at the end of the unit.

1. List the benefits of ISO certification.

2. Define TQM.

3. List the benefits of TQM.

3.4 LET US SUM UP

Ensuring the safety of fresh and processed foods is the primary responsibility of all those involved in food handling and food processors. In order to achieve that the industry has been relying on quality control methods since long time. Although quality control has been successful in ensuring food safety and quality, it has certain drawbacks. Since it is carried out mostly at the end of the manufacturing process, retrieval of defective products is rather impossible. Rejection of defective products above a certain level adversely affects the economics of the industry. Besides, certain hazards entering the food processing...
operations are difficult to detect by routine analysis. Therefore, certain food safety programmes have evolved, which are capable of ensuring virtually zero levels of defects and hazards. The main advantage of such programmes is the possibility of tracing the cause of defects easily based on the documentation, so that such recurrences can be averted.

3.5 KEY WORDS

**Biological hazards**: Pathogenic bacteria, fungus, virus and parasites and toxins elaborated by these organisms.

**Chemical hazards**: Naturally occurring toxins in foods, pesticide residues etc.

**Physical hazards**: Extraneous matter.

**GMP**: Good Manufacturing Practices.

**HACCP**: Hazard Analysis and Critical Control Points.

**ISO**: International Organization for Standardization.

**TQM**: Total Quality Management.

3.6 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress Exercise 1**

1. Your answer should include the following points:
   - Will not cause any harm
   - Practical certainty of no harm

2. Your answer should include the following points:
   - Biological
   - Chemical
   - Physical

**Check Your Progress Exercise 2**

1. Your answer should include the following points:
   - Proper factory location
   - Proper layout
   - Good raw materials
   - Quality standards
   - Quality analysis
   - Traceability

2. Your answer should include the following points:
   - Permanent or temporary injury
   - Point where control is exercised
3. Your answer should include the following points:
   - Reduce risk of food poisoning
   - Increase quality
   - Compliance with law
   - Reduce reliance of end product analysis

4. Your answer should include the following points:
   - Identify hazards
   - Determine CCPs
   - Critical limits
   - Corrective action
   - Verification
   - documentation

Check Your Progress 3

1. Your answer should include the following points:
   - Improved efficiency
   - Consistency
   - Deduced non conformity
   - Customer satisfaction
   - Less customer complaints

2. Your answer should include the following points:
   - Application of quantitative methods and human resources to improve
   - Materials and services supplied
   - Processes within the organization
   - Needs of customers

3. Your answer should include the following points:
   - Leadership
   - Decision making
   - Confidence
   - Sense of achievement
   - Self-development
   - Product quality
   - Team work

3.7 SOME USEFUL REFERENCES
