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FOOD SAFETY ISSUES

Food technologies and public health

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FOOD TECHNOLOGIES AND PUBLIC HEALTH

Since the dawn of history, food technologies have played a vital role in the life and survival of human kind. Recent advances in this area have made this science indispensable for health and socioeconomic development. In spite of this, the importance of food technologies in the prevention of diseases, and subsequently health, remains largely unrecognized in most public health circles, and at times they are even thought to be the cause of foodborne diseases.

This paper highlights the contribution of food technologies to health from the perspective of food safety and underlines the need to consider them as "health technologies" in their own right.

1. Introduction

Health technologies may be divided into those for curative and preventive purposes. In the latter group, a number of food technologies play a fundamental role, and one which unfortunately is not always recognized in public health circles.

Food technologies play a pivotal role in improving the nutritional quality of food, ensuring its safety, and preventing foodborne disease. They reduce losses due to spoilage or contamination, and are thus vital in the prevention of malnutrition and starvation.

Food technologies also have important socioeconomic implications. They facilitate and promote trade in food, provide employment for a large section of the population, facilitate the work of women in preparing the family's food, and give them the opportunity to participate fully in social life. They increase the consumer's pleasure and provide a greater choice of products.

The role of food technologies in life and health is broad. This paper describes the nature and extent of foodborne diseases and highlights the contribution of food technologies in their prevention.

2. Burden of foodborne disease

Diseases caused by contaminated food[1] constitute one of the most widespread health problems and are an important cause of reduced economic productivity (1). The majority of foodborne diseases are caused by biological agents, i.e. bacteria, viruses and parasites (see Box 1) and are manifest with gastrointestinal symptoms such as diarrhoea (watery, bloody or persistent), abdominal pain, nausea and vomiting. Infections caused by pathogens such as *Vibrio cholerae, Escherichia coli, Campylobacter jejuni, Salmonella spp, Shigella spp, Entamoeba histolytica, Cryptosporidium spp,* and rotavirus have diarrhoea as the major clinical symptom, and are therefore also known as *diarrhoeal diseases*.

Box 1. Pathogenic organisms of public health importance which may be transmitted through contaminated food

Bacteria

Bacillus cereus
Brucella spp
Campylobacter jejuni
Clostridium botulinum
Clostridium perfringens
Escherichia coli spp (pathogenic strains)
Listeria monocytogenes
Mycobacterium bovis
Salmonella typhi and paratyphi
Salmonella (non-typhi) spp
Shigella spp
Staphylococcus aureus
Vibrio cholerae
Vibrio parahaemolyticus
Vibrio vulnificus
Yersinia enterocolitica

Viruses

Hepatitis A virus
Norwalk agents
Poliovirus
Rotavirus

Protozoa

Cryptosporidium spp
Entamoeba histolytica
Giardia lamblia
Toxoplasma gondii

Trematodes

Clonorchis sinensis
Fasciola hepatica
Fasciolopsis buski
Opisthorchis felineus
Opisthorchis viverrini
Paragonimus westermani

Cestodes

Diphyllobothrium latum
Echinococcus spp
Taenia solium and saginata

Nematodes

Anisakis spp
Ascaris lumbricoides
Trichinella spiralis
Trichuris trichiura

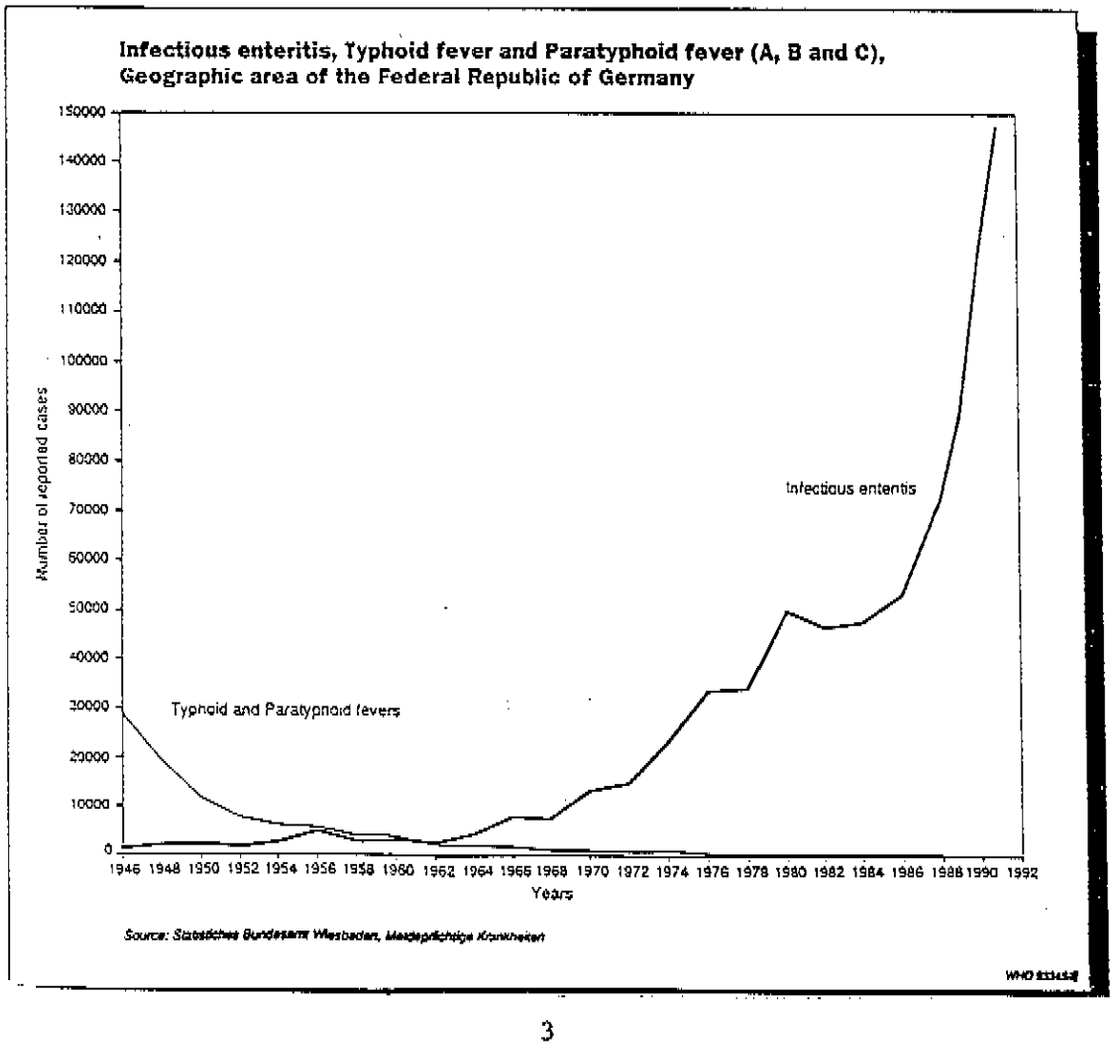
[1] including drinking-water

The variety and extent of foodborne diseases are such that no country is able to provide accurate data on their incidence or prevalence, and surveillance programmes, where they exist, mostly collect information on only a low number of incidences. It is therefore not possible to give any global estimate of the real magnitude of the problem. In some cases, the etiology is multifactorial in nature and disease becomes manifest only after a long period of exposure, as in the case of certain cancers. Consequently, many of the health problems resulting from food contaminants do not figure in statistics on foodborne disease.

Furthermore, even when there is a reporting system, only a small proportion of episodes of foodborne diseases ever comes to the attention of public health authorities. In industrialized countries, reported cases probably account for less than 10% of real incidence, but in developing countries underreporting is much higher, and it is estimated that less than 1% of foodborne disease episodes are notified (1).

A wide range of foodborne diseases are prevalent in developing countries. These include: cholera, salmonellosis, campylobacteriosis, shigellosis, typhoid, poliomyelitis, brucellosis, amoebiasis and *E. coli* infections. Although the real magnitude of the problem is unknown, statistics available from a few of these show an increasing trend (Figure 1).

Figure 1



Diarrhoeal diseases are a major cause of morbidity and mortality in infants and children under the age of five and, on average, children in developing countries suffer 2 - 3 episodes of diarrhoea per year, in some cases as many as 10 episodes. Up to 70% of such episodes in children under the age of five have been attributed to contaminated food. Weaning foods contaminated with pathogenic strains of *E. coli* are considered as the cause of 25-30% of diarrhoeal disease episodes in developing countries (2). A serious consequence of diarrhoeal disease is the effect on the nutritional status and immune systems of infants and children. Repeated episodes lead to a reduction in food intake, aggravated by loss of nutrients due to malabsorption and vomiting, fever and impaired resistance to other infections (often respiratory), and the child becomes caught up in a vicious cycle of malnutrition and infection. Many do not survive under these circumstances, and some 13 million children under the age of five die each year in this way (2).

The elderly and the immunosuppressed are also very susceptible to the health effects of foodborne infections, and case fatality rates, for example of salmonellosis, are significantly higher (as much as 10 times) in this population group (2,3).

The problem is not limited to the developing countries but is also considerable in industrialized countries. [The annual incidence of foodborne disease in the United States of America (USA) has been estimated to be in the order of 6 - 80 million cases, the latter figure corresponding to about one third of the population (4).] Studies in industrialized countries have estimated that each year 5 - 10% of the population suffer from a foodborne disease (2).

During recent years, the reported incidence of foodborne disease has increased significantly, an increase which is partly due to epidemics of salmonellosis. In many countries *Salmonella enteritidis* is the dominant pathogen and poultry, eggs and food containing eggs have been identified as the predominant source. In certain countries, 60 - 80% of poultry meat is reported to be contaminated with *Salmonella enteritidis* (5).

Many industrialized countries are also experiencing outbreaks of diseases due to relatively newly-recognized types of foodborne pathogens such as *Campylobacter jejuni*, *Listeria monocytogenes* and *E. coli* 0157:H7. Campylobacteriosis has increased to such an extent that it is now the leading foodborne disease in several of these countries. As with salmonellosis, the main vehicles for transmission are poultry meat and raw milk.