Food safety

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1. European Food Safety System: a shared responsibility

Today's lifestyles are vastly different from those of the past. The fast pace of modern lifestyles and the increase in single-person households, one-parent families and working women have lead to changes in the food preparation and consumption habits. A positive outcome of this has been rapid advances in food technology, processing and packaging techniques to help ensure the safety and wholesomeness of the food supply as more convenient food. In spite of these advances, contamination of the food supply by either naturally occurring or accidentally introduced contaminants or malpractice does occur.

Ultimately, the quality and safety of food depends on the efforts of everyone involved in the complex chain of agriculture production, processing, transport, food production and consumption. As the EU and the World Health Organisation (WHO) put it succinctly - food safety is a shared responsibility from farm to fork.

Maintaining the quality and safety of food throughout the food chain requires both operating procedures to ensure the wholesomeness of food and monitoring procedures to ensure operations are carried out as intended.

1.1. EU framework and regulations

The EU food safety policy encompasses the whole of the animal and human food chain. It provides extensive legislation and outlines the responsibility of producers and suppliers in helping to ensure a safe quality of the food supply. The EU regulations are amongst the most stringent in the world.

In order to make the area of food regulation more transparent and scientific, there was an overhaul of the EU food safety framework since the late 1990s. In 1997, a new scientific advisory system for the EU was established. Eight new Scientific Committees were appointed in addition to a Scientific Steering Committee. The European Food Safety Authority (EFSA) will be established during 2002. The EFSA will be an independent body that works in close cooperation with various scientific agencies and institutions in EU member states providing independent scientific advice on all matters with a direct or indirect impact on food safety. It will cover all stages of food production and supply, from primary production right through to the supply of food to consumers. The EFSA will also carry out assessments of risks to the food chain and scientific assessment on any matter that may have a direct or indirect effect on the safety of the food supply, including matters relating to animal health, animal welfare and plant health.

1.2. Agriculture and Transport

The quality of raw materials is crucial to ensure the safety and quality of the final product. Therefore, a systematic approach is needed from farm to fork in order to avoid contamination of foodstuffs and to

identify potential hazards.

From the farm/trade, agriculture produce is transported to food processing industry. This step of the food chain is covered by legislation on quality standards:

- The European Union's legislation on the preservation of hygiene and safety of food applies to transport and storage.
- The norms of the International Standards Organisation (ISO) contain a chapter on the storage and delivery of food products.
- The Codex Alimentarius established in 1962 by the World Health Organisation (WHO) and the Food and Agriculture Organisation (FAO) includes the issues of transport and storage in the overall recommendations for the preservation of food.

To know more about agriculture.

1.3. Food manufacturing

It is the food processing industry responsibility to meet consumer expectations that their products are safe, and meet all legal requirements.

Food processors rely on modern quality management systems to ensure the quality and safety of the products they produce. The three key systems in use are:

- Good Manufacturing Practices (GMP).These entail the processing conditions and procedures that have been proven to deliver consistent quality and safety based on long experience.
- Hazard Analysis Critical Control Points (HACCP). While traditional safety assurance programmes focused on identifying problems in the finished product, HACCP, a recent proactive technique, focuses on identifying potential problems and controlling them during the design and the production process itself.
- Quality Assurance Standards.Adherence to standards established by the International Standards Organisation (ISO 9000) and the European Standard (ES 29000) ensures that food processing, catering and other food-related industries conform to prescribed and well-documented procedures. The effectiveness of these programmes is regularly assessed by independent experts.

These quality management systems used by food processors also involve working with the suppliers (individual farmers and raw material wholesalers), transporters, product wholesalers and retailers to ensure quality assurance procedures at each level.

From the manufacturer to the consumer: Protecting Food through packaging

After the product is processed, food packaging ensures that food reaches the consumer in peak condition. Packaging preserves the integrity, safety and quality of food products in transport, wholesale warehouses, and retail stores and in the home. It helps maximise the shelf life of the product while carrying important

information on the label. Besides, bar codes on packaging containing the date and the location of manufacture enables processors, transporters and retailers to keep track of products for both inventory control and identification of potential hazards.

1.4. The Consumer's Role in Safety Practices

The consumer is the final element of the food chain. Food that has been perfectly safe at the point of purchase needs to be handled carefully to avoid contamination at home. To ensure that eating remains an enjoyable experience and is not spoiled by the risks of falling ill or the fear, a number of measures can be taken.

Purchase and transport

- Always check the "Use-By" date or "Best before" date marking on packaged foods.
- Do not purchase products marked as "Keep refrigerated", "Keep chilled" or "Keep frozen" that have not been stored under adequate refrigeration.
- Take food that needs refrigeration home quickly and place it in the refrigerator or freezer promptly. Check the condition of frozen products. If thawed, do not refreeze.
- Make sure the packaging on foods is not damaged. Avoid dented and bloated cans, torn or warped packaging and damaged safety seals.

Storage

- Avoid contact between raw and cooked foods. This reduces the risk of cross contamination (bacteria passing from one food to another). Store raw meats, poultry and fish near the bottom of the refrigerator and cooked foods on higher shelves. Do not put hot food in the refrigerator, as it will cause the temperature to rise. Store foods wrapped or in covered containers in the refrigerator. Discard foods that have gone mouldy or look, taste or smell bad.
- Store canned foods in a clean, cool dry place.

Food Preparation

- Always wash your hands in hot, soapy water before and after handling food. Cover any cuts or sores with waterproof plasters.
- Keep all kitchen surfaces clean by washing with hot soapy water and disinfectant to prevent cross-contamination.
- Wash utensils and boards used in the preparation of foods. A knife used to cut raw foods may have bacteria on it, which can be transferred to other foods. Use separate cutting boards and utensils for raw and cooked foods.
- Wash raw fruit and vegetables thoroughly before eating and further preparation.
- Thaw frozen food in the refrigerator and cook it immediately it has thawed.
- Do not leave raw food that is likely to become contaminated or cooked food at room temperature longer than necessary, and never for more than two hours.

- Cool cooked foods as quickly as possible (preferably in large shallow pans) then refrigerate. This slows down the growth of bacteria, which occurs best at temperatures between 10 and 60 degrees Celsius (the "danger zone"). Reheat cooked foods thoroughly to kill any bacteria, which may have developed during storage.
- Play it safe. If you are not sure about a food's safety, throw it out rather than risk foodborne illness.
- Always follow manufacturers recommended instructions.

2. Food Safety Challenges

The potential for food to become contaminated with chemical substances or microorganisms starts from the time it is harvested and continues right through until the time it is eaten. In general, the risks to food safety fall into two broad categories:

- Microbiological contamination (eg: bacteria, fungi, viruses or parasites). This category results in most cases in acute symptoms.
- Chemical contaminants, comprising environmental chemicals, veterinary drug residues, heavy metals or other residues unintentionally or accidentally introduced into the food supply during farming, processing, shipping or packing.

Whether a contaminant will pose a health hazard or not depends on many factors including the absorption and toxicity of the substance, the level of the contaminant present in the food, the amount of contaminated food that is consumed and the duration of exposure. Besides, individuals differ in their sensitivity to contaminants and other factors in the diet can have an impact on the contaminant's toxic consequences. A further complicating factor concerning chemical contaminants is that many of the studies on the toxicity of contaminants must, by necessity, be extrapolated from animal studies and whether or not the substances exert the same effects in humans is not always known with absolute certainty.

2.1. Microbiological contamination

The most reported causes of foodborne illnesses are of microbiological origin. Microbes are ubiquitous and can enter the food chain at any point from the agriculture produce to the consumer's kitchen. Quality assurance systems are designed to minimise the risk of microbiological contamination. However, as most of our food is not sterile, if handled improperly contamination may occur.

The table below lists the microorganisms most commonly associated with foodborne illness and examples of foods that are typical vehicles for those illnesses.

CAUSE	FOODS MOST OFTEN ASSOCIATED WITH THE PROBLEM
BACTERIA	

Bacillus cereus	Reheated cooked rice, cooked meats, starchy puddings, vegetables and fish. Improper handling after cooking is a common feature of foods causing B. cereus associated foodborne illness
Clostridium perfringens	Reheated foods including buffet dishes, cooked meat and poultry, beans, gravy, stews and soups.
Clostridium botulinum	Improperly canned (home preserved) foods such as vegetables, fish, meat and poultry.
Escherichia coli (E.coli)	Salads and raw vegetables, undercooked meat, cheese, unpasteurised milk.
Campylobacter jejuni	Raw milk, poultry
Listeria monocytogenes	Unpasteurised milk and milk products such as soft cheeses, raw meat, poultry, seafood, vegetables, paté, smoked meat and fish, coleslaw.
Salmonella	Undercooked poultry, meat, shellfish, salads, eggs and dairy products.
Staphylococcus aureus	Ham, poultry, eggs, ice-cream, cheese, salads, custard and cream-filled pastries and gravies, are the most common sources. Improper handling of food or poor hygiene could help S.aureus spread into food.
Vibrio parahaemolyticus and other marine Vibrio	Raw and undercooked fish and shellfish.
PARASITES	
Trichinella spiralis	Undercooked pork or game.
Toxoplasma gondii	Undercooked meat and poultry and raw milk.
VIRUSES	
Hepatitis A virus	Shellfish, raw fruits and vegetables can be the uncommon cause of hepatitis A. Hepatitis A can be spread by contaminated food handlers inadvertently transferring the virus to the food they handle.

2.2 Mycotoxins

Mycotoxins are toxins produced by certain fungi or moulds that grow on foods such as peanuts, tree nuts,

corn, cereals, soybeans, animal feeds, dried fruits and spices. The toxins may be produced as crops grow or develop later during poor storage or handling. Mycotoxins can also enter the food chain via meat or other animal products such as eggs, milk and cheese as the result of livestock eating contaminated feed.

The actual effects they have on health depend on the amount and type of the mycotoxins ingested. For instance continuous intake of aflatoxin is thought to be associated with liver cancer in people affected by Hepatitis B. Other mycotoxins have been linked to kidney and liver damage.

Careful surveillance procedures and proper storage conditions of foods are important in helping to prevent the development of mycotoxins. In terms of protecting the consumer, National and International Organisations are constantly evaluating the risk that mycotoxins pose to humans.

2.3. Pesticides

An important priority for farmers is to ensure that their products - whether vegetable or animal in origin - are produced in a safe manner. To comply with this, they are assisted by a wide variety of farm advisory services, providing advice on the correct use of fertilisers, pesticides and other products in crop and animal husbandry.

Chemicals such as pesticides or products used in animal health are subject to strict regulations. They undergo rigid testing procedures before they are accepted for registration by European or national authorities. This testing must prove that the product, at the intended level of use:
Has real value and will work as intended Will have no negative side effects in humans, either during use on the farm or from residues that may remain in food Will have no negative environmental effects More than 800 pesticides are currently approved for use in Europe. The procedure for establishing if a new product merits registration is complex. It requires many toxicity and efficacy studies before initial field tests can be carried out. It also includes tests on the degradation of the product and its derivatives in the plant and in the environment. A product should benefit the plant or animal it is intended to help with no negative effect on other species, and should not leave any harmful residues in the plant or animal or in the soil or water.
To know more about pesticides.

2.4. Antibiotics and growth promoters (hormones)

The use of antibiotics and growth hormones in livestock has been a controversial matter for many years. The use of antibiotics in livestock farming is essential to help prevent the widespread and devastating effects of diseases in herds. In some cases, antibiotics have been added to feed to promote growth. It has been shown that low residues of the drugs may build up in the fatty tissue, kidneys and liver of animals however these are not thought to pose any risk to human health.

The use of antibiotics in livestock has been suspected as one of the causes of the emergence of antibiotic-resistant species of bacteria, al hough the most common cause is poor drug management in the treatment of human health. This in turn results in human illnesses that cannot be treated by traditional antibiotics. In March 2002, the EU proposed that the use of antibiotics as growth-promoting agents should be phased out

by 2006.

Hormones have been fed to cattle to boost their growth rate and to increase milk production in cows. The EU banned the use of growth hormones in livestock in 1988, however, the practice still continues in the US, Canada and in Australia. The topic remains controversial especially in terms of international trade of hormone-treated beef.

2.5. Industrial pollution

2.5.1. Dioxins

Dioxins are by-products of the manufacture of certain industrial chemicals and incineration or burning. Dioxins are environmental contaminants that persist in the environment for many years and can find their way onto and into foods. In fish, polluted water is the main cause of dioxin contamination while animals are mostly exposed to dioxins through the air. Dioxins settle on plants and feed, which are then eaten by animals. Dioxin concentrates in the fatty tissues of livestock and fish. More than 90% of human exposure occurs mainly through foodstuffs. Those of animal origin normally account for approximate 80% of the overall exposure.

Despite punctual incidents (e.g. Belgium, 1999), available data shows that the background exposure to dioxin of the European population has decreased over the last 10 years. The current EU policy on dioxins aims at further reducing the contamination levels of dioxins in the environment, feed and foodstuffs in order to ensure a higher level of public health protection. Based on the knowledge that carcinogenic effects of dioxins do not occur at levels below a certain threshold, the overall goal is to reduce dioxin levels in products and hence human exposure by about 25% by 2006.

2.5.2. Heavy metals

Other industrial pollutants include heavy metals such as mercury, lead and cadmium. Fish are especially vulnerable to environmental pollutants because waters can become contaminated from industrial discharges or accidental spillage. Recent reports of levels of mercury in large predatory fish such as swordfish have caused some European authorities to issue warnings that these fish should not be eaten by pregnant or lactating women or children due to the possibility of high levels of mercury. Occasional intake by other consumers is not likely to pose a problem however intake should be limited to once a week. The fishing industry has responded by harvesting smaller sized deep-sea fish, which are unlikely to have a build-up of heavy metals. The EU has standards for mercury and other heavy metal contaminants in foods and the levels are routinely monitored.

2.6. Bovine spongiform encephalopathy (BSE)

Bovine Spongiform Encephalopathy (BSE), commonly known as "mad cow disease", is a fatal brain disease that affects cattle. The disease is named after the characteristic sponge-like changes to the brain that it causes. There are different theories regarding the cause of BSE as well as the agent of the disease.

According to one theory, the agent consists of " transmissible prions". "Prion" is actually a generic term for various proteins found mostly in the brain, but also in many other tissues, of humans and animals. Transmissible prions are abnormal prions that are capable of interacting with the normal prions in the tissues of animals to induce their conversion to transmissible prions, mostly in the brain and central nervous system. A number of other factors are thought to be involved in the development of BSE and research in this area is continuing.

The route of transmission of BSE is still not proven. However, it is thought that cattle may have became infected with BSE when fed bone meal or animal feed produced from the BSE-infected carcasses of dead or slaughtered animals. Other possible routes and causes of transmission have still not been ruled out.

Although no causal link has been formally established between ingestion of BSE-infected material and vCJD, only those who have eaten BSE-infected "specified risk material" (SRM) are thought to be at risk from vCJD. SRM refers to the parts of cattle that are most likely to be infected with the BSE agent and include the central nervous system including the brain, the spinal cord, the eye and part of the large intestine. The BSE agent has not been detected in muscle meat (beef) or milk and WHO and EU experts regard bovine milk and muscle meat to be safe.

Strict regulations to govern animal feeding, testing, slaughter, the age of cattle slaughtered for human consumption and removal of SRM are in place. The incidence of BSE in cattle in the UK, although still of concern, has fallen significantly over recent years and BSE cases in mainland Europe remain low. The risk of contracting v-CJD from food is now believed to be very low. To know more about BSE.

3. Conclusions

Food safety is only ensured by the shared responsibility of everybody involved with food from the professional to the consumer. All along the food chain, various procedures and control mechanisms are implemented to assure that the food which reaches the consumer's table is fit for consumption, that the risks of contamination are minimised, so that the population as a whole is healthier from the benefits of safe quality food. However, zero risk within food does not exist and we have to be also aware that the best legislation and control systems cannot fully protect us against those with criminal intentions.

The best way to practice food safety remains to be well informed about the basic principles of food production and safe food handling at home.

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