Technical terminology and fundamental concepts

Introduction

In food science and food safety, many ordinary words acquire a precise technical meaning. Terms such as food, quality, safety, hygiene, hazard and risk should therefore not be treated as literary vocabulary or interchangeable synonyms. Their meaning determines how food is evaluated, how hazards are identified and how preventive and control approaches are designed.

The purpose of this introductory chapter is to establish the conceptual vocabulary required for the entire course.

1. Food and food products

1.1. Food

Codex Alimentarius defines food as any substance, whether processed, semi-processed or raw, which is intended for human consumption. The Codex definition includes beverages and chewing gum and excludes cosmetics, tobacco and substances used only as drugs.

The term food product is commonly used in food science and industry to refer to a food as a manufactured, processed or marketed product. The precise legal terminology may vary according to the regulatory framework.

The term foodstuff is also used in legislation and professional documents in some jurisdictions.

1.2. Product categories

Raw material: A material entering a food operation and serving as a basis for processing or formulation.

Ingredient: A component intentionally incorporated into a food during formulation or manufacture and intended to become part of the final product.

Food additive: A substance intentionally added to food for a specific technological purpose, such as preserving, stabilising, emulsifying, colouring or regulating acidity, in accordance with the applicable regulatory framework.

Processing aid: A substance intentionally used during food processing to achieve a specific technological purpose, but which is not intended to have a technological function in the final food. It may remain only as technically unavoidable residues or derivatives.

Finished product: A product obtained after completion of the intended manufacturing operations and ready for the next stage, such as storage, distribution or consumption.

Ready-to-eat food: Food intended to be consumed directly without any further processing or preparation step expected to eliminate or adequately reduce a relevant food-safety hazard.

1.3. Classification of foods

Foods may be classified according to several independent criteria

1.3.1. According to origin

- Animal origin: milk, meat, eggs, fish and honey.
- Plant origin: cereals, fruits, vegetables, legumes, nuts and seeds.
- Mineral: water, salt

1.3.2. According to degree and purpose of processing

A commonly cited framework is the NOVA classification, which groups foods according to the extent and purpose of processing. It should be presented as a specific food-classification framework, not as the only possible classification of foods.

- Group 1: Unprocessed or minimally processed foods (fresh fruits, vegetables, eggs, milk, meat, grains and legumes)
- Group 2: Processed culinary ingredients (oils, butter, sugar and salt).
- Group 3: Processed foods (canned vegetables, cheese, bread and some smoked or salted foods).
- Group 4: Ultra-processed foods which are industrial formulations such as many packaged snacks, soft drinks and some ready-to-eat industrial products.

1.3.3. According to perishability

- Perishable foods: foods that deteriorate rapidly without appropriate preservation; examples include fresh meat, fish and raw milk.
- Semi-perishable foods: foods with a longer but still limited shelf life under appropriate storage; examples may include some cheeses, eggs and certain fruits.
- Relatively stable foods: foods that can be stored for long periods under appropriate conditions; examples include grains, dried legumes, sugar and salt.

1.3.4. According to food category or composition

- Dairy products: milk, yoghurt and cheese.
- Cereals and cereal products: wheat, rice, bread and pasta.
- Meat and meat products: beef, poultry and sausages.
- Fish and seafood: fresh, frozen or processed fish and seafood.
- Eggs and egg products.
- Fruits and vegetables.

– Fats and oils.
– Sugars and confectionery.
– Beverages.

2. The food chain

Food safety cannot be considered only at the level of the processing plant. Food passes through a sequence of stages from primary production to consumption. Each stage can influence the quality and safety of the final product.

2.1. Primary production

Primary production includes activities such as crop production, harvesting, milking, slaughter and fishing. Hazards may enter the food chain at this stage and may subsequently be carried into processing and distribution.

2.2. Main actors and concepts

- **Food business operator:** An organisation or person responsible for activities within the food chain and for meeting applicable food requirements.
- **Food handler:** A person who directly handles food, food equipment, utensils or food-contact surfaces and is expected to follow relevant food-hygiene requirements.
- **Supplier:** An organisation or person providing materials, ingredients, packaging, products or relevant services.
- **Consumer:** The person for whom the food is intended and who ultimately consumes it.

2.3. Traceability: The ability to follow the movement and relevant history of a product through specified stages of production, processing and distribution.

3. Food quality

3.1. General concept of quality

Food quality is the ability of a food product to consistently meet specified requirements and satisfy the expectations associated with its intended use.

These requirements may be implicit, such as food-safety regulations, microbiological and chemical limits, freshness, labelling requirements and product specifications, or, explicit such as taste, appearance, convenience, value for money, cultural acceptability and ethical expectations.

Therefore, a product may comply with all mandatory requirements but still fail to meet consumer expectations. Conversely, satisfying consumer expectations cannot compensate for non-compliance with safety or legal requirements.

Quality does not necessarily mean excellence or being the "best" ; it means being fit for the intended purpose and conforming to relevant requirements and expectations.

3.2. Main dimensions of food quality

Food quality is multidimensional. It concerns the characteristics that make a food conform to applicable requirements and suitable for its intended purpose, while also meeting relevant customer or consumer expectations.

- **Safety quality :** Concerns the control of unacceptable food-safety hazards and compliance with relevant safety requirements.
- **Nutritional quality:** Concerns nutrient composition, nutritional value and relevant nutritional characteristics.
- **Sensory quality:** Includes appearance, colour, odour, flavour, texture and other sensory attributes.
- **Physicochemical quality:** Includes measurable characteristics such as pH, moisture, acidity, water activity and composition.
- **Technological quality:** Concerns the suitability of a material or product for a specified processing or technological purpose.
- **Commercial quality:** Concerns conformity with specifications, presentation and market requirements.
- **Ethical and social quality:** Concerns the ethical and social conditions associated with the production, processing and marketing of food. It may include animal welfare, respect for human rights, avoidance of child labour, fair working conditions, responsible production practices, transparency and traceability. Religious requirements, such as halal requirements where applicable, may also constitute specific requirements for food products.

4. Food security, food safety and food suitability

4.1. Food security

FAO describes food security as a situation in which people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

The classical framework describes four dimensions: availability, access, use and stability.

4.2. Food safety

ISO 22000 defines food safety as the concept that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

Food safety is therefore concerned with preventing or controlling hazards capable of causing adverse health effects.

4.3. Food suitability (wholesomeness)

While food safety focuses on preventing harm to health, Food suitability concerns whether food is acceptable for human consumption according to its intended use. Codex uses these concepts together when describing hygienic food production.

This distinction is useful when discussing spoilage, sensory defects and acceptability: an unacceptable product is not automatically unsafe, and an unsafe product is not necessarily visibly unacceptable.

5. Food-safety concepts

5.1. Hazard

ISO 22000 defines a food-safety hazard as a biological, chemical or physical agent in food, or a condition of food, with the potential to cause an adverse health effect.

A hazard is a potential source of harm. In food safety, the hazard may be biological, chemical or physical, or may involve a relevant condition of food.

5.2. Exposure

Exposure refers to contact between a person and a hazard. In food safety, exposure may occur when a consumer eats food containing a biological, chemical or physical hazard.

5.3. Adverse health effect

An adverse health effect is a harmful effect on health that may result from exposure to a relevant hazard. Depending on the hazard, effects may include infection, intoxication, allergic reaction or physical injury.

5.4. Risk

Risk must not be confused with hazard. In the food-safety context, risk is a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard.

The essential distinction:

5.5. Contamination

Contamination refers to the introduction or occurrence of a contaminant in food or the food environment. A contaminant may be a biological or chemical agent, foreign matter or another substance that may compromise food safety or suitability.

5.6. Cross-contamination

Cross-contamination is the transfer of contaminants or hazards from one source to another. It may occur directly or indirectly through hands, utensils, equipment, surfaces, water, air or product flows.

Example: Raw poultry contaminated with *Salmonella* can contaminate a ready-to-eat salad through a contaminated cutting board.

5.7. Control measures

A control measure is an action or activity that can be used to prevent, eliminate or reduce a food-safety hazard to an acceptable level.

6. Food hygiene and sanitation

6.1. Food hygiene

Codex defines food hygiene as the conditions and measures necessary for the production, processing, storage and distribution of food designed to ensure a safe, sound and wholesome product fit for human consumption.

Food hygiene therefore concerns the conditions and practices needed to maintain food safety throughout the food chain.

6.2. Cleaning

Cleaning is the removal of soil, food residues, dirt, grease and other objectionable matter from surfaces and equipment.

6.3. Disinfection

Disinfection is the reduction, by chemical agents and/or physical methods, of microorganisms in the environment to a level that does not compromise food safety or suitability.

Cleaning and disinfection are complementary operations. Effective cleaning removes organic matter and residues, while disinfection reduces microorganisms to an appropriate level. A visually clean surface is not necessarily microbiologically safe.

7. Food technology and technological processes

7.1. Food technology

Food technology can be understood as the application of scientific and engineering knowledge to the handling, processing, preservation, stabilisation, packaging, storage and utilisation of food materials.

7.2. Technological process

A technological process is an organised sequence of operations designed to transform a raw material or intermediate product into a product with defined characteristics.

Technological operations can influence food safety. Heat treatment can reduce biological hazards; refrigeration can limit microbial growth; packaging can protect against recontamination; and inadequate processing or storage conditions can increase risk.