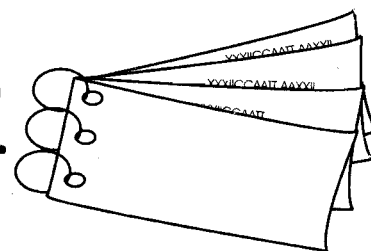


UNIT 1 UNDERSTANDING FOOD SAFETY

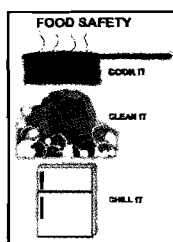
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- The globalization of the food supply is recognized as a major trend contributing to food safety problems. Eating away from home is yet another major trend of recent years.
- Many of the meals eaten away from home require extensive food handling and/or are cold foods that are not cooked before consumption. This leads to potential for transmission of food-borne diseases from food handlers to consumers.
- Public exposure to a food-borne pathogen may change due to changes in processing, changes in consumption patterns and the globalization of the food supply chain.
- Many risk factors influence the host's (our) susceptibility to infection. These may be:
 - *Pathogen (microbes)-related* : Ingested dose, virulence
 - *Host-related*: Age, immune status, personal hygiene, genetic susceptibility
 - *Diet-related*: Nutritional deficiencies, ingestion of fatty or highly buffered foods.
- Regional trade arrangements and the overall impact of the Uruguay Round Agreements have reduced many tariff and subsidy-related constraints to free trade, encouraging increased production and export from the countries with the most cost-effective production means. However, many exporting countries do not have the infrastructure to ensure high levels of hygienic food manufacture.
- The pressure to produce food for export is very significant in developing economies and can lead to improper agricultural practices. The consequences may include the following:

- accidental or sporadic low level microbial contamination of a single product, which can result in a major epidemic of food-borne illness;
 - high levels of mycotoxins, often resulting from poor storage and handling conditions;
 - high pesticide residues in food;
 - industrial contamination of food with metals and chemicals such as polychlorinated biphenyls (PCBs) and dioxins.
- With volume processing and preparation of food, the effect of contaminants are accentuated if sanitary practices are not followed. Added mechanization and larger volume operations of food processing and preparation have increased the need for workers in all segments of the food industry to have an understanding of sanitary practices and how hygienic conditions can be attained and maintained.

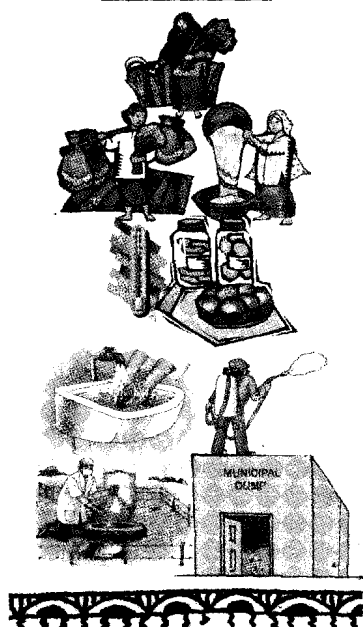


1.1 Concepts Related to Food Safety

- *Food Safety* may be defined as an assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.
- *Food safety* is usually defined in the context of absolute safety or relative food safety.
- *Absolute food safety* is the assurance that damage or injury from use of a substance is impossible.
- *Relative food safety* can be defined as the practical certainty that injury or damage will not result from a food or ingredients used in a reasonable and customary manner and quantity.
- *Toxicity* is the capacity of a substance to produce harm or injury of any kind under any conditions.
- *Hazard* is the relative probability that harm or injury will result when the substance is used in a proposed manner and quantity.
- Assessments of whether a food or ingredient is safe should not be based only on its inherent toxicity but on whether or not a hazard is created.
- Some basic terms related to food safety include the following:
 - *Cleaning* : The removal of soil, food residue, dirt, grease or other objectionable matter.
 - *Contaminant* : Any biological or chemical agent, foreign matter or other substances not intentionally added to food which may compromise food safety or suitability.

- *Contamination* : The introduction/ occurrence of a contaminant in food or food environment.
- *Disinfection* : The reduction by means of chemical agents and/ or physical methods, of the number of microorganisms in the environment, to a level that does not compromise food safety or suitability.
- *Food Hygiene* : All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.
- *Food suitability* : Assurance that food is acceptable for human consumption according to its intended use.
- *Quality* : The totality of characteristics of an entity that bears on its ability to satisfy stated or implied needs.
- *Quality Assurance* : All the planned and systematic activities implemented within the quality system and demonstrated as needed, to provide adequate confidence that an entity will fulfill requirements of quality.
- *Quality Control* : The operational techniques and activities used to fulfill requirement of quality
- *Risk* : A health effect caused by a hazard in a food and the likelihood of its occurrence.
- *Risk Analysis* : A process consisting of three components— Risk assessment, risk management and risk communication.
- *Total Quality Management* : An organization's management approach centred on quality based on the participation of all its members and aimed at long-term success through customer satisfaction and benefits to members of the organization and to society.

- Sanitation is the creation and maintenance of hygienic and healthy conditions.
- Food sanitation is the application of science to provide wholesome food handled in a hygienic environment by healthy food handlers to prevent contamination with food poisoning microorganisms and minimize contamination by food spoilage organisms. It is, therefore, an applied sanitary science related to processing, preparation and handling of food.
- Even though food plants/ factories are hygienically designed, foods can be contaminated with spoilage microorganisms or food poisoning microorganisms if proper sanitary practices are not followed. However, if hygienic practices and sanitation are ensured, clean and safe foods can be produced in older plants that have less than ideal sanitary features.
- It is difficult to segregate food sanitation and sanitation of the environment in which food products are manufactured, stored and prepared from the applied sanitation principles and personal hygiene of those who handle food during processing, preparation and serving.



- The general public might consider safe food as associated with zero risk (no risk at all). The food manufacturer, on the other hand, would consider food safe if it is within the parameters of acceptable risk.
- Zero risk is not feasible given the range of food products available, the complexity of the distribution chain and human nature. Nevertheless, the risks of food poisoning should be reduced during food manufacture to “an acceptable risk”. Unfortunately there is no public consensus on what constitutes an acceptable risk.
- A safe food supply that will not endanger consumer health and good quality food is essential for proper nutrition. It would ensure prevention of food-borne diseases, provide the consumer with unadulterated food of good quality. It also promotes participation in International trade in food products and stimulates economic development.
- Maintaining food safety and quality is essential in the entire chain of food production ranging from:
 - (i) primary food production at the level of farmers;
 - (ii) primary food processing at the farm, dairy, abattoir and grain mills;
 - (iii) secondary food processing level such as canning, freezing, drying and brewing;
 - (iv) food distribution, both at National and International level of import/export;
 - (v) food retailing and food catering as well as
 - (vi) domestic food preparation level.

- Consumer confidence in the safety and quality of the food supply is an important requirement and consumers are demanding protection for the whole food supply chain from primary producer to the end consumer, often described as from farm or pond to the plate approach.
- International agencies like Food and Agriculture Organization and World Health Organization as well as the Codex Alimentarius Commission, with a membership of 165 countries, recommend the *risk analysis approach*. Risk analysis includes risk assessment, risk management and risk communication.
 - *Risk Assessment*: Scientific evaluation of known or potential adverse health effects resulting from human exposure to food-borne hazards. It involves identification and characterization of a hazard and assessment of how likely it is that a health effect will result.
 - *Risk Management*: Process of weighing policy alternatives for accepting, minimizing or reducing risks, and selecting and implementing appropriate options.
 - *Risk Communication*: Exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers and other interested parties.
- The manufacture of safe food is the responsibility of everyone in the food chain and food factory. The production of safe food requires:
 - control at source;
 - product design and process control;
 - good hygienic practice during production, processing, handling and distribution, storage, sale, preparation and use;
 - preventive approach because effectiveness of microbial end-product testing is limited.
- Control of food-borne pathogens at source is not always easy. Many pathogens survive in the environment for long periods of time. They can be transmitted to humans by a variety of routes — water, soil, sewage, crops, silage, feed, meat.

1.4 Integrated Approach to Food Safety

Consideration of safety needs to be applied to the complete food chain from food production on the farm or equivalent, through to the consumer. To achieve this, integration of the following food safety tools is required.

- Good Hygienic Practice (GHP);
- Good Manufacturing Practice (GMP);
- Hazard Analysis Critical Control Point (HACCP);

- Microbiological Risk Assessment (MRA);
- Quality Management: ISO Series;
- Total Quality Management (TQM).

Quality management (including food safety management) along with long-term managerial strategy (e.g. total quality management) contribute to the overall quality system. Food safety management contributes to Good Manufacturing Practice (GMP) and Good Hygienic Practice (GHP). GMP and GHP form part of a Food Safety Assurance Plan such as HACCP. These then combine to create a good quality system.

The safety of foods (especially microbiological) can be principally assured by:

- The application of good hygienic practices during production, processing (including labeling), handling, distribution, storage, sale, preparation and use.
- The above in conjunction with the application of the Hazard Analysis Critical Control Point (HACCP) system. This preventive system offers more control than end-product testing, because the effectiveness of microbiological examination in assessing the safety of food is limited.



Key Terms

BSE: Bovine spongiform encephalopathy (BSE), is commonly known as *Mad-cow Disease*. It is a progressive neurological disorder of cattle that results from an infection by an unconventional transmissible agent.

Chemical additives: Food additives are substances added intentionally to foodstuffs to perform certain functions, for example to colour, to sweeten or to preserve. Certain chemicals used as additives are called chemical additives.

Codex Alimentarius Commission: *The Codex Alimentarius Commission* is "...the body responsible for compiling the standards, codes of practice, guidelines and recommendations that constitute the Codex Alimentarius," which is the international food code.

***E. coli* O157:H7:** *Escherichia coli* O157:H7 is one of hundreds of strains of the bacterium *Escherichia coli*. Although most strains are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness.

Food irradiation: The process of exposing food to radiation (rays of energy).

Genetically modified foods: GM is a special set of technologies that alter the genetic makeup of such living organisms as animals, plants, or bacteria. A genetically modified food is a food product containing some quantity of any genetically modified organism (GMO) as an ingredient.

Mycotoxins: Toxins produced by fungi

Pathogens: The disease-producing microorganisms and toxins are referred to as pathogens.

Pesticides: Chemicals used to kill pests such as insects, rodents.

Preservatives: Any substance that, for a reasonable length of time, will prevent the action of food-spoilage microorganisms.

“Risk analysis approach”: A process consisting of three components—risk assessment, risk management and risk communication.

Uruguay Round Agreements: Most of the WTO agreements are the result of the 1986-94 Uruguay Round negotiations, signed at the Marrakesh ministerial meeting in April 1994. There are about 60 agreements and decisions totaling 550 pages.

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