1. Details of Module and its structure

Module Detail	
Subject Name	Food, Nutrition for Healthy Living
Course Name	Food, Nutrition for Healthy Living
Module Name/Title	Food safety
Module Id	FNHL_101018
Pre-requisites	General knowledge about Food safety in India
Objectives	After going through this lesson, the learners will be able to understand the following : 1. Food safety in India 2. Food hazard 3. History of food safety 4. Food safety concepts 5. FSSAI 6. Steps to follow while purchasing food
Keywords	Concept, Food Quality, Food contamination, Food Spoilage, Health Hazards, Safe handling of Food

2. Development Team

Role	Name	Affiliation
National MOOC Coordinator (NMC)	Prof. Amarendra P. Behera	CIET, NCERT, New Delhi
Program Coordinator	Dr. Mohd. Mamur Ali	CIET, NCERT, New Delhi
Course Coordinator (CC) / PI	Prof. Poonam Aggarwal Dr. Suniti Sanwal	DGS, NCERT New Delhi DEE, NIE, NCERT New Delhi
Course Co-Coordinator / Co-PI	Dr. Yash Paul Sharma	CIET, NCERT, New Delhi
Subject Matter Experts (SMEs)	Dr. Sangeeta Goomer	Lady Irwin College, Delhi University
Content Reviewer	Mrs. Sunetra Roday	Former Principal, MSIHMCT, Pune

Table of Contents :

1. Food safety in India
2. Food hazard
3. History of food safety
4. Conclusion

1. Food safety in India

Food as wholesome comprises of an array of chemicals which are pure source of nutrients including water, carbohydrates, proteins, fats, vitamins, minerals and roughage for a balanced and healthy life. Some of the foods are consumed as whole in raw form while some others are subjected to processing such as cooking and storage prior to consumption. These constituents enhance nutritive value of food while some other constituents produced during processing or added intentionally may decrease the nutritional value or are toxic. Therefore, food safety is of utmost significance and has gained attention worldwide.

What is Food Safety?

Food safety may be defined as an assurance that food will not cause harm to the consumer when prepared and/or eaten according to its intended use. This aspect of food safety is usually defined in context of absolute safety or relative food safety.

i. Absolute safety is the assurance that damage or injury from use of a substance is impossible. Foods that are safe under normal conditions will never qualify for a seal of approval if they are ' consumed in' excessive quantities or used in an unusual manner.

ii. Relative-food safety, on the other hand, 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.

An understanding of food safety is improved by defining two other basic concepts i.e. toxicity and hazard
a) Toxicity is the capacity of a substance to produce harm or injury of any kind under any condition.
b) Hazard is the relative probability that harm or injury will result when the substance is used in a proposed manner and quantity.

Assessment of whether a food-or ingredient is safe should not be based on its inherent toxicity but whether or not a hazard is created. What is "safe" food? This question invokes different answers. Essentially, the different definitions would be given depending upon what constitutes a **significant risk**. The general public might consider that 'safe food' means zero risk (no risk at all). Whereas the food manufacturer would consider 'what is an acceptable risk?' The zero risk is not feasible given the range of food products available and 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.

2. Food hazard

Food hazards are the factors, which are the biggest threat to food safety. A hazard is defined as a biological, chemical, or physical agent in a food, or condition of a food, with the potential to cause an adverse health effect.

A. **Biological hazards** are commonly microorganisms such as bacteria, viruses and fungi. Microorganisms cause spoilage and toxicity in food. Therefore consumption of microorganism infested food leeds to various diseases.

B. **Chemical hazards** are naturally occurring poisons and chemicals or deleterious substances. This includes two groups, the first group covers **natural constituents** of foods that are not the result of environmental, agricultural, industrial or other contamination. Examples are aflatoxins and shellfish poisons. The second group covers poisonous chemicals or deleterious substances which are **intentionally** or unintentionally added to foods at some point in the food chain. This group of chemicals include pesticides, fungicides as well as lubricants and cleaners.

C. **Physical hazards** is any physical material not normally found in food which causes illness or injury. Physical hazards include glass, wood, stone, and metal etc. Examples of hazards are given in Table 1.

Table 1. Hazards associated with food

Biological	Chemical	Physical
Pathogenic bacteria	Veterinary residues, antibiotics	Glass, hair
Spore forming	Growth stimulants	Metal
Non spore forming	Plasticisers and packaging migration	Stones
Parasite and protozoa	Chemical residues	Wood

Viruses	Pesticides	Plastic
Mycotoxins	Cleaning fluids	Parts of pests
	Allergens	Insulation material
	Toxic metal; lead and cadmium	Bone
	Food chemicals; preservatives, processing aids, polychlorinated biphenyls, printing inks, prohibited substances	Fruit pits

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 consumer 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 farm to fork. This includes:

1. Primary food production at the level of farmers.
2. Primary food processing at the farm, dairy, abattoir and grain mills.
3. Secondary food processing level such as canning, freezing, drying and brewing.
4. Food distribution, both at national and international level of import/export.
5. Food retailing and food catering.
6. Food preparation at domestic consumer level.

3. History of food safety

Food safety has been part of our system since ancient time as refrigerators were not available so fresh food was prepared and consumed for each meal. Processes like fermentation, drying were used to preserve food. The home architecture was such that the kitchen was constructed separately from the main house and footwear was not allowed. Food was prepared by person only after taking bath and wearing washed clothes. The quality of hygiene was inbuilt into the practices being followed. However, there is a transitional shift in the practices followed. Now the kitchens are standing kitchens with footwear on while working. This might bring infection and may cause hazard to food also.

Because of change in lifestyle and paucity of time eating processed food and restaurant cooked food has become a necessity. Due to exposure to information on television children are demanding more

processed food than home cooked food like noodles soups etc. Therefore, this changeover has imparted a need to increase awareness about food safety of the fresh as well as processed foods.

During recent years newer challenges such as globalization of trade in food, urbanization, changes in life style, international travel, environmental pollution, deliberate adulteration and natural and man-made disasters have arisen which need to be addressed to ensure food safety and quality. For example, greater number of people go out and eat meals in catering establishments restaurants including partaking street foods. The boom in food service establishments is not matched by effective food safety education and control. Unhygienic preparation of food provides plenty of opportunity for contamination, growth or survival of food borne pathogens.

Consideration of safety needs to be applied to the complete food chain, from food production in the farm, or equivalent, through to the consumer. To achieve this integration of following food safety tools are required. These are as follows:

- Good Hygiene Practice (GHP)
- Good Manufacturing Practice (GMP)
- Hazard Analysis Critical Control Point (HACCP)
- Microbiological Risk Assessment (MRA)
- Quality management: ISO series
- Total Quality Management (TQM)

These tools are essential in ensuring food safety, therefore they can be implemented across food manufacturers in India. Effective hygiene control is vital to avoid the adverse human health and economic consequences of food borne illness, food borne injury and food spoilage. Everyone including farmers and growers, manufacturers and processors, food handlers and consumers has a responsibility to assure that food is safe and fit for consumption.

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 trade requires countries to protect the safety and quality of their foods entering International trade. Also, it is necessary to ensure that imported foods are of good quality and safe to eat. The new world order and global environment for food trade gives considerable obligation on

the part of both importing and exporting countries to ensure safety and quality of food. Successful food safety programmes need a shared responsibility among producers, industry, trade, government and the consumer. Food safety management has progressed rapidly in recent years. The International agencies like Food and Agriculture Organization and World Health Organization as well as the Codex Alimentarius Commission, with a membership of 187 countries, recommends risk analysis approach which includes risk assessment, risk management and risk communication.

- Risk assessment is the 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 is the process of weighing policy alternatives for accepting, minimizing or reducing risks, and selecting and implementing appropriate options.
- Risk communication is the exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers and other interested parties.

The perception of what constitutes a risk depends on a person's culture, education and past experience. But while what is perceived as risk may differ, the basic scientific principles for dealing with risk are the same. Risk communication, as a component of health education in food safety, consists of understanding consumer’s perceptions of food safety risks and disseminating the results of risk assessment and decisions regarding risk management. The latter may include measures that governments or industries have to implement or practices that the public as consumers or food handlersshould observe.

3.1. Food Safety as Integrated Approach :

An integrated approach on food safety and quality facilitates improved consumer protection, reduces incidence of food borne diseases, effectively stimulates agriculture and the food processing industry, and promotes domestic and international food trade and improves the economy. Preventive approach for improving safety and quality of food and enhancing food hygiene are gaining widespread acceptance. Promoting good manufacturing practices (GMP), educating food retailers and consumers about appropriate food handling are essential for promoting safe food, good nutrition and better health. The safe food production requires an all-encompassing approach involving the food operatives at the shop floor through to the management. Hence a number of management safety tools as mentioned underneath need to be implemented. Although industry and

national regulators strive for production and processing systems which ensure that all food is 'safe and wholesome', complete freedom from risks is an unattainable goal. Safety and wholesomeness are related to a level of risk that society regards as reasonable in the context, and in comparison with other risks in everyday life.

3.2. Food Safety Concepts :

To understand the concept of food safety an understanding of following terms are required:

- **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 Handler:** any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirement.
- **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.
- **Good Hygiene Practice (GHP):**It refers to the set of practices associated with the preservation of health and healthy living. Good hygiene Practices deal with safety and suitability requirements to be followed world-wide. GHP include all practices regarding the conditions and measures necessary to ensure it.
- **Good Manufacturing Practices (GMP):**Good manufacturing practice (GMP) is a system for ensuring that products are consistently produced and controlled according to quality standards. GMP covers all aspects of production; from the starting materials, premises and equipment to the training and personal hygiene of staff.
- **Quality:** the totality of characteristics of an entity that bears on its ability to satisfy stated or implied needs.

- **Quality Assurance:** all the planed and systematic activities implemented within the quality system and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements or quality.
- **Quality control:** the operational techniques and activities used to fulfil requirement of quality.
- **Risk:** a health 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 organisation's management approach centred on quality, based on participation of all its members and aimed at long-term success through customer satisfaction and benefits to the members of the organisation and to society.

What is Food Safety and Standards Authority of India?

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food related issues in various Ministries and Departments. FSSAI has been created for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption.

Highlights of the Food Safety and Standard Act, 2006

1. Various central Acts like Prevention of Food Adulteration Act,1954,Fruit Products Order , 1955, Meat Food Products Order,1973,
2. Vegetable Oil Products (Control) Order, 1947,Edible Oils Packaging (Regulation)Order 1988, Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967, Milk and Milk Products Order, 1992 etc will be repealed after commencement of FSS Act, 2006.

The Act also aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi- level, multi- departmental control to a single line of command. To this effect, the Act establishes an independent statutory Authority – the Food Safety and Standards Authority of India with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the Act.

FSSAI has been mandated by the FSS Act, 2006 for performing the following functions:

1. Framing of Regulations to lay down the Standards and guidelines in relation to articles of food and specifying appropriate system of enforcing various standards thus notified.

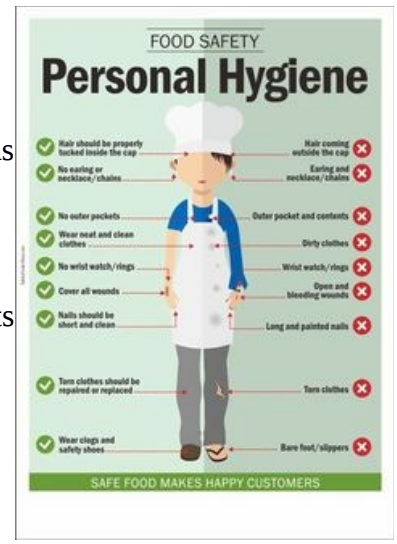
2. Laying down mechanisms and guidelines for accreditation of certification bodies engaged in certification of food safety management system for food businesses.
3. Laying down procedure and guidelines for accreditation of laboratories and notification of the accredited laboratories.
4. To provide scientific advice and technical support to Central Government and State Governments in the matters of framing the policy and rules in areas which have a direct or indirect bearing of food safety and nutrition.
5. Collect and collate data regarding food consumption, incidence and prevalence of biological risk, contaminants in food, residues of various, contaminants in foods products, identification of emerging risks and introduction of rapid alert system.
6. Creating an information network across the country so that the public, consumers, Panchayats etc receive rapid, reliable and objective information about food safety and issues of concern.
7. Provide training programmes for persons who are involved or intend to get involved in food businesses.
8. Contribute to the development of international technical standards for food, sanitary and phyto-sanitary standards.
9. Promote general awareness about food safety and food standards.

Food Safety and Standards Authority of India

4. Food Safety : To begin at home

Steps to follow while preparing food at home: -

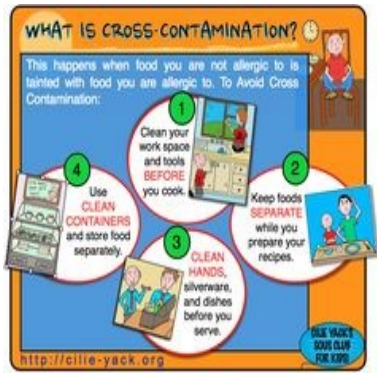
i. Maintain personal hygiene
ii. All the products should be stored at proper temperature as recommended.
iii. Proper washing and cleaning of food before using.
iv. Always use FIFO approach- First in and First out. Products purchased earlier should be consumed first.
v. All the utensils used should be properly cleaned.
vi. Avoid cross contamination.



Steps to follow while purchasing food:

I. Read the label carefully. Check all the ingredients, date of manufacturing, expiry date, instruction to store the product.

II. The pack should not be damaged or bloated.



5. Steps to follow while eating out

Steps to follow while in eating oil:

1. The restaurant should have a FSSAI certificate
2. Work stations should be clean
3. Utensils used for preparing and serving food should be sanitised.
4. Food products should be freshly prepared.
5. Food processing and serving area should be free from any rodents and pest**.**
6. Food or food ingredients should come from a safe source.
7. Food is held at the correct cold or hot holding temperatures.
8. Food is cooked properly, especially foods such as meat, poultry, and pork.

9. Cross-contamination from the environment should be prevented (for example, common work areas or common utensils).
10. Proper hand washing Techniques should be followed (fig.)
11. Food handlers should know how to prevent contamination, especially food handlers who may be sick with vomiting or diarrhea.

How to prevent the cross contamination of food:

1. Wash hands thoroughly after touching raw meat, especially poultry, and unwashed raw vegetables.
2. Wash hands thoroughly after going to the toilet or touching pets.
3. Do not let raw meat and unwashed raw vegetables touch other foods.
4. Cover raw meat in a fridge so it cannot touch other foods and store below other foods to prevent blood drips from contaminating them.
5. Do not prepare ready-to-eat foods using a chopping board or utensils that have been used to prepare raw meat or raw vegetables, especially root vegetables and leeks that may contain soil.
6. Use disposable cloths for wiping and cleaning up spills. Change cotton cloths often and wash in a hot cycle to clean them thoroughly.
7. Do not prepare food if you are ill with vomiting or diarrhoea.
8. Clean utensils and work surfaces with detergent and hot water. Those that come into contact with raw meat, unwashed vegetables and soil from vegetables need thorough cleaning and sterilising. Use separate chopping boards and utensils for preparing raw meats and other foods

Recent food safety issues

1. Mumbai: 20 students suffer food poisoning after lunch, rushed to hospital
2. 700 NDA cadets fall sick due to food poisoning, inquiry ordered
3. 47 fall ill after marriage feast, food poisoning suspected
4. Maggi Episode : The presence of Monosodium glutamate (MSG) and lead permissible limitsin maggi sample was detected. All the were withdrawn from the market.

Now we will study by examples the basic GHP and GMP to be followed while preparing a meal at home, or eating in a restaurant or while purchasing a processed food.

Steps in making aloo parantha

- Selecting good quality potato, onion, flour, condiments and spices.
- Washing vegetables thoroughly.
- Boil potato using potable drinking water in clean utensil.
- Peeling and chopping of vegetables. Diluted lemon juice/ vinegar to knife, peeler, chopping board and grater to be used.
- Knead the dough using potable drinking water.
- Fill the parantha and cook. Cooking should be proper with all the sides evenly cooked.
- Packing tiffin. The packaging material used should be of food grade quality and should not react with the food.

Steps to follow while having chowmein at a restaurant

- The place should be clean
- The cutlery and crockery used should be of food grade and clean.
- Fresh good quality vegetables, noodles and sauces and spices should be used.
- All the food items should be evenly cooked.
- Waste disposal should be systematic
- The restaurant should have a registration or license issued by Food Safety and Standards Authority of India (fassi)

Steps to follow while purchasing chips and cold drinks

1. **Check the packaging material for FSSAI license or registration number.**
2. **Read food label check the manufacturing and expiry date**
3. **Check the calorie count of the packet or bottle**
4. **Excessive intake of these products might be harmful. As high salt High in Fat Sugar and Salt (HFSS) salt and calorie intake is not recommended.**

Key Point

Focus on each and every step of making a product to prevent any hazard/ Food safety issue to occur.

4. Conclusion

Thus, we may conclude that food safety is an important issue which needs to be addressed at the earliest. Consumers should be made aware to check food handling and preparation practices of food vendor and they should follow good hygienic practices at home as well. This will help in maintaining good health.

There is growing consumer and industry interest in food labelling: the industry is concerned about informing potential consumers about the "qualities" of their products and many consumers actively seek information to facilitate product choices that meet their health needs and are consistent with their values. Thus, gaining knowledge on food safety aspect will enable our children to play an important role in successful implementation of this issue countrywide.