Food safety

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Background

It is interesting to note that the World Health Organization (WHO) Constitution, which was adopted in 1948, included a specific mandate apropos food standards. Article 2 (U) of the Constitution states clearly that WHO should develop, establish and promote international standards with respect to food. This recognition would lead to seminal work on the part of WHO in the field of food safety. Food is of fundamental importance to life. However, it is also a vehicle for transmitting hazards and causing disease and death to humans. Illness due to contaminated food is considered the most widespread transmissible health problem today and also an important cause of reduced economic productivity.

Among the duties and responsibilities of WHO, as one of the original agencies of the United Nations, established on the first World Health Day (7 April 1948) is the protection of the consumer against any health hazard which could be transmitted as a result of consuming unsafe food.

After over 2 decades of fighting smallpox, WHO declared in 1980 that the disease had been eradicated, the first disease in history to be eliminated by human effort; this has not, however, been the case with regard to foodborne diseases, which remain a great challenge.

Globalization and food

The globalization of the food trade and the urbanization of populations are changing the pattern of food production and distribution, creating the conditions conducive to widespread outbreaks of foodborne disease. In a recent crisis, more than 1500 farms in Europe received dioxin-contaminated feed from a single source over a 2-week period and food produced from animals fed on this contaminated fodder found its way onto every continent within weeks. To give another example, the international propagation of meat and bonemeal prepared from cattle affected by bovine spongiform encephalitis (BSE) caused widespread proliferation of the disease among consumers.

In developed countries, up to 50% of the food budget may be spent on food prepared outside the home. In both developing and developed countries, there are millions of single workers constituting a large floating population who move in and out of the city for work and largely depend upon street foods for their daily sustenance. In developing countries, such food is prepared and/or sold by vendors or hawkers mainly in streets or other convenient public places under unacceptable conditions of hygiene. The resulting widespread foodborne illness needs no elaboration.

As a matter of fact, food safety is an essential public health issue for all countries since foodborne disease, whether due to microbial pathogens, biotoxins or chemical contaminants of food, represents a serious threat to the health of millions of consumers: significant serious foodborne disease outbreaks have been documented in many countries in the past and are still liable to occur in any part of the world.

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Such foodborne outbreaks not only affect the health and well-being of the people but also have economic consequences for individuals and nations; they impose a substantial burden on health-care systems of the country and reduce economic productivity. The globalization of food production and trade is aggravating the widespread outbreaks of foodborne diseases.

Food safety programmes are increasingly focusing on a farm-to-table approach in the control of food-related risks as an effective means of reducing foodborne hazards since hazards can enter the food chain at any point from the initial stage of production all the way through to consumption.

There is no doubt that significant progress has been made towards making food safer; the emergence of increased antimicrobial resistance of disease-causing bacteria is, however, aggravating the situation. Furthermore, there is increasing doubt and concern among the public with regard to the introduction of new technologies in the farm-to-table chain; i.e. irradiation and genetic engineering. The safety of such technologies has to be thoroughly proved if they are to be accepted by certain countries. Confidence in the safety and integrity of the food supply is an important requirement for consumers.

Specific hazards

Specific concern about food hazards have usually been focused on microbiological hazards, pesticide residues, misuse of food additives and chemical contaminants, including biological toxins. Until recently, most systems for regulating food safety were based on legal definitions of unsafe food, enforcement programmes for the removal of unsafe food from the market and sanctions for the responsible parties. Such traditional systems cannot today provide, or stimulate, a preventive approach.

During the past decade, there has been a transition to risk analysis based on better scientific knowledge of foodborne illness and its causes. This provides a preventive basis for regulating measures for food safety at both national and international levels. The risk-based approach must be backed by information on the most appropriate and effective means to control foodborne hazards.

International regulation/agreements

At both the 11th session of the Conference of the Food and Agriculture Organization (FAO) in 1961 and the 16th World Health Assembly in 1963, resolutions were passed to establish the Codex Alimentarius Commission, and both adopted the Statutes and Rules of Procedure for the Commission. Its main objectives are to protect the health of consumers and ensure fair practice in food trade. Also included are the formulation of food standards and other specific requirements covering pesticide residues, food additives, veterinary drug residues, hygiene, food contaminants, radionuclides and labelling.

Recently, the Codex has embarked on a series of activities based on risk assessment to address microbiological hazards in foods, and thus generated worldwide awareness of food safety and consumer protection issues and how to deal with them scientifically through a risk-based approach. Consequently, a continuous appraisal of the principles of food safety at the international level was created as well as an increasing tendency to adopt these principles at the national level.

Since consumers expect protection from hazards occurring along the entire food chain, from farm-to-table, factors that could contribute to potential hazards in foods should be considered; these include improper agricultural practices; poor hygiene (at all stages of the food chain); lack of preventive

controls in food processing operations; misuse of chemicals; contaminated raw materials, ingredients and water; and inadequate or improper storage. Usually concerns about food hazards focus on microbiological hazards, pesticide residues, misuse of food additives, chemical contaminants including biological toxins, adulteration, genetically modified organisms, allergens, veterinary drug residues, growth promoting hormones used in the production of animal products, and radionuclides.

As a result of the Multilateral Trade Negotiations in Morocco, the World Trade Organization (WTO) was established on 1 January 1995, and 2 agreements, the application of Sanitary and Phytosanitary Measures (SPS) and the Technical Barriers to Trade (TBT), came into force. They are relevant in understanding the requirements for food protection measures at the national level and the rules under which food is traded internationally.

According to the SPS agreement, WTO Member Countries have the right to apply measures to protect humans, animal and plant life and health. It covers decrees, regulations, testing, inspection, certification and approval procedures and packaging and labelling requirements directly related to food safety. All Member Countries are asked to apply only those measures for protection that are based on scientific principles, only to the extent necessary and not in a manner which may constitute a disguised restriction on international trade. The agreement encourages the use of international standards, guidelines or recommendations where they exist, and identifies those from the codex (related to food additives, veterinary drugs and pesticide residues, contaminants, methods of analysis and sampling and codes and guidelines of hygienic practices) that are consistent with the provisions of the SPS.

In other words, the Codex standards serve as a benchmark for comparison of national sanitary and phytosanitary measures. It is also compulsory for Member States to apply Codex standards; they should, however, harmonize their national food standards with those elaborated by the Codex. The TBT agreement also encourages the use of international standards and requires that technical regulations on aspects such as traditional quality factors, fraudulent practices, packaging and labelling imposed by countries will not be more restrictive on imported products than they are on products produced domestically.

Benefits of globalization

The globalization of the food trade offers many benefits to consumers, as it results in a wider variety of high-quality foods that are accessible, affordable and safe, meeting consumer demand. However these changes also present new challenges to safe food production and distribution and have been shown to have widespread repercussions on health.

Although significant progress has been made in many countries in making food safer, it is impossible to provide adequate protection to the consumer by merely sampling and analysing the final product. The introduction of preventive measures at all stages of the food production and distribution chain, rather than only inspection and rejection at the final stage, makes better economic sense, because unsuitable products can be identified earlier along the chain.

The preventive approach that may be applied at all stages in the processing and handling of food products involves the Hazard Analysis Critical Control Point (HACCP) system, the principles of which have been formulated by the Codex Committee on Food Hygiene and provide a systematic structure for the identification and control of foodborne hazards. Governments should recognize the application of

the HACCP approach by the food industry as a fundamental tool for improving the safety of food.

According to the Codex, risk analysis consists of 3 components: assessment, management and communication.

Risk assessment is a scientifically based process consisting of 4 steps: hazard identification, hazard characterization, exposure assessment and risk characterization. The definition includes quantitative risk assessment, which emphasizes reliance on the numerical expression of risk, and also qualitative expressions of risk as well as an indication of the attendant uncertainties.

Risk management is the process, distinct from risk assessment, of weighing policy alteration in consultation with all interested parties, and taking into consideration risk assessment and other factors relevant to the health protection of consumers and the promotion of fair trade practices, and, if needed, selecting appropriate prevention and control operations.

Risk communication is the interactive exchange of information and opinions throughout the risk analysis process concerning hazards and risks, risk-related factors and risk perceptions among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

Foodborne disease

The major challenging foodborne diseases caused by microorganisms are:

- Salmonellosis, which constitutes a major problem in most countries. Foods involved in salmonellosis outbreaks are mostly eggs, poultry and other meat, raw milk and chocolate.
- Campylobacteriosis, which is a widespread infection caused by certain species of *Campylobacter* bacteria. In some countries, the reported number of cases surpasses the incidence of salmonellosis. Foodborne cases are mainly caused by raw milk, raw or undercooked poultry and drinking water. In 2%–10% of cases the infection may lead to chronic health problems including reactive arthritis and neurological disorders.
- Infections due to enterohaemorrhagic (causing intestinal bleeding) *Escherichia coli* (e.g. *E. coli* 0157) and listeriosis are important foodborne diseases which have emerged over the past few decades. Although their incidence is relatively low, their severe, and sometimes fatal, health consequences, particularly among infants, children and the elderly, make them among the most serious foodborne infections.
- Cholera (a major public health problem in developing countries) also causes enormous economic losses. The disease is caused by the bacterium *Vibrio cholerae*. In addition to water, contaminated foods can be the vehicle of infection. Rice, vegetables, millet gruel, and various types of seafood have been implicated in outbreaks of cholera.

There are other food safety problems, major examples of which are:

- naturally occurring toxins, such as mycotoxins, marine biotoxins, cyanogenic glycosides and toxins occurring in poisonous mushrooms, periodically cause severe intoxications. Mycotoxins such as aflatoxin and ochratoxin A are found at measurable levels in many staple foods such as sorghum, maize and millet; the health implications of long-term exposure of such toxins are poorly understood.

- unconventional agents, for example the agent causing bovine spongiform encephalopathy (BSE, mad cow disease) which is associated with variant Creutzfeldt–Jakob disease (VCJD) in humans. Consumption of bovine products containing brain tissue is the most likely route for transmission of the agent to humans.
- persistent organic pollutants (POPs) are compounds that accumulate in the environment and the human body. Known examples are dioxins and polychlorinated biphenyls (PCBs). Dioxins are unwanted products of some industrial processes and waste incineration. Exposure to POPs may result in a wide variety of adverse effects in humans.
- heavy metals such as lead and mercury cause neurological damage in infants and children. Exposure to cadmium can also cause kidney damage; this is usually seen in the elderly. These (and also POPs) may contaminate food through pollution of air, water and soil.

Biotechnology and food

There are some other challenges and developments in food safety such as the safety of foods derived from biotechnology, which needs to be carefully assessed to demonstrate the scientific basis for decisions regarding human health. New methods and policies to assess such foods need to be developed and agreed upon internationally. Crops modified to resist pests, foods with allergens removed or with essential nutrients augmented are possible using food biotechnology, while antimicrobial markers in some genetically modified foods have been suggested but are not yet available on the market. The weighing of potential risks and benefits is an important aspect of assessment of foods derived from biotechnology that has not received much attention in the past. Foods derived from biotechnology should be assessed on a case-by-case basis. Likewise, clear communication of the basis for safety assessment in this area is generally lacking at national and international levels. Continuous monitoring is necessary to ensure the safe use of pesticides, veterinary drugs and food additives.

WHO involvement

In partnership with other stakeholders, WHO is developing policies that will further promote the safety of food. These policies cover the entire food chain from production to consumption and will make use of different types of expertise.

The work of the WHO Department of Food Safety and other WHO programmes and departments are strengthening food safety systems, promoting good manufacturing practises and educating national consumers about appropriate food handling. Education of consumers and training of food handlers for the safe handling of food is one of the most critical interventions in the prevention of foodborne illness. Through continuous feedback and support, various Member States are being assisted in their efforts to improve national food control systems.

On a Regional level a manual on *Developing food legislation: guidelines for developing legislation for food control systems in the countries of the Eastern Mediterranean* is being prepared. This manual is intended to enable the countries of the Region to develop legislation suited to the local situation. It incorporates a generic description of food control infrastructure, and explains the importance of food inspection, laboratory

food analysis, administration and enforcement of legislation, and includes the general legal framework for food control acts and executive regulations, including food standards, in line with the Codex Alimentarius and SPS and TBT agreements of the WTO.

The WHO Regional Office for the Eastern Mediterranean has continued working towards putting food safety firmly on national public health agendas by addressing the issue with health and agricultural authorities. Plans also include the continuous creation of awareness of food safety as a public health priority, along with the need for collaboration of all key players; the establishments of integrated of food monitoring and foodborne disease surveillance systems and the implementation of studies on foodborne burden of disease; participation and increasing use of the International Food Safety Authority Network, both in size and in responsiveness, in an everlasting effort to reach the goal of "safer food for all".

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