FOOD-BORNE PATHOGENS


Listeria monocytogenes. A.B. Dowsett / Science Photo Library

- The World Health Organization (WHO) estimates that food-borne and water-borne diarrhoeal diseases together kill around 2.2 million people annually.
- An estimated 1 million people suffer from food-borne illness each year in the UK.
- Food-borne illness costs the UK economy an estimated £2 billion each year.

AN OVERVIEW

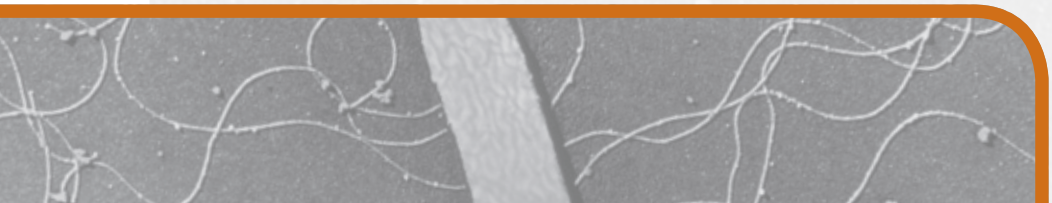
Food-borne pathogens are a major threat to food safety. Most food-borne illness is caused by infection by microbial pathogens that have entered the food chain at some point from farm to fork. Food-borne illness can also be caused by toxins (microbial or chemical) that have contaminated food. The majority of cases of food-borne illness are mild and self-limiting, although unpleasant. However, occasionally, more serious illness or even death may result. Around one-third of people in developed countries are affected by food-borne pathogens each year, according to the WHO. This figure is significantly higher in developing countries. The cost and burden of food-borne illness is high and is a global concern. International trade means that contaminated food has the potential to spread widely.

MONITORING FOOD-BORNE ILLNESS

In the UK, the Health Protection Agency (HPA) and the Food Standards Agency (FSA) both track laboratory-confirmed cases of the bacterial pathogens *Campylobacter*, *Salmonella*, *Listeria monocytogenes*, verocytotoxin-producing *Escherichia coli*, including *E. coli* O157, as well as food-borne viruses, such as norovirus. In 2009, the HPA started measuring levels of food-borne illness electronically to allow more efficient reporting. Many mild cases of food-borne illness go unreported, which means that the number of reported cases is a large underestimate of the actual number of cases.

TRENDS

In the UK, overall levels of food-borne illness have remained consistent since 2005 although levels of individual pathogens have changed. In 2010, *Campylobacter* displaced *Salmonella* as the leading cause of food-borne illness. *Salmonella*-related illness has declined in recent years due to the introduction of successful intervention strategies. The number of cases of *Listeria monocytogenes* – which causes the highest number of food-related deaths – rose between 2001 and 2009. Viruses are responsible for an increasing number of cases. *E. coli* O157 and other toxin-producing *E. coli* remain less common, but serious pathogens. The majority of food-borne outbreaks in 2010 occurred in the food service sector, particularly restaurants and take-away outlets.



FOOD-BORNE PATHOGENS

Bacteria	Proportion of food-borne illness caused in the UK	Foods most likely to be contaminated	Main symptoms
Campylobacter	30%	Poultry, red meat, unpasteurized milk, untreated water.	Abdominal cramps, fever, diarrhoea.
Salmonella	13%	Meat, poultry, salads, eggs, raw egg products.	Abdominal cramps, fever, sickness, diarrhoea.
E. coli O157	2–3%	Meat, raw milk, salads.	Abdominal cramps, bloody diarrhoea. Complications of profuse bleeding and kidney failure may arise.
Listeria monocytogenes	2–3%	Soft cheeses, pâté, chilled ready-to-eat products.	Flu-like symptoms. Septicaemia or meningitis may develop. Infection can be fatal in one-third of cases in susceptible individuals.

The time taken for symptoms to develop following infection by bacterial food-borne pathogens varies between 1 and 4 days. Young children, the elderly and those with weakened immune systems are most at risk from infection by *Salmonella*. These groups, together with pregnant women, are also more susceptible to *Listeria* infection.

Viruses could be responsible for up to 30% of food-borne illness, but cases are more difficult to diagnose. Norovirus is estimated to cause 200,000 cases of food-borne illness each year in England and Wales. It is associated with outbreaks of illness related to raw shellfish, such as oysters.

MICROBIAL TOXINS

In addition to disease caused by direct infection by food-borne pathogens, food-borne illness can be caused by microbial toxins that contaminate food.

Mycotoxins are produced by certain moulds that grow on various foods, including cereals, nuts and dried fruits. Mycotoxins cause a range of negative health effects in humans; some, such as aflotoxins, are carcinogenic in animals, and probably humans. Toxins produced by certain varieties of macroscopic fungi (e.g. wild mushrooms) can cause illness or even death when consumed. 316 cases of mushroom poisoning were reported to the HPA in 2010.

Some strains of food-borne bacteria including *Staphylococcus aureus*, *Clostridium botulinum* and *Bacillus cereus* produce toxins in food which can cause a variety of symptoms ranging from vomiting caused by *S. aureus* toxin to a severe neuroparalytic condition caused by botulinum toxin.

AVOIDING FOOD-BORNE ILLNESS

Food-borne microbes are usually killed or controlled by cooking or chilling. Most food-borne illness can be prevented by avoiding cross-contamination. This is achieved by storing cooked and raw food separately, cooking food thoroughly and washing hands before and after touching raw food. Such food hygiene practices must be adhered to during production, storage, transportation and preparation of food, to minimize the growth and spread of pathogens. Food hygiene legislation affects all food businesses, including caterers, farmers, manufacturers and retailers.

STRATEGIES TO REDUCE FOOD-BORNE DISEASE

The FSA estimate that each 1% reduction in case numbers would save the UK around £15 million per year.

- The FSA's *Foodborne Disease Strategy 2010–2015* aims to reduce microbial contamination of foods through all stages of production, processing and preparation – a farm to fork approach.
- The UK Research and Innovation Strategy for *Campylobacter 2010–2015* is a joint research strategy by FSA, DEFRA and BBSRC. It contains a list of research priorities to effectively coordinate research into *Campylobacter*.
- The WHO global strategy for food safety assists member states in improving and strengthening their food safety programmes from production through to consumption.

SGM BRIEFINGS

The Society for General Microbiology (SGM) aims to highlight the important issues relating to microbiology to key audiences, including parliamentarians, policy-makers and the media. It does this through a range of activities, including issuing topical briefing papers. Through its many members, the SGM can offer impartial, expert information on all areas of microbiology.

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