Emerging Trends in Foodborne Diseases

Christopher R. Braden, MD*, Robert V. Tauxe, MD, MPH

KEYWORDS

- Foodborne infections • Outbreak investigations • Laboratory diagnosis
- Molecular subtyping • Trends • Imports • Burden of illness • Food poisoning

KEY POINTS

- About 1 in 6 (or 48 million) Americans become ill with a foodborne illness each year.
- Successful food safety interventions significantly decreased rates of some foodborne illnesses before 2005.
- Progress in decreasing rates of foodborne illness has stalled; *Salmonella* infection rates are the same as in 1998.
- Public health surveillance, outbreak detection, and investigation serve to focus prevention efforts.
- Clinicians play a critical role in linking clinical observations and findings with public health action.

WAS IT SOMETHING I ATE?

Infections transmitted through foods are common. Presenting with a variety of symptoms and syndromes, these infections complicate school, work, and travel and can lead to hospitalization and even death, particularly in high-risk patients. The spectrum of infections and the food sources that transmit them has changed as new pathogens have emerged or are better detected, the number of high-risk persons in the population has increased, previously idiopathic syndromes have been linked to foodborne infection, and as the nature and sources of the foods we eat has changed. Since the 1990s, some infections have been reduced by intensive and focused control efforts in some parts of the food chain, whereas others remain as common or are increasing.

Some foodborne pathogens, like *Campylobacter,* Shiga toxin–producing *Escherichia coli* (STEC), nontyphoidal *Salmonella*, and *Listeria* have animal or environmental reservoirs, and humans are most often incidental hosts, after foods or ingredients are contaminated from those reservoirs somewhere along the chain of production, slaughter and processing. Secondary spread, particularly of *Salmonella* from food handlers and of STEC among young children can also be important. Other pathogens, like norovirus, hepatitis A, or *Shigella* have a primary human reservoir and cause foodborne illness when an infected human contaminates foods. Some of these pathogens also spread via water or animal contact, so the source of an infection is not necessarily food.

Our food supply is changing as more food is imported from distant lands, food processing becomes more centralized and industrial, and consumer tastes and cooking practices evolve. Food animals are raised in close quarters and are slaughtered and processed with ever-greater efficiency. Fresh fruits and vegetables are available year round, often shipped from warmer countries. Processed foods like peanut butter and raw cookie dough have caused large outbreaks when food safety measures were insufficient to prevent microbial contamination. In the kitchen, microwaving is replacing traditional cooking, which means that the heating that kills microbes is less thorough and more difficult to monitor. Consumers may desire local foods and foods eaten with minimal cooking as well as convenience. In 25 states, the sale of raw unpasteurized milk is now permitted, despite the raw milk–associated outbreaks that occur more frequently in those states.[1]

Diagnosing these infections is important for individual patients, who may be helped by specific treatment, and also for the general public health. Diagnosis and reporting is the foundation of public health surveillance, which makes it possible to detect and investigate outbreaks, to halt ongoing transmission, to better prevent similar outbreaks in the future, and to track progress in making the food supply safer.

PUBLIC HEALTH BURDEN OF FOODBORNE INFECTIONS

In 2011, the Centers for Disease Control and Prevention (CDC) estimated that each year approximately 48 million illnesses, 320 000 hospitalizations, and 3000 deaths caused by foodborne diseases occur in the United States.[2,3] The 31 known foodborne pathogens with sufficient data to make estimates account for an estimated 9.4 million illnesses, 56 000 hospitalizations, and 1400 deaths annually. These estimates are based on population surveys of acute gastroenteritis and pathogen-specific surveillance data. Eight pathogens account for most of the health burden caused by known pathogens (**Table 1**), accounting for 91% of illnesses, 88% of hospitalizations, and 88% of deaths. Norovirus accounts for most foodborne illnesses (58%), whereas nontyphoidal *Salmonella* accounts for the most hospitalizations (35%) and deaths (28%). Beyond the 31 defined pathogens, unspecified agents account for the balance of the total estimated burden. These unspecified agents represent those with insufficient data to estimate agent-specific burden (eg, *Plesiomonas* spp); known agents not yet identified as causing foodborne illness; marine and mycotic biotoxins; microbes, chemicals, or other substances known to be in food whose ability to cause illness is unproven or unknown; and agents yet to be identified.

The 2011 estimates update the previous 1999 estimate of 76 million cases with improved methods and data.[4] Because the analyses and data differed, direct comparison is not possible between the two sets of estimates. Additional population survey data used for the 2011 estimates revealed a more precise rate of acute gastroenteritis (0.6 per person per year) compared with data used for the 1999