The Microbiological Safety of Food in Healthcare Settings

Edited by

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Foreword

The challenge of ensuring safe food in the healthcare setting occurs on the interface between the worlds of curative medicine and public health. One point of intersection is the patient with an infection that might be foodborne. As a centre for diagnosis and treatment, the hospital is a listening post for problems affecting the community at large, and for problems that may be specific to that institution. That infection may have been acquired in the community, and reports of clusters of such infections from astute hospital-based clinicians and microbiologists have often been the first indicator of outbreaks that affect the entire community. A single infection or a cluster of infections may have been acquired at the hospital itself. Conducting surveillance for infections that might have an origin within the hospital depends on rigorous monitoring of illnesses and on setting a low threshold for obtaining diagnostic specimens from patients with gastroenteritis when an outbreak is suspected. Because patients continuously move out of the hospital into the community, infections that may be related to hospital food service may also be identified among persons who are recently discharged. Thus, detecting infections that may be related to hospital exposures also depends on regular communication between the public health authorities conducting surveillance in the community and infection control groups conducting surveillance in hospitals or other healthcare settings.

Because the populations in hospitals and long-term care facilities include many of the most vulnerable individuals, those who become ill there may be at particularly high risk for serious and sometimes fatal consequences. Many kinds of infections may have a foodborne source, though it is rarely possible to definitely determine that source for a single isolated case. Typically, the specific food source of a foodborne infection is only determined in the course of an outbreak investigation. However, sporadic cases of foodborne infections are far more common than outbreaks in community-acquired foodborne infections, and the same may be true for hospital-acquired infections. Because a sporadic individual case may be the herald event that presages an outbreak, it is important to heighten surveillance efforts after a single case is identified, and to consider the food sources within the hospital itself when the likely exposure period includes the time for which the person was in the hospital.

When an outbreak occurs as a result of contaminated food served in a hospital, the persons affected can include patients, staff, visitors and others in the community. The investigation and control of outbreaks of foodborne illness in the healthcare setting can be challenging, because the population turns over rapidly, the patients have a variety of other illnesses, a multitude of possible food and non-food sources need to be considered, and there is a natural reluctance to disrupt routines of care and treatment. In addition to the efforts of the institution’s epidemiologist and infection control staff, close coordination with the local...
health authorities is vital to help clarify links the outbreak may have to events beyond the hospital. Engagement of the local food safety authorities will also help bring their expertise in the evaluation of food service premises, a skill that few hospital infection control staff would be expected to have. The successful investigation may well require the combined efforts of community public health authorities with experience and skill in food safety issues, as well as the hospital and local epidemiological and microbiological staff.

The investigations reveal that most of these outbreaks can be prevented by policies and procedures within the institutions. These same measures are likely to also prevent many of the sporadic cases that may be occurring. It is important to remember that the population served in many healthcare settings includes many persons at higher risk for poor outcomes or even death, because of underlying diseases, or immunocompromising treatments. Therefore, the safety standards for foods provided to such populations need to be set higher than those used for ordinary restaurants or other foods service establishments. In the United States, for example, the Model Food Code, a set of draft regulations recommended by the Food and Drug Administration for adoption by state or local governments, has a special section that covers establishments serving high-risk populations. This section has additional requirements that are beyond what is required of restaurants. For example, it requires the use of pasteurized eggs in many recipes, in place of unpasteurized shell eggs, and has other provisions that reduce the risk for the most vulnerable. Hospital authorities can consider and implement a menu of prevention practices. They could require that kitchen staff receive training and certification in the principles of food safety. They could routinely provide paid sick leave to dietary staff. They could ensure that the layout of the kitchen minimizes cross-contamination and maximizes handwashing, and could provide incentives to make regular handwashing happen. They could put food safety requirements in their food purchase contracts, just as some major restaurant and grocery store chains do. They could routinely use nothing but pasteurized eggs, either as bulk liquid product in a carton or as in-shell pasteurized eggs purchased by the dozen. They could use irradiated meat and poultry products. It is possible that the lower risk could even translate into lower costs of illness, and that economic considerations favour prevention.

In addition, because healthcare facilities serve persons who are most vulnerable to foodborne infections, they can also be educated about food safety, and how they can reduce their risk after they leave the hospital. Consulting dietitians can be a source of preventive information, providing food safety advice to all patients in addition to the advice specific to their condition, as well as consulting with high-risk persons on food safety before they leave hospital and return home.

The dietary service should be seen as an integral part of the general effort to prevent healthcare-associated infections. The daily routines of the dietary service are a central bulwark against disaster. It is unfortunate that this is often ignored by those with direct oversight of hospitals. Routine hospital inspection for accreditation, and audits of the food service consider many aspects of patient safety in some detail. However, they often leave the safety of the foods that are produced and served to hospital patients to the attention of local public health authorities, who may lack resources and the perceived authority to inspect and enforce the higher standards that are needed for the healthcare setting. The recent trend towards outsourcing hospital food to external food establishments should be used as opportunity to require higher standards.
At the same time, the challenges of food safety should remind us that hospitals do not exist in isolation, and that foodborne disease prevention extends all the way back to the farm. Food is one of the primary routes by which microbes and microbial genes flow from farms into communities and hospitals. Outbreaks can occur as the result of contamination in remote pastures, feedlots, henhouses and produce fields as well as because of specific food handling errors in the kitchen itself. Foodborne illnesses show how closely the clinical world can be connected to the ways that food animals and plants are raised and processed. Egg-associated outbreaks of salmonellosis are a recurrent reminder of this. Locally produced foods have been the source of many infections, and need to be chosen with regard to both their quality and safety. At the same time, some infections are imported with foodstuffs from other countries. The rapid shipment of foods across international boundaries, and the rapid transmission of illnesses around the world mean that the state of the world’s food supply matters to hospitals as well as to travel clinics.

This text brings together the most up-to-date information on all these dimensions from a panel of experts on both sides of the Atlantic, with a focus on the experience in the United Kingdom. It covers in one volume the salient features of each of the major foodborne pathogens, the intricacies of outbreak investigations, the size and complexity of the at-risk population, the recent regulatory experiences and practical approaches to making sure that the food and water supplies in healthcare facilities are managed for safety. It should be a standard reference work for professionals and students alike, for those managing the safety of food in healthcare institutions, and those providing for the treatment, safety and well-being of the patients that come to them.

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Healthcare settings include hospitals, nursing homes, institutions and homes for the elderly and for the disabled, nurseries, organizations supporting sick or elderly persons in their homes, and relief for malnourished populations. In many cases individuals in healthcare settings are particularly vulnerable to infections, including foodborne diseases, because of their illness, drug treatment, impaired immune response, or age. Thus, standards for the microbiological safety of foods in healthcare settings need to be more stringent than those for the general population. In addition, advice on safe foods needs to be given to persons in vulnerable groups who live in the community.

The aim of this book is to describe the ascertainment and risks of foodborne disease and its incidence in healthcare settings, and to highlight important features of the provision of safe food in these settings.

This book is intended to be suitable for physicians, doctors and nurses responsible for the control of infection, clinicians, those responsible for catering management, microbiologists, environmental health officers, food scientists and food technologists. The aim is to assist all who have a responsibility for the supply of safe food for persons in healthcare settings and for dietary advice given to vulnerable individuals.

Barbara M. Lund
Paul R. Hunter
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**Abbreviations used in the text**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>Acquired immune deficiency syndrome</td>
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<tr>
<td>BSE</td>
<td>Bovine spongiform encephalopathy</td>
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<tr>
<td>CCP</td>
<td>Critical control point</td>
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<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention (USA)</td>
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<tr>
<td>CFSAN</td>
<td>Center for Food Safety and Applied Nutrition (USA)</td>
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<tr>
<td>CFU</td>
<td>Colony-forming unit</td>
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<tr>
<td>DNA</td>
<td>Deoxyribonucleic acid</td>
</tr>
<tr>
<td>DH</td>
<td>Department of Health (UK)</td>
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<tr>
<td>EFSA</td>
<td>European Food Safety Authority</td>
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<tr>
<td>EHO</td>
<td>Environmental Health Officer</td>
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<td>EU</td>
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<td>FDA</td>
<td>Food and Drug Administration (USA)</td>
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<td>FSA</td>
<td>Food Standards Agency (UK)</td>
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<tr>
<td>HACCP</td>
<td>Hazard Analysis Critical Control Point</td>
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<tr>
<td>HAI</td>
<td>Healthcare-associated infection</td>
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<tr>
<td>HPA</td>
<td>Health Protection Agency (UK)</td>
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<td>HTST</td>
<td>High temperature short time</td>
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<td>HUS</td>
<td>Haemolytic uraemic syndrome</td>
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<td>ICT</td>
<td>Infection control team</td>
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<tr>
<td>kDa</td>
<td>Kilodaltons</td>
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<tr>
<td>NHS</td>
<td>National Health Service (UK)</td>
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<tr>
<td>PCR</td>
<td>Polymerase chain reaction</td>
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<td>PFGE</td>
<td>Pulsed field gel electrophoresis</td>
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<td>PHF</td>
<td>Potentially hazardous food</td>
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<tr>
<td>RNA</td>
<td>Ribonucleic acid</td>
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<td>RTE</td>
<td>Ready-to-eat</td>
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<tr>
<td>STEC</td>
<td>Shiga toxin-producing <em>Escherichia coli</em> (Vero cytotoxin-producing <em>E. coli</em>)</td>
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<tr>
<td>TCS</td>
<td>Time/temperature control for safety food</td>
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<tr>
<td>UK</td>
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<tr>
<td>US</td>
<td>United States of America</td>
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<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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### Interconversion of degrees Centigrade and degrees Fahrenheit

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\[
{\degree}C = \frac{5}{9} (\text{°}F - 32)
\]

\[
\text{°}F = \frac{9}{5} \cdot \text{°}C + 32
\]
1 Overview

Patrick G. Wall

1.1 Food safety for vulnerable groups
A series of food-related problems, culminating in BSE, have placed food safety high on the agenda of policy makers and local and international media. The confidence of consumers at large in the safety of food, in the food industry’s commitment to produce safe food, and in the ability of enforcement agencies to police the food chain, has been damaged. In the context of healthcare institutions, however, it is not new variant CJD or dioxin contamination that is contributing to morbidity and mortality but a range of bacteria, viruses and protozoa (Chapter 2), causing illnesses that are easily preventable (Rocourt et al., 2003).

The position of catering services within healthcare institutions is often given low priority compared to high-profile medical services. However, catering is pivotal to the operation of the institution. For any patient to recover they must be in an anabolic state, and appetizing, nutritious food is the foundation for achieving this. The patient’s diet is as important as therapeutic and surgical interventions. Unfortunately, this is rarely recognized and while there are often fund-raising initiatives for a new MRI scanner or coronary care unit, and politicians love the high media coverage associated with announcing the opening of these facilities, the need for a new kitchen or a blast chiller does not generate the same level of interest.

Food poisoning may not cause major morbidity in robust adults but can be life-threatening in small infants, the frail elderly, or people suffering from concurrent morbidity (Kendall et al., 2003). The frail elderly (Kendall et al., 2006) and the ill (Trevejo et al., 2005) often have lower immunity than healthy adults and the infectious dose to precipitate an infection is lower (Chapter 5). For example, Enterobacter sakazakii can cause sepsis, meningitis or necrotizing enterocolitis in neonates and the case-fatality rate has been reported to be as high as 33%, however this pathogen rarely causes disease in adults (Lai, 2001). Similarly, persons over 65 years old are about 7.5 times more susceptible to Listeria monocytogenes than persons under 65 with no other condition, and persons with a range of conditions from alcoholism through diabetes, cancer, AIDS and transplant patients show an increased relative susceptibility ranging from 18 to 2584 (WHO, 2004). The problem of low-level contamination of a food

1