

Food safety and foodborne illness

Food safety is an increasingly important public health issue. Governments all over the world are intensifying their efforts to improve food safety. These efforts are in response to an increasing number of food safety problems and rising consumer concerns.

Definition of foodborne illness: Foodborne illnesses are defined as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food. Every person is at risk of foodborne illness.

Magnitude of foodborne illness: Foodborne diseases are a widespread and growing public health problem, both in developed and developing countries.

- The global incidence of foodborne disease is difficult to estimate, but it has been reported that in 2005 alone 1.8 million people died from diarrhoeal diseases. A great proportion of these cases can be attributed to contamination of food and drinking water. Additionally, diarrhoea is a major cause of malnutrition in infants and young children.
- In industrialized countries, the percentage of the population suffering from foodborne diseases each year has been reported to be up to 30%. In the United States of America (USA), for example, around 76 million cases of foodborne diseases, resulting in 325,000 hospitalizations and 5,000 deaths, are estimated to occur each year.
- While less well documented, developing countries bear the brunt of the problem due to the presence of a wide range of foodborne diseases, including those caused by parasites. The high prevalence of diarrhoeal diseases in many developing countries suggests major underlying food safety problems.
- While most foodborne diseases are sporadic and often not reported, foodborne disease outbreaks may take on massive proportions. For example, in 1994, an outbreak of salmonellosis due to contaminated ice cream occurred in the USA, affecting an estimated 224,000 persons. In 1988, an outbreak of hepatitis A, resulting from the consumption of contaminated clams, affected some 300,000 individuals in China.

Major foodborne diseases from microorganisms

- **Salmonellosis** is a major problem in most countries. Salmonellosis is caused by the *Salmonella* bacteria and symptoms are fever, headache, nausea, vomiting, abdominal pain and diarrhoea. Examples of foods involved in outbreaks of salmonellosis are eggs, poultry and other meats, raw milk and chocolate.
- **Campylobacteriosis** is a widespread infection. It is caused by certain species of *Campylobacter* bacteria and in some countries, the reported number of cases surpasses the incidence of salmonellosis. Foodborne cases are mainly caused by foods such as raw milk, raw or undercooked poultry and drinking water. Acute health effects of campylobacteriosis

include severe abdominal pain, fever, nausea and diarrhoea. In two to ten per cent of cases the infection may lead to chronic health problems, including reactive arthritis and neurological disorders.

- Infections due to **enterohaemorrhagic** (causing intestinal bleeding) **E. coli**, e.g. E.coli O157, and **listeriosis** are important foodborne diseases which have emerged over the last 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** is a major public health problem in developing countries, also causing enormous economic losses. The disease is caused by the bacterium *Vibrio cholerae*. In addition to water, contaminated foods can be the vehicle of infection. Different foods, including rice, vegetables, millet gruel and various types of seafood have been implicated in outbreaks of cholera. Symptoms, including abdominal pain, vomiting and profuse watery diarrhoea, may lead to severe dehydration and possibly death, unless fluid and salt are replaced.

Other food safety problems: some major examples

- **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; the health implications of long-term exposure of such toxins are poorly understood.
- **Unconventional agents** such as the agent causing bovine spongiform encephalopathy (BSE, or "mad cow disease"), is associated with variant Creutzfeldt-Jakob (vCJD) Disease 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 PCBs (polychlorinated biphenyls). Dioxins are unwanted byproducts of some industrial processes and waste incineration. Exposure to POPs may result in a wide variety of adverse effects in humans.
- **Metals**: such as lead and mercury, cause neurological damage in infants and children. Exposure to cadmium can also cause kidney damage, usually seen in the elderly. These (and POPs) may contaminate food through pollution of air, water and soil.

Costs of foodborne diseases

- Food contamination creates an enormous social and economic burden on communities and their health systems. In the USA, diseases caused by the major pathogens alone are estimated to cost up to US \$35 billion annually (1997) in medical costs and lost productivity. The re-emergence of cholera in Peru in 1991 resulted in the loss of US \$500 million in fish and fishery product exports that year.

Challenges and developments in food safety

The safety of food derived from **biotechnology** needs to be carefully assessed. To provide the scientific basis for decisions regarding human health, new methods and policies to assess such food need to be developed and agreed upon internationally. The assessment should consider health benefits as well as possible negative health implications. Crops modified to resist pests, foods with allergens removed or food with an increase of essential nutrients are possible examples of the former, while anti-microbial markers in some genetically modified foods have been suggested to be an example of the latter. 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. Likewise, clear communication of the basis for safety assessment in this area is generally lacking at national and international levels.

If not properly monitored and assessed, changes in animal husbandry practices, including feeding, may have serious implications for food safety. For example, increased use of ruminant bone and meat meal as feed supplement for cattle appear to have played a role in the emergence of BSE.

Adding low levels of antibiotics to animal feed in order to increase growth rate has raised concern about the transfer of antibiotic resistance to human pathogens from this practice.

Modern intensive agricultural practices contribute to increasing the availability of affordable foodstuffs and the use of food additives can improve the quality, quantity and safety of the food supply. However, appropriate controls are necessary to ensure their proper and safe use along the entire food chain. Pre-market review and approval followed by continuous monitoring are necessary to ensure the safe use of pesticides, veterinary drugs and food additives.

Other challenges, which need to be addressed to help ensure food safety, include the globalization of trade in food, urbanization, changes in lifestyles, international travel, environmental pollution, deliberate contamination and natural and manmade disasters. The food production chain has become more complex, providing greater opportunities for contamination and growth of pathogens. Many outbreaks of foodborne diseases that were once contained within a small community may now take on global dimensions.

Future directions for food safety at the World Health Organization (WHO)

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 includes strengthening food safety systems, promoting good manufacturing practices and educating retailers and consumers about appropriate food handling. Education of consumers and training of food handlers in safe food handling is one of the most critical interventions in the prevention of foodborne illnesses.

- WHO is promoting in-country laboratory-based surveillance of priority foodborne diseases in humans and animals, as well as the monitoring of pathogens in food. In co-operation with its Member States, WHO is working to support the development of internationally agreed-upon guidelines for data collection in countries. WHO is also compiling outbreak and surveillance databases, and is broadening its epidemic surveillance capacity to include foodborne disease outbreaks.
- WHO is expanding its global network of participating institutions to monitor chemical contamination of the food supply, particularly in developing countries.
- WHO is promoting the use of all food technologies which may contribute to public health, such as pasteurization, food irradiation and fermentation.
- WHO has undertaken an important new initiative to strengthen the scientific basis of food safety activities through the establishment of a WHO/FAO (Food and Agriculture Organization of the United Nations) expert advisory body to assess microbiological risks in food.

- WHO is increasing its involvement in the work of the FAO/WHO Codex Alimentarius Commission, whose standards, guidelines and recommendations are regarded as the international reference for food safety requirements by the World Trade Organization. WHO and FAO is initiating a thorough review of Codex primo 2002.
- Biotechnology has become a major public issue in developed as well as developing countries. WHO, jointly with FAO, will convene a series of expert consultations to assess the safety and nutritional aspects of foods derived from genetically modified plants, microorganisms, and animals. WHO has initiated work to establish a knowledge base focusing on a broader evaluation of risks, benefits and other considerations related to the production and consumption of foods derived from biotechnology.