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Food safety: its relation to fruits and vegetables processed products

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Introduction:

Food safety is used as a scientific method/discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. Food safety concerns the handling, preparation, and storage of food (Angousana *et al.,* 2025). The occurrence of two or more cases of a similar illness resulting from the ingestion of a common food is known as a food-borne disease outbreak. This includes a number of routines that should be followed to avoid potential health hazards. In North eastern state of India due to a lack of information, strawberry farming and their processed products is not often carried out economically (Singh *et al*.,2022). In this way, food safety often overlaps with food defence to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labelling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. Ecological problems have been brought about by the high cost of common synthetic chemicals, their detrimental impact on the environment, and their propensity to promote disease resistance (Guragai *et al.,* 2023). In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer. The main change to the law relates to food safety management systems i.e. risk based methodologies to ensure the safety of food. Food safety issues are becoming more important in India. It is not because of global pressure of the World Trade Organization (WTO), a monitoring agency in this respective field, it is because of customers' increasing demand for better quality food. The Food Safety Standards Authority of India (FSSAI) came into

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existence under Food Safety and Standards Act, 2006. It covers all the global food safety norms laid down by WTO such as goods manufacturing practices (GMP), good hygienic practice (GHP), and hazard analysis critical control point (HACCP). The Food Safety Standards Authority of India (FSSAI) came into existence under Food Safety and Standards Act, 2006. It defines a food business operator (FBO) as a person engaged in the business of food manufacturing, processing, packaging, transportation, distribution, storage, export and import, etc., and the scope of definition includes food services, catering services and sale of food or food ingredients. The objective of FSSAI is to make available good quality food products for consumption irrespective of its origin. The food safety is the major concern besides sensory properties of the food. The food borne outbreaks have been a serious problem in the history of human kind. Therefore, to achieve an appropriate level of protection for human health, consumer's interests, including fair practices in all kinds of food trade, FSSAI act was passed. It ensures the prevention of fraudulent, deceptive or unfair trade practices which may mislead or harm the consumer with unsafe, contaminated or substandard food. (Anonymoushttps ://en.wikipedia.org/wiki/Food_safety). Many new food preservation systems have been developed as a result of the development of modern technology, one of which includes radiation (Angousana *et al*., 2025). Food processing is the transformation of agricultural products into food, or of one form of food into other forms. Food processing includes many forms of processing foods, from grinding grain to make raw flour to home cooking to complex industrial methods used to make convenience foods. Some food processing methods play important roles in reducing food waste and improving food preservation, thus reducing the total environmental impact of agriculture and improving food security.

Primary food processing

Primary food processing turns agricultural products, such as raw wheat kernels or livestock, into something that can eventually be eaten. This category includes ingredients that are produced by ancient processes such as drying, threshing, winnowing and milling grain, shelling nuts, and butchering animals for meat. It also includes deboning and cutting meat, freezing and smoking fish and meat, extracting and filtering oils, canning food, preserving food through food irradiation, and candling eggs, as well as homogenizing and pasteurizing milk. Commercial food processing uses control systems such as hazard analysis and critical control points (HACCP) and failure mode and

effects analysis (FMEA) to reduce the risk of harm.

Secondary food processing: Secondary food processing is the everyday process of creating food from ingredients that are ready to use.

Tertiary food processing: Tertiary food processing is the commercial production of what is commonly called processed food. Tertiary food processing has been criticized for promoting over nutrition and obesity, containing too much sugar and salt, too little fiber and otherwise being unhealthful in respect to dietary needs of humans and farm animals.

Safety and regulation

With the increasing use of processed foods since the 19th century, food additives are more widely used. For example, boric acid was widely used as a food preservative from the 1870s to the 1920s, but was banned after World War I due to its toxicity, as demonstrated in animal and human studies. During World War II, the urgent need for cheap, available food preservatives led to it being used again, but it was finally banned in the 1950s. Such cases led to a general mistrust of food additives, and an application of the precautionary principle led to the conclusion that only additives that are known to be safe should be used in foods. In the United States, this led to the adoption of the Delaney clause, an amendment to the Federal Food, Drug, and Cosmetic Act of 1938, stating that no carcinogenic substances may be used as food additives. However, after the banning of cyclamates in the United States and Britain in 1969, saccharin, the only remaining legal artificial sweetener at the time, was found to cause cancer in rats. Widespread public outcry in the United States, partly communicated to Congress by postage-paid postcards supplied in the packaging of sweetened soft drinks, led to the retention of saccharin, despite its violation of the Delaney clause. However, in 2000, saccharin was found to be carcinogenic in rats due only to their unique urine chemistry. There has been significant controversy associated with the risks and benefits of food additives. Natural additives may be similarly harmful or be the cause of allergic reactions in certain individuals. For example, safrole was used to flavour root beer until it was shown to be carcinogenic. Due to the application of the Delaney clause, it may not be added to foods, even though it occurs naturally in sassafras and sweet basil. In many cases, HACCP plan will not be successfully implemented without any prerequisite programmes, such as good manufacturing practice (GMP), good hygiene practice. A HACCP-based system is a recognised food safety management programme aiming at the control of all the

factors affecting food safety. It is also possible to add factors related to food quality. To evaluate the effectiveness of a quality system, a realistic estimate of quality costs is essential (Zugarramurdi *et al.*, 2007). For processed food sectors that wish to establish and implement a HACCP system, they must apply the principles of HACCP to identify any significant hazards and develop a HACCP plan to prevent, eliminate or reduce the hazard to an acceptable able level. The processed foods are treated with a range of approaches being investigated, mostly using minimal heating, natural preservatives and non-thermal treatment as technologies and often combined preservation/hurdle technology as the principle in designing the overall treatment. The food processing techniques require to be well controlled through adequate product, process design, its proper implementation and monitoring through HACCP. It is the responsibility of food processing sector industry, including small enterprises (Havelaar *et al*., 2010).

Food safety control system

The prerequisite for deployment and implementation of HACCP philosophy is to introduce sanitation standard operating procedures (SSOP) and standard operating procedures (SOP) in processed food sector. Therefore, Food Safety and Standards Act (2006) have made provisions in governing food sanitation requires that food HACCP, GMP and GHP must be implemented in processed food sector. The resultant food safety control system is three fold in India. It comprises of HACCP, GMP and GHP. FASSI laid-down nine SOPs for processed food manufacturing and food processing sector for implementation of HACCP in India. These SOPs must be written and describes daily procedures. It will be conducted before and during operations to prevent direct product contamination or adulteration. In addition, the SOPs also include the frequency at which each procedure will be done. The SOPs in HACCP, GMP and GHP must be signed by an official with overall authority on-site or a higher-level official of the plant. Even for miner alteration, initiation and modification, the SOPs must be signed. The microbiological testing including the total aerobic count, coliform and *E. coli*, is often being done to ensure that each particular SOPs achieve an acceptable level of performance in controlling microbial hazard.

Food Good Hygiene Practices

GMP is defined as a bundle of feasible methods and practices that ensure quality manufacturing system. It can provide consistent manufacturing by controlling product quality through qualitative and conformity assessing criteria. It has a clear goal as desired by International, national legal authorities specification, marketing channels,

consumers of the product. The investment required to ensure that a food handling facility is suitably constructed to offer safe food. This may be stating the obvious but the lack of effective good hygiene practices (GHP) and GMP has often been overlooked (Jackson, 2006). The advance manufacturing techniques are used by production plants for performing tasks related to quality assurance systems such as GMP, GHP and HACCP (Konecka-Matyjek *et al*., 2005).

Three broad categories of interrelated issues arose during the development of the GMPs (Dunkelberger, 1995):

- concern that the regulations were unduly stringent and especially burdensome for small food companies without necessarily improving the quality or safety of foods.
- contention that the GMP regulations must prescribe conditions that 'reasonably' relate to insanitary conditions that may contaminate food and render it injurious to health.
- assertions that the regulations did not have the force of law.

Primary production: The environmental and production hygiene should be maintained.

1. To minimise the food contamination or food hazards.
2. Establishment design and facilities: The risk analysis should be performed on premises, equipment, facilities used for preparation of the product. The manufacturing process must ensure food safety.
3. Control of operations: The package material must be food grade. The water must be cleaned and as per guidelines for food production. The production process must be documented. It should be supervised properly. The product recalls and their handing must be properly done.
4. Maintenance and sanitation: The cleaning method, pest control, waste management and their effective monitoring is required to be in place.
5. Personal hygiene: Employee's health status, personal cleanliness of cloths and personal behaviour in terms of spitting, chewing, smoking, etc., required to be checked regularly.
6. Transportation: The arrangement of transporting vehicles is as per required goods to be transported. The wet products will be moved using cold chain. The dry products will be transported using closed or even open vehicles.
7. Product information and consumer awareness: The information should be shared among supply chain members for example lot identification, labelling

and consumer education on hygiene, nutrition, etc.

8. Training: Training ought to be imparted on regular intervals. It is one of tool to remove food hazards.

10 ways to ensure food safety:

1. Facilities location and design

The design and location of a food processing facility need to be taken into account when ensuring food safety meets the correct standards. Areas that are known to be pest "hot spots" as well as prone to pollution need to be avoided to reduce the risk of contamination.

2. Machineryandproductionlinedesign

The layout of the production line should allow easy maintenance and cleaning of machinery and surrounds and prevent contamination of the food products and ingredients during the production process.

The design of machinery used for food processing also has to be taken into account to comply with food safety regulations. Poor design can result in build-up of food material in hidden places that are difficult to clean.

3. Pest control

Pest control plays an important part in food safety. Troublesome insects such as cockroaches and flies can spread food-borne diseases by contaminating food at any stage of production. Rodents also spread diseases as well as causing damage to buildings, fixtures and machinery. Stored product insects can damage and contaminate food during transport and storage.

4. Waste management

The BRC Global Standards for Food Safety states provides guidelines for waste management to meet the correct food safety regulations. This states that: *"Waste disposal shall be managed in accordance with legal requirements and to prevent accumulation, risk of contamination and the attraction of pests."*

5. Cleaning

Establish cleaning and disinfection programmes to ensure the correct hygiene standards are met and reduce the risk of a foodborne illness outbreak.

6. Maintenance

Establishing proactive maintenance measures for premises and food processing machinery to ensure they run smoothly and properly, and ensures the production of safe foods.

7. Personal hygiene

The UK Food Standards Agency advise that food handling businesses ensure the following factors are considered to ensure personal hygiene:

- **Hand Washing** - ensure effective hand-washing techniques are followed at appropriate times

- **Minimise hand contact with food**- try to minimise direct hand contact with raw food by using appropriate utensils and safe use of disposable gloves
- **Personal cleanliness** - cover hair; do not sneeze or cough over food; cover cuts and sores; and do not wear jewellery
- **Wear protective clothing**- wear suitable clean protective clothing and handle appropriately to prevent cross contamination
- **Exclude ill staff**- staff must report illnesses; exclude staff with vomiting or diarrhoea

8. Environmental hygiene

Food processing facilities rely on the use of potentially dangerous chemicals for sanitation and pest control. Because of this attention has to be applied to reduce the risk of accidental environmental contamination during the food processing cycle.

9. Correct handling, storage & transport

On top of food production and preparation, food safety also has to be applied during handling, storage and transportation, for both incoming deliveries and products going out to customers.

10. Staff training

Areas which staff should be trained about include:

- Hand hygiene
- Safe food storage practices
- Safe food handling practices
- Cleaning for food safety
- Pest control

The UK Food Standards Agency provides guidelines on training staff about food safety

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