5 Food Safety and Quality

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Learning Objectives

- Gain knowledge about the importance of food safety.
- Obtain an in-depth understanding about food quality control.
- Acquire the skill of identifying the adulterants in foodstuffs.

Food safety is a method of handling, preparation, and storage of food in ways that prevent food-borne infections. Food can transmit pathogens which can result in the illness or death of a person consuming it. Bacteria, viruses, mold and fungi are the pathogens responsible for spoilage of food. Food safety is possible when food hygiene is practiced.

According to World Health Organization (WHO) the five key principles of food hygiene are:

- Prevent contamination of food with pathogens spreading from people, pets, and pests.
- Separate raw and cooked foods to prevent contaminating the cooked foods.
- Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
- Store food at the proper temperature.
- Use safe water and safe raw materials.

5.1 Factors Affecting Safety of Food

Factors affecting food safety can be classified broadly into two categories as shown in Fig. 5.1.

Microbial hazards

Human skin, untreated water, pests, raw foods, garbage, debris and dust are the sources of food spoilage by microorganisms

Physical hazards

1. **Food premises and equipments:**
   - Improper and unhygienic handling.
   - Improper working condition of the equipments.
   - Improper sanitation of the premises.
2. **Raw ingredients:**
   - Improper handling of the raw materials.

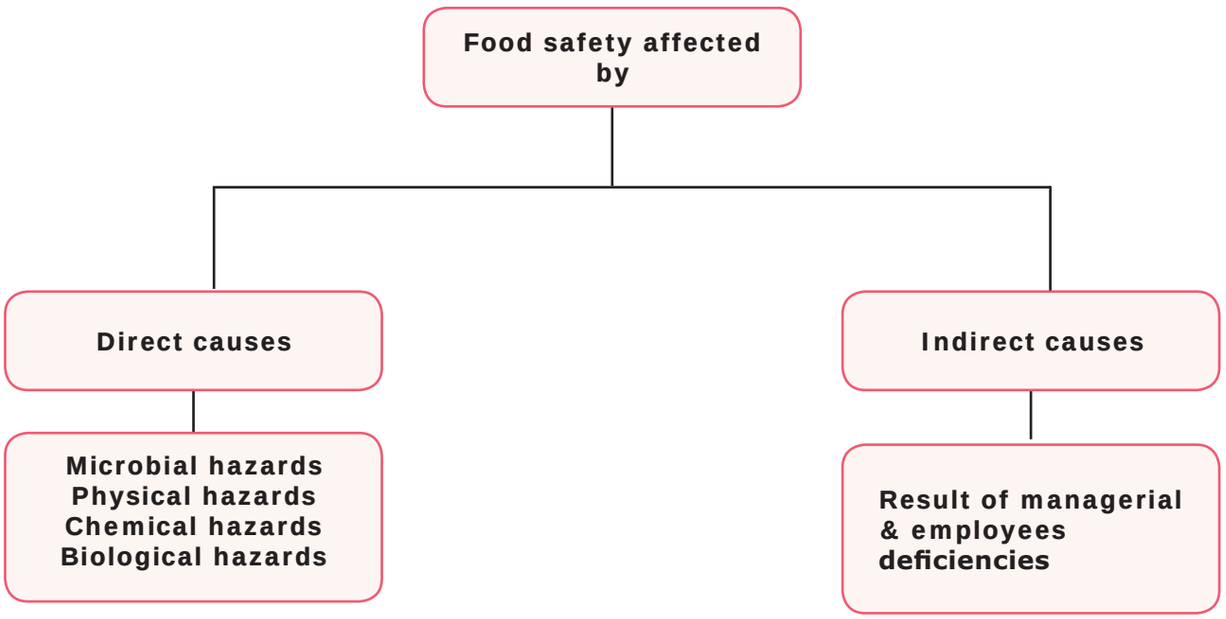

Figure 5.1 Factors Affecting Safety of Food

- Excess purchase of raw materials.
- Usage of ingredients after its expiry.

3. **Equipment, Maintenance and operations:**

- Improper working condition of the equipments.
- Improper maintenance of the equipment.
- Improper training given to the employees on the operation procedures.

Chemical hazards

- Pesticides /additives and fertilizers
- Store cleaning agents separately
- Do not practice cleaning and pest control activities in the presence of exposed foods
- Use of chemicals as per the manufacturer's instruction

Biological hazards

- The place where the foods are placed must be cleaned properly
- Elimination of the source of contamination is fundamental to the prevention and control of the biological hazards
- Gloves must be used as they protect the bends from containing blood, dropouts, body fluids and can avoid infection when touching the eyes, mouth or nose afterwards
- Gloves can also protect open wounds from contamination
- Sterilization process can be used to even eliminate microorganisms including the spores in bacteria
- Primary method for avoiding infection is to wash hands by using liquid soaps
- Wash bends before and after waste

Prevention of Food Safety Hazard

Temperature Control:

The primary rule of sanitation is food temperature control

1) Keep high - risk food at 5C or below 60C to avoid the temprature danger zone.
2) Should ensure the availability of thermometer to all food storage areas
3) Monitoring of temperature on regular basis
4) Thawing foods must be done in the refrigerator or under cold water

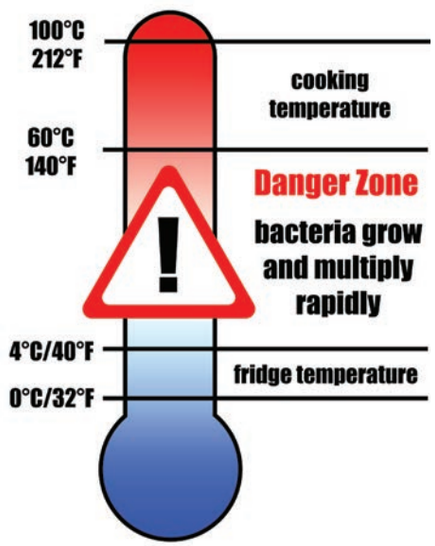

Plate 5.1 Temperature Control

Personal Hygiene Practices

Plate 5.2 Personal Hygiene

A good sanitation programme should need the hygiene of people working in food industry. Personal training must include appropriate sanitation principles of food hygiene practices.

Hygiene Practice

Personnel suffering from communicable disease is likely to be transmit infection through food. So they must be restricted from production and food handling areas. Persons who are with infected wound, skin infection or health problems must be restricted from the kitchen and serving areas.

Plate 5.3 Hygienic Practice

Hand Washing

All personnel involved in food handling must thoroughly wash hands with hand washes using warm water.

Food Handling Practices

- Food handling personnel should consume food in the place allocated for them
- Should not use tobacco in any form

- Should never use a tasting spoon twice
- Follow hygienic practices while transporting and storing
- Should use sanitary plastic disposable gloves while serving food
- Should clean equipment before and after use

DO YOU KNOW?

5.2 Food Adulteration

Food Safety and Standard Authority of India (FSSAI) defines food adulteration as the addition or subtraction of any substance to or from the food, so that the natural composition and the quality of food substance is affected.

One form of adulteration is an addition of another substance to a food item in order to increase the quantity of the food item in raw form or prepared form which may result in the loss of actual quality of food item.

Reasons for food adulteration: Adulterants are added to increase the weight and get more profit.

Adulterants

An adulterant is any material which is or could be employed for making the food unsafe or sub-standard or mis-branded or containing extraneous matter (FSSAI, 2006).

Concept of Adulteration

Food is adulterated

- If the food contains any other substance which affects the quality or health of the consumer.
- If the food has been prepared, packed or kept under unsanitary conditions whereby it has become contaminated or injurious to health.
- If the food consists wholly or in part of any filthy, putrefied, rotten decomposed or diseased animal or vegetable substance or is insect infested or is otherwise unfit for human consumption.
- If any colouring matter other than that prescribed in respect thereof is present in the article or if the amounts of the prescribed colouring matter which is present in the article are not within the prescribed limits.

Types of Adulterants: Adulteration may be intentional or incidental.

Intentional adulterants:

Intentional adulterants are those substances that are added as a deliberate act on the part of the adulterer with the intention to increase the margin of profit. Some intentional adulterants are sand, marble chips, stones, mud, chalk powder, water, mineral oil and coal tar dyes. These adulterants cause harmful effects on the body.

Incidental Adulterants

Incidental adulterants are found in food substances due to ignorance, negligence or lack of proper facilities. It is not a wilful act on the part of the adulterer. E.g.. Pesticides, droppings of rodents, larvae in food.

The common adulterants are

Milk is adulterated with water, chalk, urea, caustic soda and skimmed milk. Khoya is adulterated with paper, refined oil and skimmed milk powder.

Plate 5.4 Milk

Pure Honey is often adulterated with several types of standard sugar solution, glucose, fructose, sucrose and also with cheap syrups, corn, inverted sugar and cane sugar.

Plate 5.5 Honey

Turmeric powder is adulterated with 'metanil yellow'. 'Metanil yellow' is produced utilizing some raw materials like 'metanilic acid' and 'diphenylamine'. The risk of consuming turmeric powder mixed with 'metanil yellow' is that it is purely carcinogenic – means it is capable of causing cancer in living tissues.

Plate 5.6 Spices

In **black pepper,** the adulterant used is papaya seeds to add bulk. The harmful effect is that papaya seeds can cause serious liver problems, stomach disorders, severe glaucoma and epidemic dropsy.

Chilli powder is often adulterated with a similar looking substance like brick powder.

Ginger is used widely in culinary practice in India in the fresh or dry form. Dry ginger is often coated with blue coloured dye ultramarine blue to prevent insect infestation. It is an inorganic pigment used as laundry whitener.

In **Ice cream** the adulterant is pepper oil, ethyl acetate, butraldehyde and washing powder that are not less than poison. Pepper oil is used as a pesticide and ethyl acetate causes terrible diseases affecting lungs, kidneys and heart.

Plate 5.7 Ice cream

Food grains like rice and wheat are a part of staple food in India. Powdered rice and wheat is usually adulterated with starch. Rice is being adulterated with small 'grains of stones' to increase the overall weight per quintal by retailers.

Plate 5.8 Food Grains

Coffee powder is usually adulterated with tamarind seeds, chicory powder and also used to add bulk and colour. This can cause diarrhea, stomach disorders, giddiness and severe joint pains.

Plate 5.9 Coffee Powder

Tomato sauces mostly used in local fast food centres are, artificially made from 'pumpkin pulp', 'sugar', 'non-edible colours and flavours' with less amount of tomato. These sauces with 'artificial colours and flavours' are highly carcinogenic.

Plate 5.10 Tomato Ketchup

Tea leaves are often adulterated with chemicals and additives to add its aroma or flavour. Ordinary substances for adulterating tea include, Prussian blue - a non soluble, blue pigment commonly used to colour blueprints, crayons, paintings, and paint; it is non-toxic to humans. Indigo - a blue dye derived from the Indigo feratinctoria plant; it is non-toxic to humans. Graphite (Plumbago) - a naturally occurring mineral that is a form of carbon; commonly used as the "lead" in pencils.

Plate 5.11 Tea Leaves

Gypsum — a soft, naturally occurring mineral is used to alter colour of tea.

Vegetable oils - Edible oils are adulterated with mineral oil, karanja oil or castor oil. This causes loss of eyesight, damage to liver, heart problems, stomach infections or cancer Young children and senior citizens with poor immunity are more susceptible to this.

Plate 5.12 Vegetable Oils

Traditional sweets - Khoya and paneer are commonly used for the preparation of traditional sweets, and are often adulterated with starch. Silver coating (vark) used to decorate sweets is made from silver. According to Indian regulations, silver must be 99.9 per cent pure if it is used as a food ingredient. However, with silver becoming expensive many sweet shop owners use silver vark containing aluminium.

Plate 5.13 Traditional Sweets

Contamination of foods with harmful micro organisms

Some raw foods like meat, fish, milk and vegetables grown on sewage are likely to be contaminated with harmful microorganisms. These are generally destroyed during cooking or processing of food. Some of the micro organisms may survive due to inadequate heat processing. Even, low moisture foods when stored in humid atmosphere get infected with pathogenic fungus which causes serious illness.

Metallic contamination

Contamination of food with lead can cause toxic symptoms. Lead brings about pathological changes in the kidney, liver, and arteries. The common signs of lead poisoning are nausea, abdominal pain, anaemia, insomnia, muscular paralysis and brain damage. Fish caught from water contaminated with mercury salt contains large amount of mercury. The other elements which are toxic in small doses are cadmium, arsenic, antimony and cobalt.

Packaging hazards

Polyethylene, polyvinyl chloride and other allied compounds are used to produce flexible packaging material. While this method of packaging is very convenient, it must not contain any noxious thermal breakdown products which could be injurious to health. Further, temperatures used for sealing or sterilization should not result in formation of toxic residues. Therefore, it is essential to use food grade plastic packaging materials for packaging foods.

Plate 5.14 Low Quality Food Grade Plastic

Other adulterants

Pests such as rats, rodents and insects introduce into the food a high degree of filth in the form of excreta, bodily secretions and spoilage microorganisms. Chemicals like DDT are absorbed by the small intestine when ingested. The toxins usually pile up in the fatty tissues of such vital organs as the thyroid, heart, kidney, liver, mammary gland and damage these organs.

This incidental poisoning can be prevented by:

- Regular market surveys to warn people on the dangerous build-up of toxins in food.
- Stepping up the integrated pest management programme to teach farmers to use pesticides judiciously. No spraying should be done a week before harvest.
- Using safer pesticides
- Washing vegetables thoroughly before cooking.

Prevention of Food Adulteration Act (PFA 1954)

Keeping the large scale adulteration in view, legislation was passed called Prevention of Food Adulteration Act in the year 1954 with the objectives to

- Ensure pure and wholesome food to the consumers and also to prevent fraud or deception.
- Protect the public from poisonous and harmful food.
- Prevent the sale of substandard foods.
- Protect the interests of the consumers by eliminating fraudulent practices.

Food additives

Food additives have been used for centuries to enhance the appearance and flavour of food and prolong shelf life. Food additives find their way into the foods to help ease processing, packaging, and storage. Some additives have been used for centuries; for example, preserving food by pickling as with vinegar, salting, as with bacon, preserving sweets or using sulphur dioxide as with wines.

DO YOU KNOW?

Food Additive

A food additive is a substance added to food to enhance its flavour or appearance or to preserve it

Artificial Sweeteners

Aspartame is found in foods labelled "diet" or "sugar-free". Aspartame is believed to be carcinogenic, neurotoxin and accounts for more reports of adverse reactions than all other foods and food additives combined.

It is found in diet or sugar-free sodas, diet coke, coke zero, desserts, sugar-free gum, drink mixes, baking goods, table top sweeteners, cereal, breath mints, ice tea, chewable vitamins and toothpaste.

Plate 5.15 Artificial Sweeteners

Monosodium Glutamate- (MSG / E621)

MSG commonly known as Aginomoto is an amino acid used as a flavour enhancer in soups, salad dressings, chips, frozen entrees, instant noodles, Chinese foods and many restaurant foods. Studies show that regular consumption of MSG may result in adverse side effects which include depression, disorientation, eye damage, fatigue, headaches, and obesity. MSG affects the neurological pathways of the brain.

Plate 5.16 Monosodium Glutamate

Trans Fat

Trans fat is found in deep-fried fast foods, chips and crackers, baked goods, and certain processed foods made with margarine or partially hydrogenated vegetable oils. Trans fats are formed by a process called hydrogenation. Numerous studies show that trans fat increase LDL cholesterol levels while decreasing HDL or good cholesterol, increases the risk of heart attacks, heart disease, and strokes, and contributes to increased inflammation, diabetes, and other health problems.

Plate 5.17 Trans Fat

Common Food Dyes

Artificial colourings which are found in soda, fruit juices, and salad dressings, may contribute to behavioural problems in children and lead to a significant reduction in IQ.

Plate 5.18 Artificial Colouring

DO YOU KNOW?

FSSAI Drafts the Food Safety and Standards (Packaging) Regulations, 2017

The FSSAI has issued a notice proposing new packaging regulations. In the regulations, the **FSSAI** has defined the terms related to packaging so that the terms like food grade, multilayer food packaging, overall migration limit, package or container, primary and secondary food packaging and specific migration limit are all clearly understood.

General Requirements

- Only food grade quality material must be used for packaging, preparation, storing, wrapping, transportation and sale or service of food shall be of food grade quality.
- The ink used for printing on food packages shall conform to IS: 15495
- Printed surface of packaging material must not come into direct contact with food products
- Newspaper or any such material shall not be used for storing and wrapping of food

DO YOU KNOW?

The FSSAI has removed the following two additives from the list of additives that can be used

- Potassium Bromate
- Cyclamates

Potassium bromate is a cancer-causing substance used in bread and bakery products. Cyclamates is used in jams, jellies, marmalades, dairy based drinks, confectionary. Henceforth these two additives will no longer be allowed to be used in any food category.

DO YOU KNOW?

IS:15495 – The Bureau of Indian Standards (BIS) has framed a standard code of practice of printing ink for food packing to be IS ; 15495. The ink under this guideline should not contain any hazardous chemicals that may get transferred to the food.

Hence avoid using printed paper to packing and serving foods.

- Tin containers once used, shall not be re-used for packaging of food
- Food products shall be packed in clean, hygienic and tamper proof bottles or containers.
- In case of multilayer packaging, the layer which comes in contact with food shall meet the requirements of packaging materials.

5.3 FSSAI

FSSAI (Food Safety and Standards Authority of India) is a statutory body governing the food safety of the country. It is an autonomous body established under the Ministry of Health and Family Welfare, Government of India. The Chairperson and Chief Executive Officer (CEO) have been appointed by government of India and head quartered at New Delhi.

FSSAI has been established under Food Safety and Standards Act 2006 which consolidates various acts and orders that have hitherto handled food related issues in various ministries and departments.

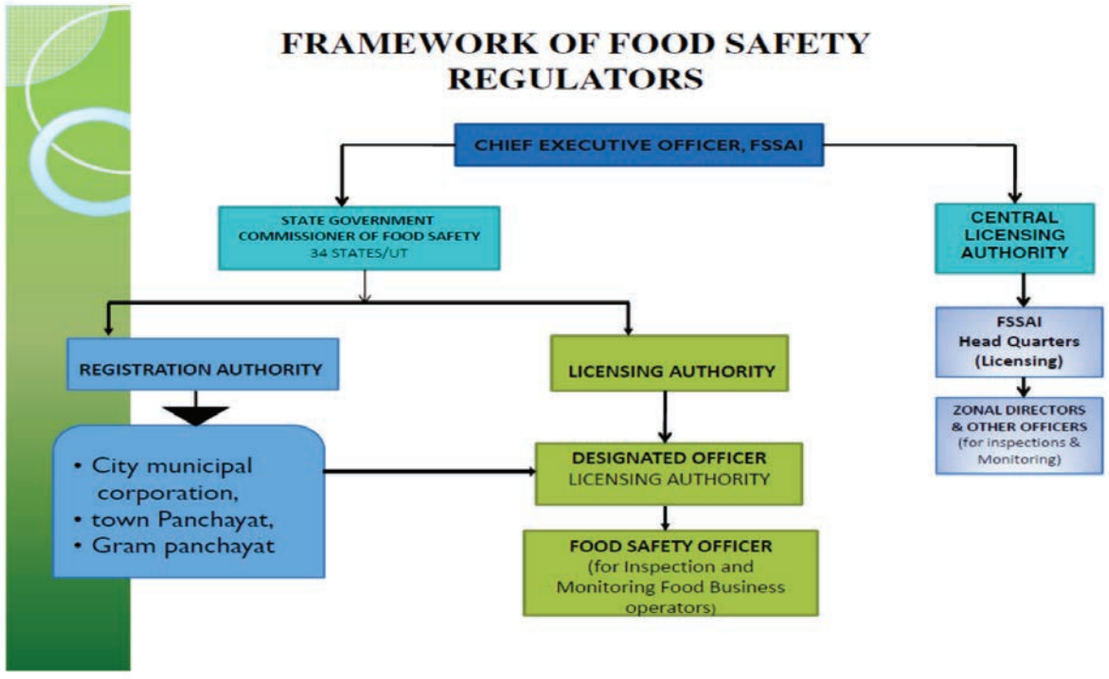

Figure 5.2 Framework of Food Safety Regulators

Laws relating to food before FSSAI 2006:

Various Central acts like,

- Prevention of Food Adulteration Act, 1954
- Fruit Products Order, 1955
- Meat Food Products Order, 1973
- Vegetable Oil Products (Control) Order, 1947
- Edible Oil Packing (Regulation) Order, 1988
- Solvent Extracted Oil, De-Oiled Meal and Edible Flour (Control) Order, 1967 and
- Milk and Milk Products Order, 1992

The Food Safety and Standard Act 2006 (FSS) is a bucket for all the older laws, rules and regulations for food safety.

The FSS Act brings all seven older acts into one umbrella.

How it integrates?

It is an Act of the parliament that received the assent of the President of India on 23rd August 2006. The act aims to establish

- A single reference point for all matters relating to food safety and standards, regulations and enforcements
- By moving from multi-level, multi-departmental control to a single line of command
- Integrated response to strategic issues like novel foods, health foods, nutraceuticals, organic foods, International trade and proprietary foods.
- Achieve high degree of consumer confidence in quality and safety of food.
- Create investor friendly regulatory mechanism with emphasis on self-regulations and capacity building.
- Every food business operator (FBO) needs to get a FSSAI license – from petty shop to high end manufacturers.

Objectives of FSSAI 2006

- To consolidate the laws relating to food
- To lay down science based standards for articles of food
- To regulate the manufacture, storage, distribution, sale and import of food products
- To ensure availability of safe and wholesome food for human consumption

Functions of FSSAI

Framing of Regulation

- To lay down the standards and guidelines in relation to articles of food and
- Specifying appropriate system of enforcing various standards thus notified.

Laying down mechanisms and guidelines

- For accreditation of certification bodies engaged in certification of food safety management system for food businesses.

Laying down procedure and guidelines

- For accreditation of laboratories and notification of the accredited laboratories
- To provide scientific advice and technical support to central Government and state Governments

In the matters of framing the policy and rule

- In areas which have a direct or indirect bearing of food safety and nutrition

Collect and collate data regarding

- Food consumption,
- Incidence and prevalence of biological risk,
- Contaminants in food,
- Residues of various contaminants in food products,
- Identification of emerging risks and
- Introduction of rapid alert system.

Creating an information network across the country so that

- The public, consumers, panchayats receive rapid, reliable and objective information about food safety and issues of concern
- Provide training programmes for persons who are involved or intend to get involved in food businesses.
- Contribute to the development of internal technical standards for food, sanitary and phyto-sanitary standards.
- Promote general awareness about food safety and food standards.

Safe and Nutritious Food

Safe and Nutritious Food (SNF) at work place is a nation-wide campaign to help people eat safe, eat healthy and eat right at their work place.

This initiative promotes safe and healthy diets through FSSAI trained Food Safety Supervisors (FSS) and Health and Wellness Co-ordinators (HWC) at every work place across India.

Figure 5.3 Safe and Nutritious Food

Orange Book

The Orange book is organised into three parts. The **first** part is meant for **HR/ Administration**, to create a system and an enabling environment to ensure food safety and nutrition for everyone at the work place. The **second** part is for the **canteen or cafeteria** establishment to ensure that the food served in the work place, whether prepared in-house or catered from outside, is safe and wholesome. The **third** part is for **employees**, which indicates useful tips and suggestions to empower employees to eat and stay healthy at the workplace by making informed choices about the food they consume.

Pink Book

Figure 5.4 Safe and Nutritious Food

A guide for safe and nutritious food **at home.** The book covers sections namely,

- Selecting and purchasing food
- Serving food
- Preparing and cooking food
- Eating healthy
- Packing food and
- Maintaining hygienic and sanitation

It provides useful tips, do's and don'ts, methods and practices that should be followed in Indian Kitchens.

Yellow Book

The yellow book is an interactive and illustrative, easy to understand guide which becomes an important tool **for parents, teachers and students**. This book serves as a **ready reckoner** that includes material for classroom narrative lectures as well as laboratory exercises. It aids as a comprehensive tool kit in the form of training manual, power point presentations, activities, posters and handouts.

The "yellow book" is aimed at inculcating wholesome food habits at a young age, as habits formed in the early years stay throughtout the life. The activities and guidelines have been designed to encourage adoption of safe and nutritious food practices at schools.

Licensing & Registration

Registering Authority

Food Safety Officer or any official in Panchayat, Municipal Corporation or any other local body in an area, notified as such by the State Food Safety Commissioner for the purpose of registration

State Licensing Authority

Designated Officers appointed under Section 36(1) of the Act by the Food Safety Commissioner of a State or UT-Union Territory for the purpose of licensing and monitoring.

DO YOU KNOW?

How to display the FSSAI logo and licence on the label

The FSSAI logo and the license number of the brand owner shall be displayed on the label of a food package in the colour that is in contrast to the background.

The height of the letters and the numeral of license number shall be as prescribed as per Food Safety and Standards (Packaging & Labelling) regulation, 2011.

Figure 5.5 FSSAI Labels

Central Licensing Authority

Designated Officer appointed by the Chief Executive Officer of the FSSAI in his capacity of Food Safety Commissioner.

Thus FSSAI plays a very crucial role and has the major responsibility for protecting and promoting public health through the regulation and supervision of food safety.

5.4 HACCP

Hazard Analysis Critical Control Point (HACCP)

Hygiene and sanitation of food at all levels is an important and compulsory process that needs serious and constant consideration. Food handling practices, personal hygiene and clean premises are to be maintained and clean procedures to be followed by the staff.

In 1971, Hazard Analysis Critical Control Point (HACCP) took form at the National conference of Food Production, where risk assessment was combined with the critical point concept. The United Nations Codex Alimentarius Commission Food Hygiene standard approved HACCP as an internationally accepted method for ensuring food safety by identifying hazards and monitoring the Critical Control Points (CCP) in the process.

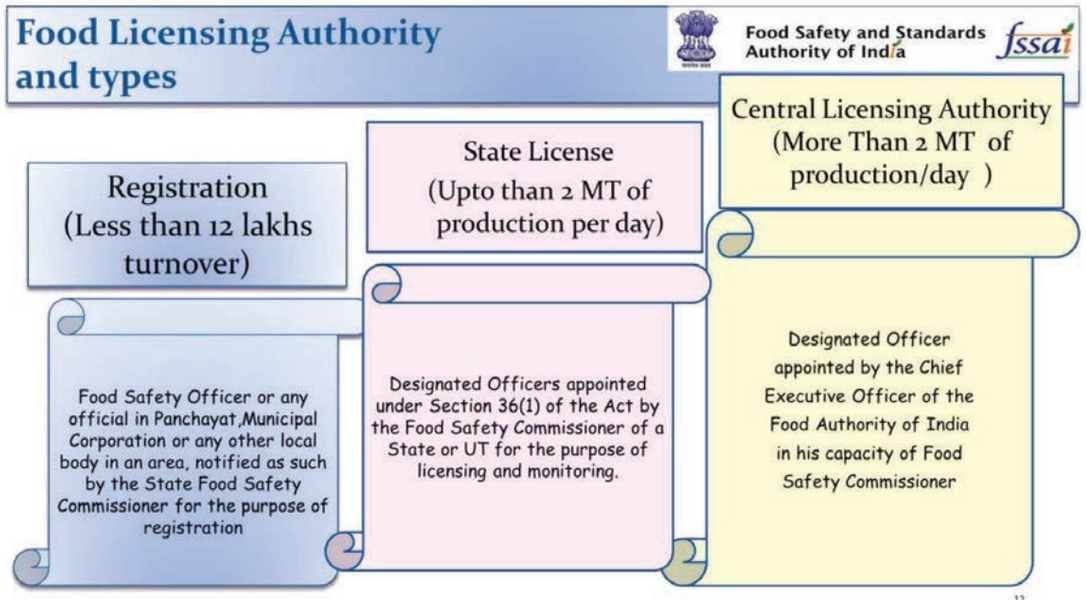

Figure 5.6 Food Licensing Authority and Types

Other Recent Initiatives By FSSAI

1. FSKAN Portal; Food Safety Knowledge Assimilation on Network: To Serve as a Consortium of research thesis, e-books, e-journals, leading papers and articles pertaining to food safety, hygiene and nutrition. http://fssai.gov.in/fakan
2. FOSTaC (Food Safety Training and certification); http://fssai.gov.in/fakan
3. FOSCoRIS (Food Safety Compliance through Regular Inspection & sampling); http://foscoris.gov.in/fakan
4. InFoLNet (Indian Food Laboratory Network: A digital Platform connecting all the labs across India) http://infolnet fssai.gov.in/fakan
5. Food Safety on wheel (Mobile Testing Units Launched in few states);
6. Food Fortification Resource Centre: http://ffrc fssai.gov.in
7. Food Safety Connect: An online Platform for consumer to voice their food Safety concern.

DO YOU KNOW?

Food companies can't lie now! FSSAI to prohibit terms like pure, natural, authentic on packaged foods

The only exception to the rule is that the products so labelled can be washed, peeled, chilled, trimmed or put through other processing stages that could alter its basic characteristics.

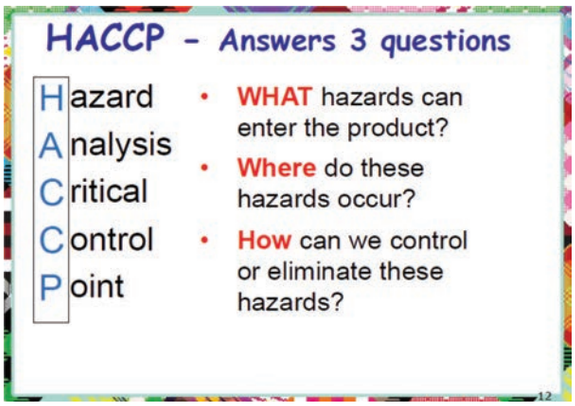

Figure 5.7 HACCP What? Where? How?

A **Hazard** is defined as a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect. Hazards can be

- physical (metal contamination)
- chemical (a cleaning product could contaminate the product or there are toxins that could contaminate the product) and
- biological (bacteria or virus could contaminate the product).

HACCP is a procedure that examines each stage in the food production process. It helps to find the hazard that may appear at any stage of the food production process. It critically examines each stage of the food process until it reaches the customer. Once the potential hazard is found in the process, whether it is within the preparation, processing, storage or service, it should be either be eliminated or minimized.

Awareness of food-borne illness is on the rise and concern throughout the industry is driving the use of HACCP and HACCP based certification programmes.

Figure 5.8 Different types of Hazards

Principles of HACCP

Conduct Hazard Analysis

Identification of the hazard is done in two steps, first identify what the hazard is, then evaluate the risk of the hazard for the consumer. The hazard evaluation is a determination of the degree of risk to the consumer.

Identify Critical Control Points

A Critical Control Point (CCP) is a procedure in a food manufacturing process. It can be applied at the point at which a hazard is identified. This will prevent, eliminate, or reduce the hazard to an acceptable level. Thus, food safety can be achieved.

Establish critical limits for each Critical Control Point

A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard to the food must be controlled. The various methods that can be used to control the hazard should be identified.

Establish Critical Control Point monitoring requirements

The methods for control should be monitored. This is necessary to ensure

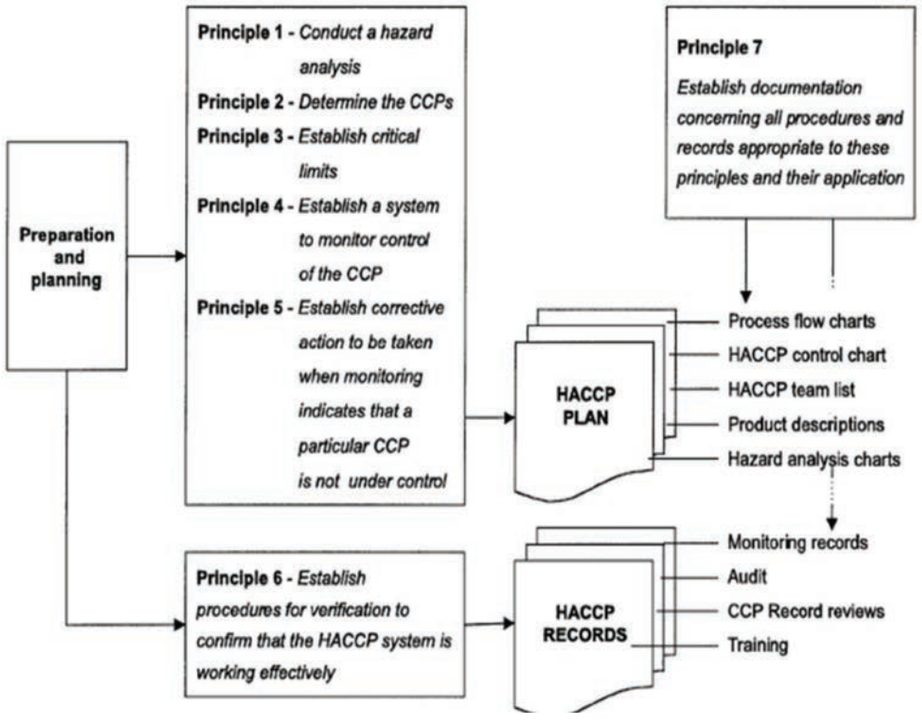

Figure 5.9 HACCP Principles

that the process is under control at each Critical Control Point. Each monitoring procedure and its frequency should be listed in the organization's HACCP plan.

Establish corrective action

The organization's HACCP plan is needed to identify the corrective action to be taken if a critical limit is not met. Corrective action are intended to ensure that no product is injurious to health when it enters the market.

Establish procedures for ensuring the HACCP system is working as intended

Validation ensures that there is production of a safe product scientifically. Verification ensures the HACCP plan is working as intended. Verification procedures also include a review of HACCP plans, CCP records, critical limits and microbial sampling and analysis.

DO YOU KNOW?

Validation – It is the action of checking or proving the validity or accuracy of something, that can be legally or officially acceptable.

Establish record keeping procedures

The HACCP regulation requires that all organizations to maintain certain documents, such as hazard analysis and written HACCP plan, and records documenting the monitoring of Critical Control Points, critical limits, verification activities, and the handling of processing deviations. Implementation involves monitoring, verifying, and validating of the daily work that is compliant with regulatory requirements in all stages.

HACCP and the quality management system together form an organization's Total Quality Management system.

HACCP can be adopted by all sections of the food industry. A simplified version of HACCP has also been introduced called Assured Safe Catering.

Assured Safe Catering

Assured Safe Catering (ASC) is based on the HACCP approach but tends to look at the many steps or individual processes involved in getting all the supplies from the supplier to the customer. At each point where a risk is identified, a control measure needs to be designed, implemented and monitored.

Examples of Critical Control Points

- Inspection (including temperature checks) of goods on delivery and before use.
- Check for fresh and quality goods while receiving and delivery. Reject goods if spoilage is identified.
- Separate storage and holding of ingredients and finished products.
- Separate freezers should be provided for raw and cooked foods.
- Correct temperature ranges for refrigerated and frozen foods. Maintain refrigerator temperature between 34°F and 40°F. The freezer temperature should be -10 to -20°F.
- Prevent cross contamination with other menu items-Use gloves, tongs and different ladles while serving food.
- Personal hygiene and health standard-The food service personnel should be free from infections while preparing and serving.
- Proficiency in use and cleaning of equipment-Separate sinks and cutting boards should be used for vegetables and meat.

Everyone responsible for Food Safety

- Government - Food Legislation & Enforcement
  - Guidelines for Industry/ Trade
  - Information Gathering and Research
  - Provision for Health related services
  - Consumer Education

Industry - Follow GMP-GHP requirements
- Quality Assurance
- Trained Managers and Food Handlers
- Appropriate Process and Technology
- Informative labelling

Consumer - Educated & Knowledgeable
- Active Consumer Groups & community participation

Academia - Introducing HACCP in the curriculum

GMP – Good Manufacturing Practices

GHP – Good Hygienic Practices

How to establish HACCP?

- Choose a specific menu or group of items in a menu
- Draw up a flow diagram showing how the items are made
- Select the most relevant person who should
  - a) Modify the flow diagram if necessary
  - b) Inspect each stage and clearly find out where significant hazards could occur both under normal and occasional conditions
  - c) Make a note of all predictable causes of each hazard
  - d) Point out each CCP and how they can be controlled
- State the control procedures at each CCP and change working practices as necessary.

How to maintain HACCP?

- Monitor the information (E.g.. Record temperature and maintain a chart) and take effective action when needed.
- Alter the HACCP system as necessary in the processes.
- Periodic checks should be carried out to ensure all instruments are safe.
- Periodic microbiological testing should be done in the lab of raw materials, equipment and product.
- Ensure adequate personnel monitoring, training and retraining.

Use of HACCP in food service operations

The most common aspects to be considered are:

- Handling and storage procedures from delivery to service of the menu items
- Handling items and temperatures
- Cooking time and
- Personnel training

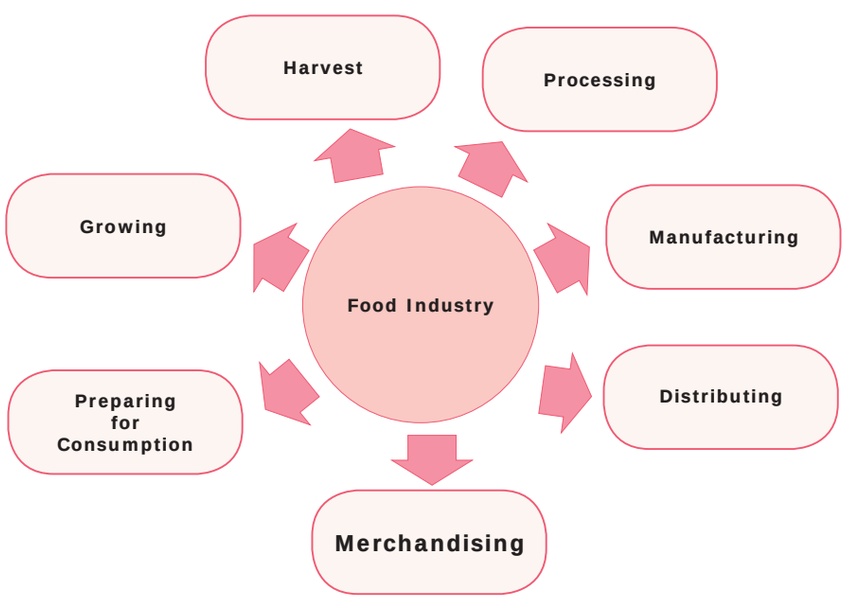

Figure 5.10 HACCP and its Uses

A-Z GLOSSARY

Pathogens	:	A bacterium, virus, or other microorganism that can cause disease
Gravitate	:	Move towards or be attracted to
Salience	:	The quality of being particularly noticeable or important; prominence
Monetary status	:	Financial status
Glaucoma	:	A condition of increased pressure within the eyeball, causing gradual loss of sight.
Migraine		A recurrent throbbing headache that typically affects one side of the head and is often accompanied by nausea and disturbed vision
Seizure		Uncontrolled electrical activity in the brain, which may produce a physical convulsion, minor physical signs, thought disturbances, or a combination of symptoms.
Nutraceuticals		Another term for functional food.

LINKAGES

- https://www.bing.com/videos/search?q =factors+affecting+food+acceptability+sensory+evaluation&&view=detail&mid=A707E113835CE480FDD7A707E113835CE480FDD7&&FORM=VRDGAR
- https://www.bing.com/videos/search?q =adulteration+in+foods&&view=detail&mid=FAF97F0041A458165859FAF97F0041A458165859&&FORM=VRDGAR https://www.bing.com/videos/search?q=fssai&&view=detail&mid=EF8BC449DC1E9BFECF6AEF8BC449DC1E9BFECF6A&&FORM=VRDGAR
- https://www.bing.com/videos/search?q=haccp&&view=detail&mid=0FB45BDD78C28792639B0FB45BDD78C28792639B&&FORM=VRDGAR
- https://www.bing.com/videos/search?q=types+of+kitchen+layout&&view=detail&mid= 3E2CE2AC5154C0BBDA3F3E2CE2AC5154C0BBDA3F&&FORM=VRDGAR

STUDENT ACTIVITY

- Evaluate the foodstuffs in the school canteen.
- Use tests to identify adulterants in foodstuffs.
- Read a FSSAI label and report about it.
- Find the Critical Control Points in the preparations the student prepares.

TEACHER ACTIVITY

- Prepare a rating scale to find the acceptability of various foodstuffs in the school canteen.
- Prepare adulterated foodstuffs for identification.
- Arrange a visit to a food product factory and teach the students how to read a label.
- Plan a competition to find the critical control points while preparing the food products.

QUESTIONS

SDPDSF

Choose the correct answer (1 Mark)

1. _____ is the microbial hazard that causes food spoilage.
   a) Untreated water
   b) Soda
   c) Equipment
   d) Sweetner
2. Identify the 'A' that is not under food security _____.
   a) Acceptability
   b) Availability
   c) Accessibility
   d) Analysis
3. _____ is an intentional adulterant.
   a) Stone
   b) Bird dropping
   c) DDT
   d) Pest droppings
4. Turmeric is adulterated with _____
   a) Brick powder
   b) Metanil yellow

c) Chalk powder

d) Saw dust

5. Mustard seeds are adulterated with _____

a) Papaya seeds

b) Tea leaves

c) coffee powder

d) Argemone seeds

6. _____ is found in foods labelled diet or sugar free.

a) MSG

b) Aspartame

c) Acesulfame-K

d) Saccharin

7. Trans fats are found in _____

a) Baked goods

b) Fruit juices

c) Spices

d) Coke

8. Pillsbury published the first comprehensive regulation on HACCP in _____

a) 1973

b) 1975

c) 1977

d) 1979

9. A _____ is the maximum or minimum value to which a physical, biological, or chemical hazard to the food must be controlled.

a) Critical point

b) Critical limit

c) Critical note

d) Critical side

10. _____ is a statutory body governing the food safety of the country.

a) FPO

b) FSSAI

c) ISI

d) HACCP

11. FSSAI was established on _____

a) 23rd August, 2000

b) 23rd August, 2004

c) 23rd August, 2005

d) 23rd August, 2006

12. The _____ book is a guide for safe and nutritious food **at home** has been specially crafted for kitchens in Indian homes.

a) Pink

b) Yellow

c) Orange

d) Green

13. The _____ book" is aimed at inculcating wholesome food habits at a young age, as habits formed in our early years stay with us for life.

a) Pink

b) Yellow

c) Orange

d) Green

14. _____ is used in Chinese food.

a) MSG

b) SNF

c) BSI

d) ISI

15. Maintain refrigerator temperature between _____
    a) 38°F and 46°F
    b) 45°F and 50°F
    c) 34°F and 40°F
    d) 24°F and 30°F

II. Answer in 3 lines (3 Marks)

1. Classify the factors affecting food safety.
2. What are the types of adulterants?
3. Enumerate how honey is adulterated?
4. Point out how incidental poisoning can be prevented?
5. Write a note on MSG.
6. What kind of adulterants can you identify in cakes and samosas?
7. What are the objectives of FSSAI?
8. Write a note on the pink book?
9. What is Assured Safe Catering?
10. Identify the causes for incidental adulterants.

III. Answer in a paragraph (5 Marks)

1. What are the key principles of food hygiene according to WHO?
2. Write a note on artificial sweeteners.
3. State the aims of FSSAI?
4. Define 'Hazard.'
5. Give examples of Critical Control Points.

IV. Answer in Detail (10 Marks)

1. Discuss on food safety hazards and its prevention
2. Explain any 10 foods that are adulterated.
3. What are the functions of FSSAI?
4. Write in detail the principles of HACCP.
5. If you want to start a food service operation how will you maintain hygiene and sanitation using the principles of HACCP?